FOCAL SPOT

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SPRING/SUMMER 2026 Beyond the Knife: The Rise of Interventional Oncology

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

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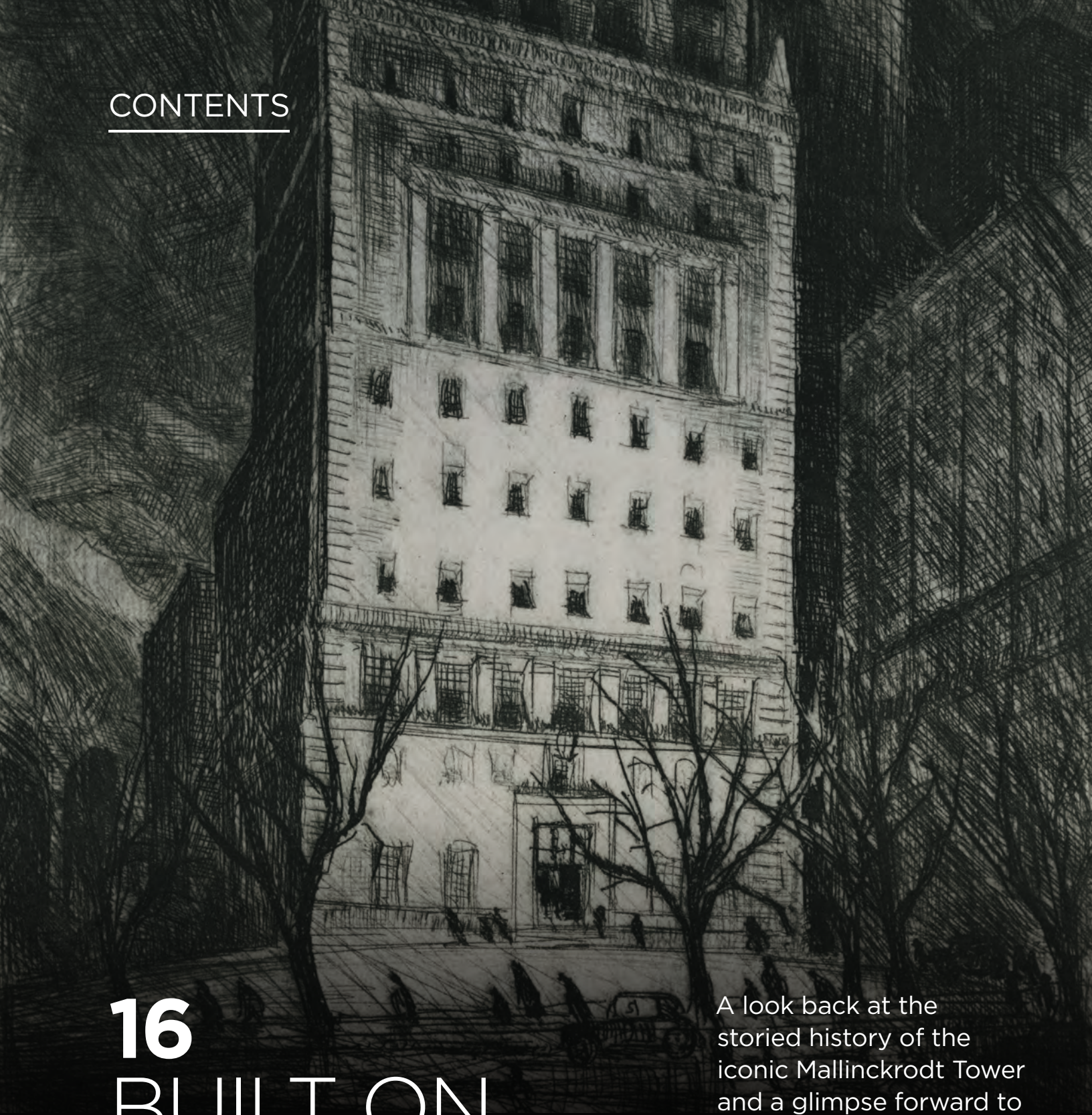
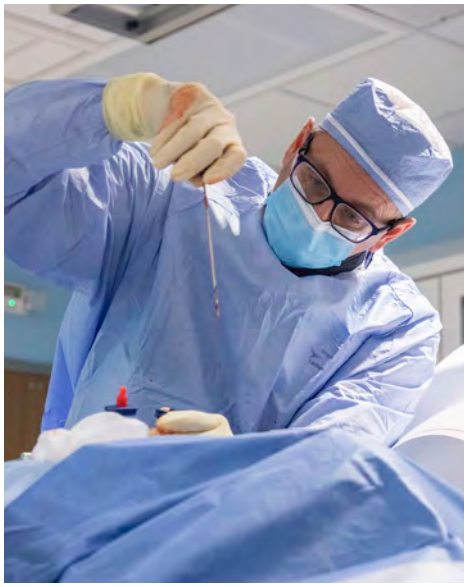


16 BUILT ON HISTORY

A look back at the storied history of the iconic Mallinckrodt Tower and a glimpse forward to MIR's cutting-edge future at Plaza West Tower.

Drawing by George Spearl ca. 1930



Cover Photo: Christopher D. Malone, MD, performs a Y-90 radioembolization, which delivers radioactive microspheres straight to the blood vessels that supply a liver tumor. This is one of many minimally invasive, image-guided interventional oncology procedures that are expanding what's possible for patients with cancer.

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Last In, First Out

$5 million NIH grant funds neuroimaging research on mirroring between early brain growth and old age

by Mark Reynolds

The study aims to characterize the overlap between early-life development patterns and later-life degeneration.

Muriah D. Wheelock, PhD (above), and Brian A. Gordon, PhD, were awarded a $5 million, five-year grant from the NIH National Institute on Aging to examine how early-life stress on the developing brain can influence brain aging and the progression of neurodegenerative diseases such as Alzheimer's.

Adverse circumstances in the first years of life — such as low birth weight, poverty, unsafe living conditions and exposure to trauma — are known to alter the development of certain brain regions in ways that are visible on MRI scans and that persist well into early adulthood. These regions, which govern complex functions such as decision-making, language, emotional regulation and memory, are the same ones that take longer to develop than other brain regions and that tend to be affected by Alzheimer's and other age-related neurodegenerative diseases. Researchers have dubbed this phenomenon "last in, first out," meaning that the brain regions that develop last are the first to be affected by disease in old age.

Wheelock, an assistant professor at WashU Medicine Mallinckrodt Institute of Radiology (MIR), said that there was a longstanding theory in the neuroscience community that there was mirroring between neurological development and neurological degeneration. But the idea that the areas of the brain that mature last are the first to degrade had not been scientifically quantified, in part because of the computational complexities that the work would require.

Furthermore, longitudinal studies of early-life adversity and health tend to follow participants only into young adulthood. This means that data connecting detrimental brain changes in infants and toddlers to neurodegeneration in old age are lacking.

To fill the gap, Wheelock and Gordon — an associate professor at MIR and co-principal investigator on the study — will analyze brain images and other data from large cohorts of individuals across the lifespan to understand how neurodevelopmental changes in the brain's functional connectivity (the patterns in how different brain regions speak to one another to complete tasks) caused by early-life adversity may prime the brain for specific patterns of degeneration later.

"Damage to these later developing regions could be on a lifelong trajectory that can show up later in life as Alzheimer's disease or other conditions," said Wheelock. "We might be able to identify early-childhood or even maternal interventions to reduce the risk of Alzheimer's and other age-related neurological disorders."

Over the next five years, their labs will analyze thousands of MRI scans, patient histories and biomarkers from large cohorts representing both ends of the human lifespan, drawn from databases collected at WashU Medicine and other institutions around the world. With that information, they aim to characterize the overlap between early-life development patterns and later-life degeneration, track how adverse social factors and genetic risk factors affect those patterns, and explore the underlying mechanisms of aging and disease progression.

One goal is to identify early-life interventions to mitigate the social stressors tied to neurodegeneration later in life and thereby minimize their influence on age-related diseases.

"The brain is much more plastic in that zero-to-two age range, so any intervention is magnified relative to any other point in life," said Gordon. "It's still speculative that we could prevent or reduce Alzheimer's disease with environmental changes in childhood, but we're hoping to at least start that discussion."

MIR-Based Center Advances AI-Driven Imaging Technologies

by Mark Reynolds

WashU Medicine Mallinckrodt Institute of Radiology (MIR) is establishing a center dedicated to developing AI-based imaging tools to improve the diagnosis and precision treatment of cancers, cardiovascular disease, neurological diseases and numerous other conditions. The Center for Computational and AI-Enabled Imaging Sciences (C2AIS) brings together collaborators from across WashU Medicine and others from WashU's McKelvey School of Engineering.

"MIR has long been a national leader in developing innovative imaging technologies, from the invention of positron emission tomography to today's AI applications in diagnostics and image analysis, and this new center represents an ambitious expansion of our capability," said Director Pamela K. Woodard, MD. "Integrating AI into imaging will enhance how we diagnose disease, predict its progression and tailor treatments to the unique needs of each patient."

The new center will help advance AI-driven imaging technologies, such as two recently developed at WashU Medicine — in collaboration with MIR — that are being commercialized. One tool can analyze mammograms to predict an individual patient's risk of breast cancer over the next five years. Another rapidly maps the brain to help neurosurgeons plan delicate surgeries and avoid sensitive areas that control speech, movement and cognitive function. The center will be a hub for expertise in image analysis that uses sophisticated computing tools to find patterns in datasets of millions of medical images and de-identified patient records, providing insight on both the progression and the potential treatment of disease. The center will also support training on these tools for clinicians and researchers.

C2AIS joins a growing WashU ecosystem of collaborative AI initiatives that are helping to shape the future of medicine. The new center will primarily focus on developing AI-based medical imaging applications that integrate information from different imaging types — ranging from digital microscope images of cells to MRI scans to X-rays — to identify clinically informative connections between them. This may include identifying previously unknown early indicators of disease onset that could allow for more effective clinical interventions.

The center will bring together AI imaging experts and researchers from across the Medical Campus, including Siteman Cancer Center and from the Departments of Medicine, of Neurology, of Psychiatry and of Radiation Oncology.

C2AIS will house information from the imaging databases of all the participating departments, collectively representing a range of imaging modalities across many different types of disease. The AI-powered tools developed from those large datasets will enable increasingly precise diagnosis for individual patients, Woodard said.

"Institutions with leading academic medical centers that unite medical data, clinical expertise and advanced AI research will lead the next revolution in healthcare," said Mark Anastasio, PhD, director of C2AIS and a recognized expert in computational imaging science and AI for imaging applications. "WashU is exactly such an institution and an ideal home for this center that will enable us to build a community to drive innovation that advances patient care in ways few other institutions can achieve."

Mark Anastasio, PhD: New Role, Big Vision

Mark A. Anastasio, PhD, joins WashU as MIR's R. Gilbert Jost Distinguished Professor of Imaging Sciences and Artificial Intelligence and vice chair for imaging sciences and AI research. He also serves as a professor of electrical & systems engineering in McKelvey Engineering. Anastasio previously served as head of the Department of Bioengineering at the University of Illinois Urbana-Champaign for six years.

As part of the efforts to build community among AI innovators at WashU and with its partners, Anastasio joins the leadership team of the Oncologic Imaging Program at Siteman Cancer Center and was named the Pedal the Cause Professor. He is also the associate chief research information officer for biomedical imaging at the Institute for Informatics, Data Science & Biostatistics (I2DB), where he works with institute director Philip R.O. Payne, PhD, the Janet and Bernard Becker Professor of Medicine.

The Imaging Engine Behind an FDA-Cleared Brain-Mapping Tool

by Kristi Luther

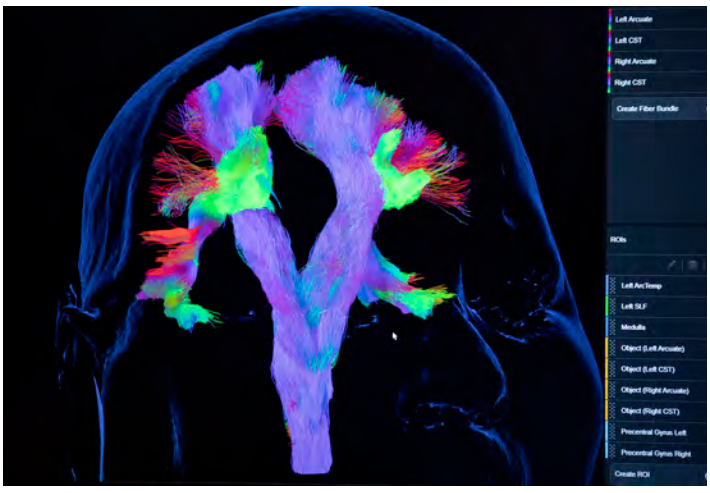
AI-powered software designed to rapidly chart the brain's functional landscape — pinpointing regions involved in speech, vision, movement and other crucial abilities — has been authorized by the Food and Drug Administration (FDA). The program can now be offered to hospitals to support precision neurosurgery, from treating epilepsy to performing intricate surgeries and removing brain tumors.

Behind a milestone as significant as FDA approval are years of cross-disciplinary work. In this case, it included a long arc of discovery from WashU Medicine Mallinckrodt Institute of Radiology (MIR) physicians and scientists. MIR's contributions in the areas of functional imaging of the brain, data infrastructure and clinical workflows played a key role. Tammie L.S. Benzinger, MD, PhD, the Hugh Monroe Wilson Professor of Radiology, and Daniel S. Marcus, PhD, professor of radiology, unpack the advanced imaging and informatics that helped empower the successful translation of this project.

Let's rewind a bit. How does this milestone connect to WashU's longer history in resting-state functional magnetic resonance imaging (fMRI)?

Marcus: There's a direct throughline from the transformative foundational work of Marcus Raichle, MD — who played a central role in the understanding of a "default mode network" to describe resting-state brain function — to what we're doing today with AI and neurosurgical mapping.

Benzinger: When this project started, we had a really large data set of healthy adult resting-state brain MRIs collected through studies of aging at the Knight Alzheimer Disease Research Center (Knight ADRC) at WashU. Within the Neuroimaging Labs Research Center (NIL-RC) are pioneers of fMRI, including Abraham Z. Snyder, MD, PhD, and Joshua S. Shimony, MD, PhD, who are co-investigators with neurosurgeon Eric Leuthardt, MD, on this clinical translation of brain mapping technology. Avi and Josh were pivotal to moving resting-state science forward, as were radiologists Michelle M. Miller-Thomas, MD, and Gloria J. Guzmán Pérez-Carrillo, MD, who advanced the clinical workflows. Few places have this combination of continuity of knowledge and the blend of neuroscientists, physicians and informatics engineers needed to translate it into real-world clinical practice.



FDA clearance can take years. What MIR-based expertise helped move this project forward?

Marcus: Numerous MIR researchers across multiple research centers contributed to the algorithm development work, which combined radiology, neurology, neurosurgery and computational imaging expertise to build a machine-learning model that can identify functional brain areas from patient data. On the infrastructure side, the group I previously led (the Computational Imaging Research Center) and 1Rad (MIR's IT support) helped build the data platforms and workflows to pull exams from hospital systems, run processing reliably and return results into clinical systems. We've had to develop platforms and an ethos that is centered around translation and corresponding efficiently with hospital systems. It's a big feat.

What were some of the make-or-break technical challenges of this project?

Marcus: We needed perfect spatial registration. These maps ultimately guide surgery, so the images and network maps have to line up precisely — from what's collected on the scanner all the way to what the surgeon sees on the navigation system in the operating room. We spent a lot of time validating registration end-to-end, making sure it worked everywhere, because it had to be perfect.

Benzinger: This only works if you can collect the right data consistently and with high quality. When scanners arrive from the factory, they're not optimized for the clinical questions we need to answer. One of MIR's strength is

Left: There is a throughline from the transformative foundational work of Marcus Raichle, MD, to the AI and neurosurgical mapping being done today.

tailoring protocols. We build exams that match the patient and the decision at hand and enforce quality control so the data from the clinical scanners produce data comparable to our research scanners, for example.

In the relay race from discovery to clinical impact, collaboration makes a huge difference. What made that cross-disciplinary handoff work here?

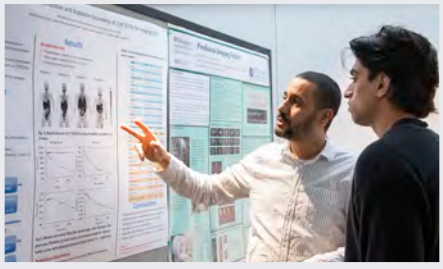
Benzinger: The culture. We work in a really integrated fashion. This work brought scientists, radiologists and neurosurgeons together around patient care, not credit. The lack of "walls" meant we could move unusually fast: from the project's origins with then-MD/PhD student Carl Hacker's research analysis all the way to a clinical service now led by Matt Glasser, MD — which is used for essentially every neurosurgical brain tumor patient at Barnes-Jewish Hospital.

What's next and how will this scale beyond WashU?

Marcus: With AI advancing, I think we'll see more precise maps, larger datasets and new disease areas. Very likely there will be impactful clinical applications in psychiatric disorders, neurological disorders and dementia. Since we started this project years ago, there have also been major leaps in the efficiency with which WashU innovators are able to commercialize their work. Combine that with the new AI-focused research center at MIR (see page 3), and we'll be well positioned to develop and scale projects like this one and beyond.

PET Tracer Innovation

The global PET tracer community converged at MIR for the 2026 PET-RTRC Workshops & Scientific Session. Following two days of workshops, attendees toured facilities and explored inflammation-oxidative stress at the scientific session, hearing from Sruti Shiva, PhD, from the University of Pittsburgh, and WashU Medicine's Paul Zolkind, MD, Vijay Sharma, PhD, and Caroline Guglielmetti, PhD.



Multidisciplinary PERT Advances Care for High-Risk Pulmonary Embolism

by Pam McGrath

Treating acute pulmonary embolism (PE) is not only a race against time but a test of collaboration. Despite being the third-leading cause of cardiovascular mortality in the U.S., there is not enough evidence to indicate a single "right" treatment approach for these patients. And with high-risk PE sitting at the intersection of multiple specialties, it can leave care teams wondering whom to call.

"Just diagnosing PE can be difficult because it has nonspecific symptoms such as chest pain, shortness of breath and coughing, which mimic other heart and lung conditions," said Pavan K. Kavali, MD, associate professor of radiology and associate director of interventional radiology (IR) at Barnes-Jewish West County Hospital and Missouri Baptist Medical Center.

To address these issues, Kavali and a multidisciplinary team of colleagues launched a Pulmonary Embolism Response Team (PERT) at Barnes-Jewish Hospital (BJH) in January 2021. The team was designed to provide an organized, streamlined mechanism for determining individualized treatment for each at-risk PE patient and draws on a wide range of expertise: IR, pulmonary/critical care, vascular surgery, hematology, emergency medicine, cardiothoracic surgery, anesthesiology and pharmacology.

"PERT members are responsible for reviewing available clinical information, mobilizing resources and making decisions regarding the best therapy and interventions for PE patients at risk for life-threatening complications," said Kavali, who serves as PERT IR director. "This is a service available 24 hours a day, every day, to guarantee immediate consultations are always available."

The first PERT was developed by clinicians at Massachusetts General Hospital in 2012. By 2015, more than 40 institutions that had adopted the PERT model formed The PERT Consortium™, which now numbers approximately 150 members in the U.S. and internationally. Soophia Naydenov, MD, professor of medicine in the Division of Pulmonary & Critical Care Medicine and medical director of the BJH PERT, was a founding member of the consortium and currently serves as a board member.

"PERTs at some hospitals take a tiered approach in which a clinical gatekeeper serves as the first contact, with the responsibility of deciding the specialists needed to make an initial evaluation," she explained. "Other PERTs may vary in relation to the specialty that performs procedures. For the BJH PERT, we involve all of the team's specialists to come to a consensus for treatment."

When a primary physician identifies a patient with intermediate to high-risk PE, they contact the hospital's transfer center, which alerts the PERT team. On odd days of the month, IR answers calls; on even days, vascular surgery. Video conferencing enables the team to quickly share opinions, discuss options and agree on a treatment plan. If a patient's condition changes over time, another meeting might be convened or the patient might proceed directly to intervention based on the initial call.

"This discussion is important for having a 360-degree view of the pros and cons of what we are deciding," said Naydenov, "whether that is continued observation in the ICU, administering an anticoagulation drug or performing an interventional procedure."

She noted that these patients' care does not end when they leave the hospital. "Three weeks after discharge, a nurse practitioner conducts a telehealth visit to see if patients have questions, are tolerating medications and if their symptoms are improving," she said. "At three months, the patients return to a pulmonary critical care physician for an in-depth exam."

Data supporting a standard of care for intermediate- and high-risk PE is still being developed; however, an analysis of clinical outcomes following mechanical thrombectomy for patients referred to the BJH PERT during its first three-and-a-half years showed that they typically had shorter hospital stays and a 49% reduction in odds for 30-day mortality.

Right: Pavan K. Kavali, MD (far right), and Soophia Naydenov, MD, collaborate with the team's specialists to come to a consensus for treatment.

MIR Takes RSNA

Dehdashti Named 2025 Outstanding Researcher

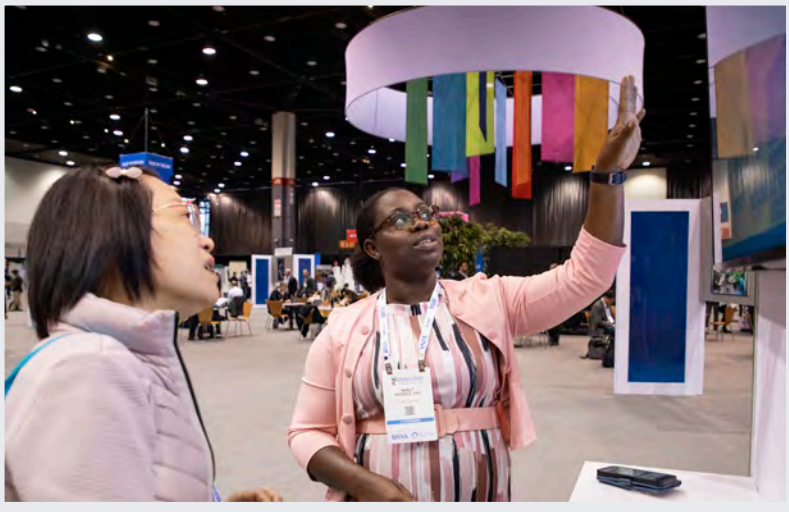
Farrokh Dehdashti, MD, the Drs. Barry A. and Marilyn J. Siegel Professor of Radiology, was selected for the prestigious RSNA Outstanding Researcher Award. Each year, this award recognizes an individual whose significant contributions to radiologic research and pioneering advancements in the industry have made a lasting impact.

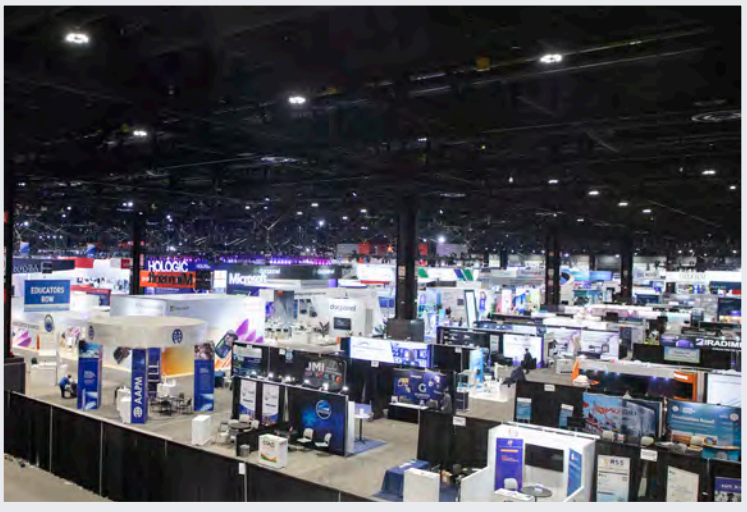
Dehdashti has been pivotal in expanding the role of PET in oncology research for over 30 years, focusing primarily on translational oncologic studies and receptor imaging. She has spearheaded first-in-human, phase 1 and phase 2 studies of numerous novel radiotracers developed at the university. Additionally, she has conducted pioneering studies on several novel PET diagnostic compounds for various cancers, including cervical, breast, pancreatic and prostate.

Ippolito Named Distinguished Investigator

Joseph E. Ippolito, MD, PhD, associate professor of radiology, was selected to receive the Distinguished Investigators Award from the Academy for Radiology & Biomedical Imaging Research. This honor recognizes individuals from academic and industry institutions for their outstanding contributions to medical imaging.

An established expert in MRI, his research aims to identify the key metabolic pathways supporting various tumor compartments, understand nutrient distribution among them, and develop or repurpose imaging methods and therapies to target these specific areas. Ippolito's work helped lead to the discovery that sex differences in cancer metabolism may contribute to disparities in cancer incidence and mortality.





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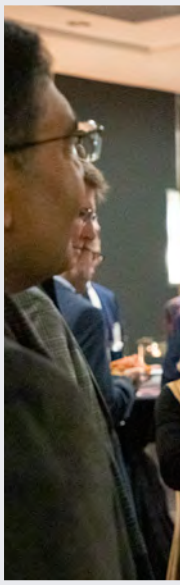
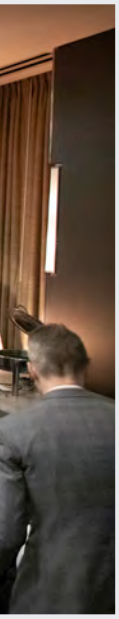


Reunited at RSNA 2025

The MIR alumni network spans the globe, but its foundation remains deeply rooted in a shared experience growing and learning together at MIR. Nowhere are those lifelong connections on better display than the annual RSNA reception, where faculty, trainees and alumni remembered where it all began, traded stories from all corners of the medical world and forged new bonds — all while sharing a delicious meal beneath the glow of Chicago's holiday lights.



The Fourth Pillar

Interventional oncology trials at MIR are expanding what cancer treatment can look like

by Kristi Luther

Following a cancer diagnosis, patients often find themselves moving through three long-established pillars of cancer care: medical oncology, surgical oncology and radiation oncology. As medicine continues to embrace personalized care, a fourth pillar has emerged: interventional oncology.

Interventional oncology, or IO, uses imaging to guide minimally invasive, targeted therapies, reaching tumors through catheters and needles rather than large incisions. These innovative treatments can also be paired with traditional systemic treatments, such as immunotherapy and chemotherapy, or radiation. For some patients, IO can offer hope where traditional methods have run out of road.

Jack W. Jennings, MD, PhD, who has helped shape the field's growth for more than a decade, remembers when a thriving IO landscape still felt like an aspiration.

"I believed this should be the fourth pillar of oncological treatment, and it became a real mission for me that interventional radiology should be at the table," said Jennings, senior vice chair and division director of interventional radiology for WashU Medicine Mallinckrodt Institute of Radiology (MIR). What began as a seat at the table at tumor boards has grown into a full-fledged subspecialty with a dedicated professional society and a host of clinical trials.

Today, Jennings believes the field has arrived. "Over the last five years, MIR has gone from doing a handful of clinical trials to running dozens of therapeutic studies, including impactful work in interventional oncology," said Greg Williams, associate director of clinical research.

Whether treating the liver, stabilizing bone, freezing a breast lesion or targeting a brain tumor, the principle is the same: using imaging to deliver less invasive care that complements — not competes with — the previously existing foundation of cancer care.

Liver Cancer

Key trials: ROWAN; EMERALD-Y90
Condition: Hepatocellular carcinoma
Approach: Y-90 radioembolization + immunotherapy
Principal investigator: Christopher D. Malone, MD

Y-90 radioembolization uses a small catheter that delivers radioactive microspheres to the blood vessels that supply a liver tumor. Named for the isotope found in the microspheres, this radiation therapy is one of the fastest-growing liver-directed therapies in the country.

Two open-label, single-arm prospective trials — ROWAN and EMERALD-Y90 — paired radioembolization with immunotherapy, a combination approach aimed at improving treatment response in patients with unresectable hepatocellular carcinoma. "The concept at the heart of these two trials is essentially that radiation can help convert a 'cold' tumor into a 'hot' one, potentially making immunotherapy more effective," said Williams.

Previous Page: Jack W. Jennings, MD, PhD, performs a spinal radiofrequency ablation and kyphoplasty to treat bone metastases and stabilize fractures.

Left: Image-guided IO approaches, such as liver microwave ablation, often treat tumors through needles rather than large surgical incisions.

Above: Arindam R. Chatterjee, MD, is principal investigator for FRONTIER, a single-arm, multicenter trial designed to create a more targeted treatment option for recurrent glioblastoma.

ROWAN enrolled participants globally, while EMERALD-Y90 enrolled from approximately 20 locations around the U.S. WashU Medicine was a leading enroller for both trials.

The combination approach requires close collaboration from medical oncology, which principal investigator Christopher D. Malone, MD, said reflects one of WashU Medicine's strengths. "What I think is unique about WashU is we're very collaborative and very multidisciplinary," said Malone, emphasizing the comfort he feels co-managing patients with hepatology, oncology and surgical colleagues. "In other healthcare settings, some clinical decisions are being made in silos rather than the specialties working in stride."

Bone Cancer

Key trials: TRIBUTE; BOREALIS

Condition: Metastatic bone cancer

Approach: percutaneous ablation + radiation, cryoablation

Principal investigators: Jack W. Jennings, MD, PhD, and Resten Imaoka, MD

Radiation therapy has long been a cornerstone of palliative treatment for painful bone metasases, and MIR investigators are incorporating interventional methods for synergistic benefits. The small incisions used by interventional radiologists reduce wound-healing concerns, which means patients don't have to stop chemotherapy. In cases of weakened bone, IO approaches can also stabilize as they treat, combining tumor ablation with vertebroplasty or cementoplasty to reduce pain and reinforce structure.

The Society of Interventional Radiology's TRIBUTE trial combines ablation with radiation therapy for high-risk lesions. Notably, the study is using pain metrics as a key outcome, a divergence from the typical measure of tumor response. In 2025, WashU Medicine became the first site activated for the observational trial.

> **"It became a real mission for me that interventional radiology should be at the table."**

This trial highlights another defining feature of interventional oncology at MIR: collaboration with the other pillars of cancer care. Jennings and longtime collaborator Clifford Robinson, MD, professor of radiation oncology, serve as two of the four national leaders of the trial.

"This study is not only exciting because of what we're investigating," Jennings said. "It also sends the message that radiation oncologists and interventional oncologists are teaming up and that this model has industry support."

For years, Jennings and Robinson have set a tone for interdisciplinary cancer care among colleagues and mentees. "It's these relationships that break down barriers," said Jennings. When radiation can no longer be delivered optimally or a cancer is particularly ornery, IO methods can offer options that are desperately needed. "But it takes a person of real integrity like Cliff to set egos aside and dialogue about what may be best for the patient."

BOREALIS, another clinical trial currently enrolling patients, focuses on non-painful bone metastases, with a preventive aim: treat lesions earlier with cryoablation to reduce catastrophic downstream events. Ideally, this prevents the progression of bone metastases and events such as fractures or spinal cord compression.

"WashU is the only non-European site involved," said Jennings. "Our institutional expertise, credibility and relationship with the Cardiovascular and Interventional Radiology Society of Europe (CIRSE) have positioned us to be an international leader in this space."

Breast Cancer

Key trial: COOL-IT, COOL-IT Pro
Condition: Low-risk, early-stage breast cancer
Approach: cryoablation
Principal investigator: Heather V. Garrett, MD

Improvements in breast cancer screening mean cancers can be found earlier when tumors are smaller and more treatable. Lumpectomy remains the gold standard for early-stage breast cancer, but researchers have been studying ultrasound-guided percutaneous breast cryoablation as a less invasive alternative for selected patients.

Smaller single-arm studies have shown promising results, but more data is needed. Breast cryoablation had been lacking a large, randomized clinical study, previously having only a host of smaller studies. Heather V. Garrett, MD, stepped in to fill the void with COOL-IT, a randomized controlled trial born out of Garrett's collaboration with former IR resident Anurag Chahal, MD. The pair also received the support of Julie Margenthaler, MD, professor of surgery, who saw the need for a noninferiority trial and recognized Garrett's expertise in the procedure.

"For some patients, it's clear breast cryoablation has an advantage: no anesthesia, little or no recovery time, no breaks in chemotherapy or delays in radiation therapy," said Garrett. "We hope this research will determine how cryoablation can best be integrated into standard breast cancer treatment and provide a less invasive option for our patients." The complementary COOL-IT PRO is a registry study for breast cancer patients who undergo cryoablation because they are not surgical candidates.

Left: Using live CT guidance, Christopher D. Malone, MD, is able to precisely place a needle-like probe to a tumor and then heat and kill cancer cells.

Brain Cancer

Key trial: FRONTIER
Condition: Recurrent glioblastoma
Approach: Y-90 intra-arterial therapy
Principal investigator: Rano Chatterjee, MD

Glioblastoma is an aggressive, insidious disease that is challenging to treat and currently without a cure. Fewer than 7% of patients live five years post-diagnosis, and systemic drugs cause toxicity that yields brutal side effects.

The scarcity of options offers a ripe opportunity for FRONTIER. Designed to create a more targeted treatment option, the trial harnesses Y-90 glass microspheres for internal radiation therapy — rather than the typical external beam radiotherapy.

> "Getting straight to a tumor through the blood vessels could open a new door..."

FRONTIER is a single-arm, multicenter trial marking a notable expansion of Y-90 treatment into the brain. When a therapy moves into a new organ system, FDA oversight is stringent. Early phases start with low doses and strict stopping rules, advancing only as safety is established. In the current design, WashU is one of six U.S. sites selected to participate as the trial expands. "Getting straight to a tumor through the blood vessels could open a new door for treating head and neck cancers," said Arindam R. Chatterjee, MD, "and maybe even for agents beyond Y-90 and other combination therapy trials."

Scaling the Fourth Pillar

Scaling IO as a mainstay of cancer care requires supportive systems. The 2025 opening of the Plaza West Tower boasts two complete floors of IR,multiple procedural CTs and hybrid imaging capability — physical infrastructure that can change the clinical reality for patients. "This IR facility is on a scale I've never seen comparable in the U.S.," Jennings said.

MIR also received accreditation from the International Accreditation System for Interventional Oncology Services. It's systematic quality and safety standards were developed through CIRSE, the largest interventional society in the world, and WashU was the first U.S. site to receive this accreditation. Jennings credited internal partners who helped evaluate and implement the accreditation, an effort he believes has strengthened patient experience and credibility while unifying a global IO community with a consistent set of standards.

Although Jennings believes the field has achieved its "fourth pillar" status in major medical centers, he sees patient and provider awareness as a gap to fill. "Patients may not realize that these minimally invasive procedures are being developed developed — that a big surgery isn't their only option."

As radiology trainees become skilled in IO approaches, medical teams around the country are able to expand their offerings to patients with cancer. As an example, Jennings points to three MIR alumni — two interventional radiologists and one musculoskeletal radiologists who practice in St. Joseph, Missouri. "Their radiation oncology and medical oncology colleagues have told me how grateful they are to those former MIR fellows for bringing interventional oncology there," Jennings said. "And that gets me really excited."

Right: Heather V. Garrett, MD, is leading two studies evaluating breast cryoablation — a clinical trial comparing it with lumpectomy and a prospective registry tracking long-term outcomes.

Towering Success

"In many ways, this 12-story building became as much a part of our department as any faculty, trainee or scientist."

— Sanjeev Bhalla, MD
Residency ('99)
Fellowship ('00)

by Marie Spadoni

In October 2025, WashU Medicine Mallinckrodt Institute of Radiology (MIR) officially moved all imaging services from its building on south campus to the new Plaza West Tower, located at the former site of Queeny Tower. The 16-floor, state-of-the-art tower stands as a monument to the future of clinical care and as a testament to the evolution of radiology as a patient-centric offering.

The move also signifies the end of an era that began nearly a century ago, when local businessman and philanthropist Edward Mallinckrodt Jr. provided a substantial endowment to construct a world-class center for radiological research and patient care. When the original building opened in early 1931, it was one of the first dedicated institutes of its kind in the U.S. Sherwood Moore, MD, a 1905 graduate of WashU Medicine, was appointed as the inaugural director — leading a team of four radiologists and a single physicist.

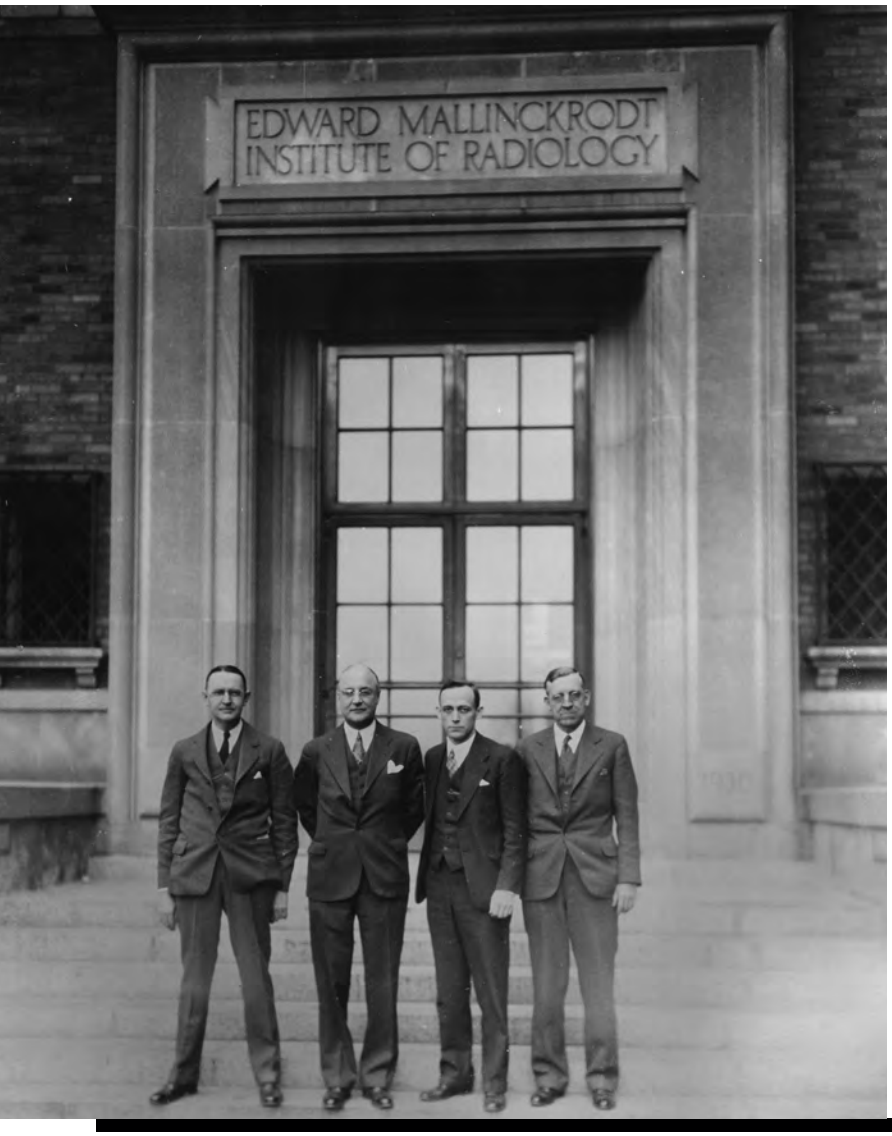
Prior to construction, Moore was tasked with surveying top radiological departments in Maryland, Pennsylvania, New York, Michigan, Ohio and Illinois to identify best design practices. Relying heavily on Moore's input, the architectural firm of Jamieson and Spearl drew up preliminary sketches for an eight-story building. The layout, designed to be easily modified, initially included office space, a classroom, a urology lab, a gastrointestinal unit, animal research space and storage vaults for X-ray film.

Opposite: The Edward Mallinckrodt Institute of Radiology under construction in October 1930.

Here We Grow

In 1968, to accommodate the rapid growth of radiological sciences and the subsequent need for more research space, four additional floors were constructed on top of the original building, bringing the tower to its current 12 stories. Three years later, MIR appointed a new chair: Ronald G. Evens, MD, a 31-year-old radiologist just one year out of his nuclear medicine residency. Evens, who led the department for nearly three decades, oversaw significant structural transitions.

"For quite a while, the first five floors were clinical, and floors six through 12 were used for research, offices and animal facilities," said Evens, professor emeritus of radiology. "As radiology grew, over a period from 1980 and 1990, all floors became clinical, and research facilities moved to other buildings."



While MIR eventually expanded to occupy nearly 200,000 square feet across multiple buildings, the 12-story tower — often referred to as Mallinckrodt Tower — remained its heart. For decades, residency candidates touring MIR consistently expressed shock at the size and scope of the tower.

> "We saw the new tower as an opportunity to modernize our radiology department."

"In 1993, when I was starting my fourth year of medical school at Columbia in New York, a friend's mother told me I had to look at a radiology program in St. Louis," said Sanjeev Bhalla, MD, chief of cardiothoracic imaging at MIR. "Coming from New York City, where radiology often seemed like an afterthought in the hospital labyrinths, I was amazed to see this structure in the heart of the medical campus."

Bhalla was sold on MIR and went on to complete a diagnostic radiology residency ('99) and a cardiothoracic imaging fellowship ('00), eventually stepping in as vice chair for education to guide future generations of radiologists through their MIR journey.

Modern Times

Despite adapting to the evolving needs of clinical radiology over the decades, certain challenges became increasingly insurmountable. Limited floor weight capacity and restricted access hindered the installation of modern imaging machinery. Infrastructure issues and difficulties with patient ingress and egress further signaled that it was time for a change.

Enter Plaza West Tower. Conceived by BJC Health and opened in October 2025, the 16-story patient care tower features 224 private inpatient rooms, 56 private intensive care unit rooms and a new home for MIR's south campus clinical operations.

"Moving came up at various times over the years," said Vincent M. Mellnick, MD, vice chair of academic practice. "We saw the new tower as an opportunity to modernize our radiology department. It just made sense."

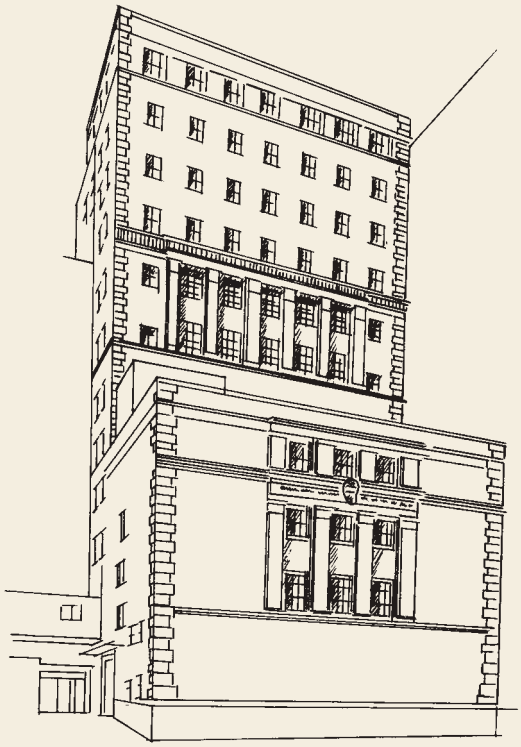
Left: Glover H. Copher, Evarts A. Graham, Warren H. Cole and Sherwood Moore (pictured in 1935) collaborated on a method for visualizing the gallbladder in February 1935.

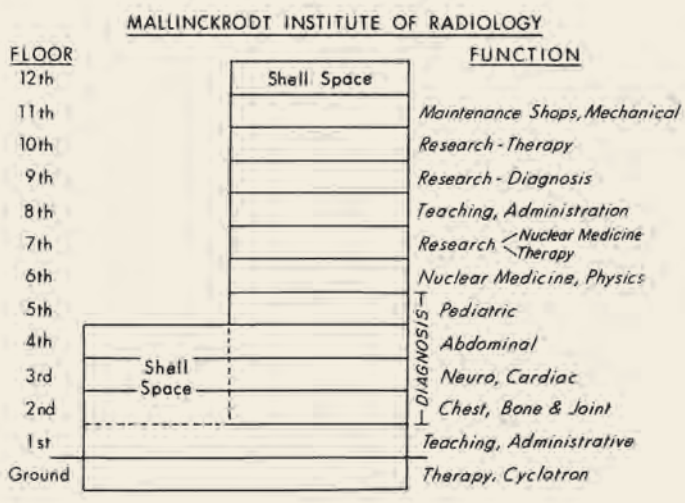
If You Build It, They Will Come

The partnership between architectural firm Jamieson and Spearl and the famed Mallinckrodt family transcended a mere business arrangement. This decades-long collaboration profoundly shaped a cohesive aesthetic that defined the family's private estate, their medical contributions and the fabric of the Washington University campus.

As the unofficial WashU architects, by 1930 James P. Jamieson and George Spearl were the natural choice to design the original Mallinckrodt Institute of Radiology. The project presented a challenge: create a structure that evoked the grandeur of an academic cathedral while functioning with the precision of a high-tech physics lab. To accommodate the groundbreaking science within, the design had to seamlessly integrate massive lead shielding and specialized ventilation for early X-ray equipment behind a traditional stone façade.

While many of Jamieson and Spearl's other campus projects embraced a pure Collegiate Gothic style, the MIR building utilized a more restrained, vertical version of the aesthetic to better fit the dense constraints of the medical campus. The design maintained the firm's signature look: Missouri red granite accented with limestone trim. And in a display of engineering foresight, the eight-story Mallinckrodt Tower included a reinforced structure specifically built to support future growth. This ultimately allowed for the successful four-story expansion in 1968, bringing the building to its final height of 12 floors.





Above: The MIR tower design balanced academic grandeur with the precision of a high-tech physics lab. Initially an eight-story structure, it was built so that four more floors could be added later.

Up, Up and Away

In 1972, UK-based music and electronics company EMI Limited introduced the first computed tomography (CT) scanner, a revolutionary new technology developed by research engineer Sir Godfrey Hounsfield. By 1975, the technology was improving dramatically, and the applications were expanding beyond brain imaging, with three new whole-body scanners en route in the U.S.: one to Mayo Clinic in Rochester, another to Massachusetts General Hospital in Boston and a third to MIR.

For then-chair Ronald G. Evens, MD, the scanner was the realization of a bold vision. "We had the most research funds of any radiology department in the country," Evens said. "But the first to install this machine would have a historic advantage, so the race was on."

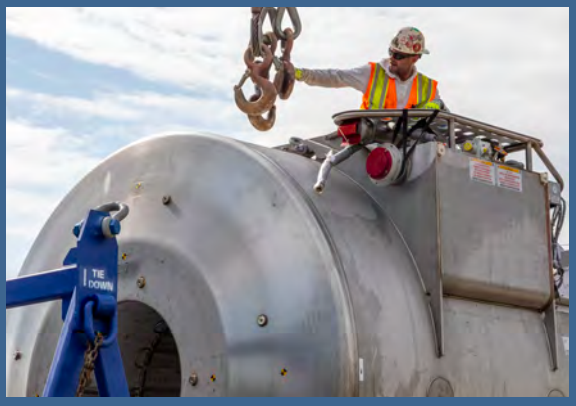
The new machine was delivered to the Mallinckrodt Tower basement, but it was too big to fit into the building's 1930s elevator.

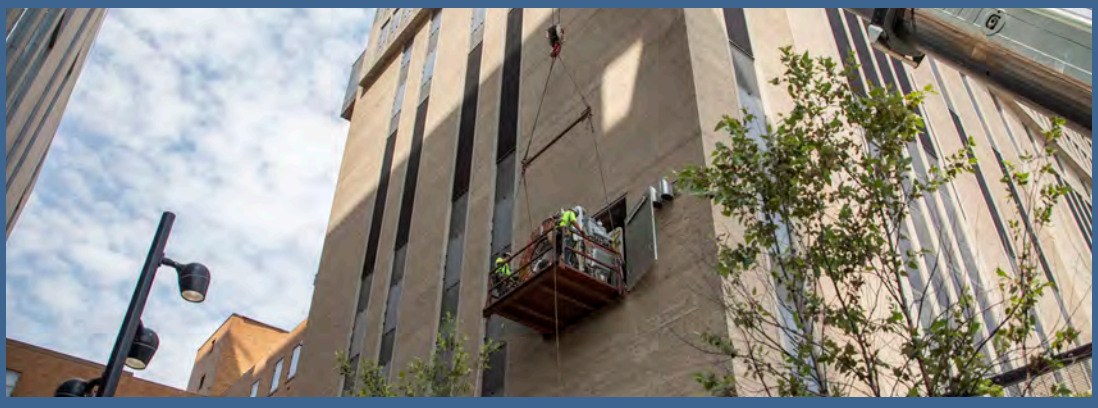
"What could we do?" Evens recalled. Hounsfield, who had traveled to St. Louis to help supervise the installation of the scanner, "suggested renting a crane and pulling it up to the sixth floor."

Lifting the scanner was only part of the solution. Getting it inside the building meant cutting a hole in the wall big enough to accommodate the equipment. With a crane at the ready and the opening clear, the machine was hoisted up and carefully placed into a specially reinforced suite.

In that moment, MIR became the first U.S. site to install this whole-body scanner — providing a jump-start to scan patients and eventually publish foundational CT scanning reference papers. "All because we were able to get the machine in faster," Evens said.

The legacy of that installation remains visible today in the form of an oversized window on the western wall of Mallinckrodt Tower — a permanent architectural reminder of the day MIR won the scanner lift race.





Over the years, scanner lifts at MIR have become coveted photo ops and, in recent years, a favorite on social media. For example, the 2024 lift and installation of the Terra.X 7T (top, left) had nearly 20,000 impressions across MIR's channels.

A standout feature of Plaza West Tower is its advanced imaging capabilities, including dedicated radiology floors equipped with MRI, CT, ultrasound and X-ray technology. This includes the addition of photon-counting CT scanners, which allow for more flexible imaging protocols and faster, higher-resolution imaging. The increased capacity helps shorten wait times, and patients benefit from lower radiation doses during exams. The upgrades also improve the workflow of many of MIR's subspecialty sections, but perhaps the most evident change in operations is in interventional radiology.

Home Suite Home

By the late 1980s, interventional radiology (IR) had solidified as a distinct specialty at MIR, and in 1987, Daniel D. Picus, MD, became the section's first chief. Under Picus' leadership, IR evolved from specializing zin a select few procedures to a robust clinical specialty.

"For IR, the biggest challenge was absolutely the elevators," Picus recalled. "Every patient that came to IR on the eighth floor had to go up the elevators. Not only did this mean that the elevators were a scarce resource, but it also made it difficult for critically ill patients to access IR services." The section eventually moved to the 4th floor, giving the radiologists direct access to inpatients. Unfortunately, that meant everyone had to share what Picus described as a "miniature reading room."

All of this is far cry from the new IR space at Plaza West Tower, which features five state-of-the-art IR suites, two dedicated CT scanners and a central reading room. "I'm not aware of any IR section that has a better physical plant," Picus said.

After nearly a hundred years, seven different department chairs and countless scanner lifts, Mallinckrodt Tower has passed the torch. But while one era has ended in this historic building, another is just beginning: one that includes a new physics section, dedicated ultrasound research facility and more. Stay tuned.

Right: Plaza West Tower features advanced imaging technology, expanded capacity and dedicated floors for MRI, CT, ultrasound and X-ray, improving subspecialty workflows and reducing wait times and radiation exposure for patients.

Meeting the Moment

Innovations in Radiology Education

by Bailey Tripp

Medicine is changing rapidly, and so is the way it's taught. At WashU Medicine Mallinckrodt Institute of Radiology (MIR), faculty members across specialties are creating new, innovative approaches to educating radiology residents and equipping them for the realities of modern practice.

From Bitter Pill to Gummy Vitamin?

A crucial but often dreaded subject in radiology education is medical physics. Often considered a "bitter pill" that residents must swallow to complete their studies, physics curricula are notoriously dry and can sometimes obfuscate the link between abstract theory and daily practice. But where many saw a dense lesson plan, Tyler J. Fraum, MD, associate professor of radiology, saw an opportunity to turn this bitter pill into a cognitively nourishing yet enjoyable "gummy vitamin."

MIR's previous physics curriculum covered nuclear and non-nuclear medicine topics over two years; however, the order and complexity of the lectures didn't align with the academic calendar, leaving new residents sitting through advanced lectures without foundational knowledge. When this perennial complaint resurfaced, Fraum and other physics-focused individuals in the department banded together to revitalize the curriculum and improve physics education at MIR.

Reshaping 64 hours of content was no small feat. Fraum knew he needed support to complete the project, which he found in the Loeb Teaching Fellowship through the WashU Medicine Academy of Educators. The two-year program provides protected time to develop and implement new medical education ideas at the university. "I didn't want the momentum that we had initially to be lost," he said.

The new curriculum prioritizes teaching the foundations of radiologic physics in a logical sequence before diving into more advanced subjects, organizes content around the individual modalities and emphasizes clinical application. Other changes include more active learning strategies, such as interactive polls that ask questions and enable real-time responses and discussion. For the nuclear medicine portion of the curriculum, Fraum delivers six board review-style lectures that revisit earlier lessons for those about to take their core exams. Another addition, an annual introductory physics "boot camp," was inspired by resident listening sessions. Held in July, the boot camp ensures that trainees understand the basic principles of radiologic physics, no matter when they enter the program.

Ultimately, the goal is to help residents connect how physics impacts their day-to-day work. "I try to make the physics as clinically relevant as possible," he said, "so that residents appreciate why they need to know what we're teaching them and how these concepts can be implemented in their actual practice as radiologists."

> "We want to measure effects of the curriculum with the goal of publishing the MIR experience."

Now nearly halfway through the Loeb fellowship, Fraum continues to hone the curriculum and plans to add more active learning strategies. He has also been collecting quantitative data to determine the curriculum's efficacy, not only to enhance the next iteration but to help grow communal knowledge of radiologic physics education. "It's not just about local implementation," said Fraum. "We want to measure effects of the curriculum with the goal of publishing the MIR experience to help other programs learn from our challenges and successes."

Making Sense of Medical AI

Nearly every facet of modern radiology — from image generation to workflow management and reporting — has been touched by artificial intelligence (AI). As more tools are introduced and integrated into medical

Opposite: Tyler J. Fraum, MD, gestures to imaging during a noon conference as he works to revitalize the medical physics curriculum, turning a "bitter pill" into a "gummy vitamin."

Above: Shinjini Kundu, MD, PhD (left), goes beyond the basics in her curriculum, teaching residents how models are trained, tested and validated; how to distinguish well-crafted models from inferior ones; and the role of cognitive biases and trust in AI tools.

institutions, educators like Shinjini Kundu, MD, PhD, assistant professor of radiology, are now tasked to prepare trainees to practice radiology in the era of AI.

Kundu, also a principal investigator in the Computational Imaging Research Center, has developed a new resident curriculum dedicated to AI and medical imaging. So far, the curriculum includes two dedicated noon conference lectures a year that use real-time quizzes for a more active learning experience. The core content covers basic AI definitions, existing tools and their uses across fields; however, Kundu said she wanted to go beyond the basics and ground the lessons in what would be useful in their practice. She teaches how machine learning models are trained, tested and validated; how to discern between well-crafted and inferior models; and how cognitive biases and personal trust in AI tools affect their efficacy. "It's not simply about the tool. It's about the complex ways a human interacts with that tool," she said.

Not all AI tools are created equal, and for radiologists, it's important to understand how a tool's limitations and nuances impact patient care. "Many of these tools are designed for a narrow context," Kundu said. "While these models are trained on specific data, they cannot always account for the nuanced needs of the patient in front of you. Advocating for a patient's best interest is something only a human physician can provide."

She doesn't expect residents to become AI experts or develop their own models, but some residents have gone above and beyond. Ramanan Sivakumar, MD, a diagnostic radiology resident, reached out to Kundu in his first year about pursuing a research project on AI. They created a study to examine the current landscape of AI tools that receive clearance from the Food and Drug Administration. "I believed it would be beneficial for him to understand how the FDA carries out its process because he will probably encounter FDA-cleared tools in clinical practice," Kundu said.

"Advocating for a patient's best interest is something only a human physician can provide."

Sivakumar pulled data from nearly 1,000 radiology-specific AI and machine learning vendors that submitted applications for FDA clearance and compared whether they underwent clinical testing or not. Since completing the study, Sivakumar has published his findings in the Journal of American Medical Association Network and presented at the Association of Academic Radiology.

Training for the Unknown

Complications in medicine are inevitable, so how do educators prepare their trainees for the unknown? Arindam R. Chatterjee, MD, associate professor and director of the neuroendovascular intervention fellowship program, has developed a course to give

neurointerventional fellows the opportunity to gain deliberate practice in managing procedural complications.

Fellows Leaping Into Practice (FLIP) is a three-day radiology oral board-style course focused on navigating complications and receiving immediate feedback. While fellows encounter numerous successful cases in their training and have access to educational content, Chatterjee said it can be challenging to capture the high-stress demands of rare real-life case complications.

> "We've had so much enthusiasm that graduates are asking to return as faculty."

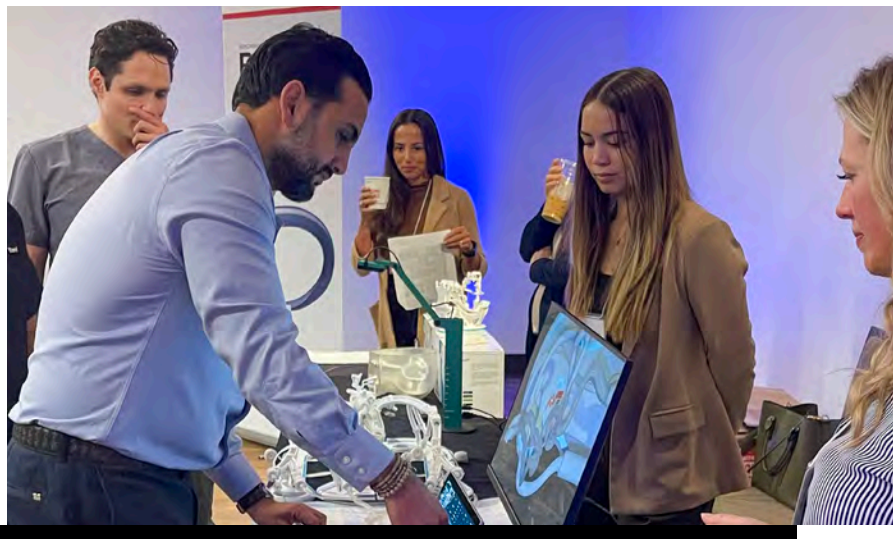
FLIP launched in 2022 in partnership with Penumbra, a medical device company. Core faculty are from MIR, the Departments of Neurosurgery and Neurology, and additional nationally recognized faculty from around the country. FLIP sessions invite fellows to share cases and complications they've experienced in their training with a panel of faculty members in various disciplines. The panel discusses how the cases went and different approaches to take in the future — everything from preventing the complication to managing it in the moment.

Another session involves simulation cases in a style inspired by the radiology oral boards. Chatterjee described this as an interactive "choose your own adventure" exercise where students must determine how to proceed, and mentors provide immediate, specific and actionable feedback modeled after Anders Ericsson's work on deliberate practice. "When they're sitting one-on-one, the students are the ones doing all the talking, and the mentor is there to guide them through the case. If they give the wrong answer or an answer that would lead to a complication, then the mentor may say, 'The patient died. Do you want to start this case over?'"

FLIP was first held in St. Louis, but Chatterjee has taken the program on the road to Houston, Washington, D.C., and New York City. Now in its fifth year, the course is not only unique, but popular. "It's quickly become a high-valued educational resource with about 60 participants per year, and it typically has a waitlist," Chatterjee said. "We've had so much enthusiasm that graduates are asking to return as faculty."

About 800–1,000 neurointerventionalists practice in the U.S. — a small but impactful subspecialty. Many medical facilities have only one or two neurointerventional radiologists on staff, and even practitioners at larger academic institutions rely on their fellow practitioners for guidance. Chatterjee said an added benefit to the course is building a network of practitioners who contribute to the field's knowledge pool and can serve as trusted resources.

"All of us encounter complications in this field that continues to evolve at a rapid pace," he said. "While complications are rare, new devices can lead to situations we haven't encountered before. By openly sharing our experiences and discussing complications as a field, we can collectively advance care and improve outcomes for patients everywhere."



Right, Top: A panel of neuroendovascular interventional radiologists discusses difficult cases and shares their professional advice during the 2025 Fellows Leaping Into Practice event.

Right, Bottom: A neuroendovascular interventional radiologist leads a demonstration during the 2024 Fellows Leaping Into Practice event.

Alumni Spotlight

by Bailey Tripp

An MIR residency not only offers a robust diagnostic and therapeutic training experience but the opportunity to discover the passion for a subspecialty. We caught up with three alumni dedicating their careers to breast imaging: Michelle V. Lee, MD, ('07, '08), Benjamin Pettus, MD, PhD, ('10, '11), and Ami Trivedi, MD ('24, '25).

Choosing a training program is a huge decision. What set MIR apart for you?

Lee: During my third year of medical school, I was awarded the RSNA Medical Scholars Grant, and I studied the imaging appearance of emphysema using hyperpolarized ^{3}He MRI with Dmitriy Yablonskiy, PhD. The mentorship I received during that year, coupled with the extraordinary research infrastructure, was unlike anything I had experienced elsewhere. The decision ultimately felt straightforward. MIR was — and remains — the premier radiology training program in the world.

Pettus: I was excited to train under a diverse group of subspecialty experts and impressed by the hybrid research track. At the time, I had two young children with a third on the way, and my wife (an educator) was interested in homeschooling. St. Louis offered the perfect balance: family-friendly, affordable and full of things to do, even on a tight budget.

Trivedi: I knew I wanted to be at MIR the day I interviewed. I loved the reading room environment and being on a first-name basis with the attendings. I was looking for a change from life in the Northeast, and St. Louis was the perfect fit for me and my husband.

How would you describe your time at MIR?

Lee: Intensely challenging and deeply rewarding. The clinical volume was tremendous, and the breadth of pathology was unmatched. Equally important were the relationships forged during that time. My residency class — including Jack Jennings and Heather Garrett — was cohesive, driven and supportive. Many of my closest friends and most trusted colleagues are individuals I met at MIR.

Pettus: My residency experience was challenging due to significant personal demands. I often felt I was at the bottom of my class for the first time in my life, yet the program and my co-residents were remarkably supportive. Colleagues shared their knowledge and created a collaborative environment. I performed well on my board exams, largely through on-the-job learning, resident camaraderie and grace. That experience taught me the value of lifelong learning.

Trivedi: Rigorous, rewarding and fun! I'm grateful for the graduated independence throughout training that helped me build the confidence to start my attending career off on a great foot. I'm also really grateful for the lifelong friendships I made at MIR.

Was there an "aha" moment during residency that solidified breast imaging as your subspecialty?

Lee: My decision to pursue breast imaging crystallized when I saw the direct and immediate impact our work has on patients. Knowing that my interpretations can directly help save a life gives the work a sense of purpose that extends far beyond what I hoped to experience as a doctor.

Left: Lee at her 2000 graduation from Northwestern University Feinberg School of Medicine with her daughters, Geneva (left) and Grace (right).

Pettus: My passion for women's imaging ignited when I witnessed how curable breast cancer can be when detected early and how devastating it remains for those with genetic risks, symptoms before screening age or delayed screenings. Having watched my mother overcome immense challenges and being blessed with an extraordinary wife, I highly respect women. What higher calling is there than fighting daily for their health and lives?

What's something you didn't fully appreciate about breast imaging until you were in practice?

Lee: How much the science would change and advance over my career. I learn something new every day.

Trivedi: The impact you can have on a woman's life. Taking an extra moment of care when discussing results with a patient and her family goes a long way, and it's so meaningful to see the positive effects you can have on someone else's life.

What are some of your interests outside of the reading room?

Lee: I love watching NFL football on Sunday afternoons while cooking in the kitchen. Go Packers!

Pettus: I treasure time with my wife and our six children and extended family and friends. Art has become a meaningful creative outlet, and I stay active in our community and church. I reconnect with my training and live my faith through medical missions, primarily in Colombia and Venezuela.

Trivedi: Traveling! My husband and I took some great trips after I finished training, including Australia (Sydney, Melbourne and the Great Barrier Reef) and India (Rajasthan and the Taj Mahal). We also love walking with our little cavapoo.

Right, top: When away from the reading room, Trivedi and her husband love to travel. They are pictured here on a visit to the Taj Mahal in India.

Right, bottom: Pettus enjoys spending time with his wife and six children, often playing board games or watching movies together.

Woodard Elected to National Academy of Medicine

Pamela K. Woodard, MD, the Elizabeth E. Mallinckrodt Professor of Radiology and director of MIR, was elected to the National Academy of Medicine. One of the highest honors in medicine, membership recognizes outstanding professional achievement and commitment to service. Woodard was honored for her leadership at MIR, dedication to inspiring the next generation of physician-scientists and significant contributions to the advancement of cardiac imaging techniques.

A renowned physician-scientist, Woodard has translated an MRI technique that reduces motion artifacts, led a team that developed a PET radiotracer to characterize atherosclerotic plaques, and was a principal investigator on the clinical trial that eventually established multidetector spiral CT as the standard of care for diagnosing blood clots in the lungs. She holds several honors and leadership positions, including with the American Association for the Advancement of Science, Academy of Radiology and Biomedical Imaging Research, and American College of Radiology.

New Hires

Jay M. Amberker, MD
Clinical Assistant Professor

Mark A. Anastasio, PhD
R. Gilbert Jost Distinguished Professor of Imaging Sciences and Artificial Intelligence

Amira M. Bahu, MD
Clinical Assistant Professor

Lucas Buckley, MD
Clinical Assistant Professor

James B. Burke, MD
Clinical Assistant Professor

Robert C. Burke, MD
Clinical Assistant Professor

Jason P. Carmichael, MD
Clinical Assistant Professor

Andrew L. Chang, MD, PhD
Assistant Professor of Radiology

Lucy Ann Christopherson, MD
Clinical Assistant Professor

Matthew M. Donaldson, MD
Clinical Assistant Professor

Michael G. Fazio, DO
Clinical Assistant Professor

Michael Friedman, MD
Clinical Assistant Professor

Chester Harrison, MD
Clinical Assistant Professor

Michael Jennewein, MD
Clinical Assistant Professor

Pegah Khoshpouri, MD
Assistant Professor of Radiology

Louba Laurie, MD
Clinical Assistant Professor

Alex M. Mayeux, MD
Clinical Assistant Professor

Saad Naseer, MD
Clinical Assistant Professor

Arpit Patel, DO
Clinical Assistant Professor

Christine M. Peterson, MD
Clinical Associate Professor

Janet H. Pollard, MD
Associate Professor of Radiology

Kevin Roodhouse, MD
Clinical Assistant Professor

Timothy Russell, MD
Clinical Assistant Professor

Alexander Ryan, MD
Clinical Assistant Professor

Amar S. Shah, MD
Assistant Professor of Radiology

Parvish Shah, DO
Clinical Assistant Professor

Hillary Shaw, MD
Clinical Assistant Professor

Nathan J. Siesener, MD
Clinical Assistant Professor

Carl J. Stokes, MD
Assistant Professor of Radiology

Yasasvi Tadavarthi, MD
Assistant Professor of Radiology

Tamara J. Walls, MD
Clinical Assistant Professor

Markus G. Zei, MD
Clinical Assistant Professor

Promotions

Naganathan B. Mani, MD
Professor of Radiology

Ayman M. Nada, MD, PhD
Associate Professor of Radiology

Benjamin E. Northrup, MD
Associate Professor of Radiology

Vikas Prasad, MD, PhD
Professor of Radiology

Mohamed Z. Rajput, MD
Associate Professor of Radiology

Anup S. Shetty, MD
Professor of Radiology

Benjamin S. Strnad, MD
Associate Professor of Radiology

Zhongwei Zhang, MD, PhD
Associate Professor of Radiology

MIR Amps Up Preclinical Power

A newly acquired ultra-high-field small animal scanner, one of few worldwide, marks a leap in MIR's preclinical imaging technology. The Bruker BioSpec 15.2-tesla (T) MRI scanner boasts an increased magnetic field and high-powered gradient set for exceptionally high image quality, faster imaging and ultra-sensitive functional and metabolic measurements. The scanner replaced the 11.74T system and will consume less liquid helium, improving the sustainability of the preclinical imaging program.

IR Expands with New Division

The Division of Interventional Radiology was launched to support the continued clinical and operational expansion of one of the nation's largest and most comprehensive service centers. The move follows infrastructure growth — including Plaza West Tower with state-of-the-art IR suites — and aims to enhance patient care, strengthen referring physician support and deepen ties with BJC Health partner hospitals. Jack W. Jennings, MD, PhD, a prominent IR innovator and leader, was named senior vice chair and division director. Associate directors overseeing specific service lines or locations are James R. Duncan, MD, PhD (St. Louis Children's Hospital); Resten Imaoka, MD (musculoskeletal interventions); Pavan K. Kavali, MD (Barnes-Jewish West County Hospital and Missouri Baptist Medical Center); and Alexander Ushinsky, MD (Barnes-Jewish Hospital).

Honors/Awards

Joelle W. Biernacki, MD, **Jack W. Jennings, MD, PhD**, **Michelle V. Lee, MD**, **Matthew S. Parsons, MD**, **Anup S. Shetty, MD**, and **Richard Tsai, MD**, received the WashU Medicine Dean's Impact Award, which recognizes the "focused excellence of exemplary clinicians and researchers." The honorees' accomplishments include delivering advanced imaging services to community locations, broadening access to subspecialty care and spearheading initiatives that improve healthcare accessibility.

Daniel Ludwig, MD, associate professor of radiology, was named a fellow of the Society of Abdominal Radiology — a distinction honoring those making significant contributions to the specialty including devoting at least half of their professional practice to abdominal imaging.

Jaimee E. Mannix, MD, assistant professor of radiology, was named a St. Louis Blues and Siteman Cancer Center Hometown Hero in recognition of Mannix going above and beyond to help her community.

Parisa Mazaheri, MD, assistant professor of radiology, was inducted into the WashU Medicine Academy of Educators, a highly selective and service-based institutional coalition dedicated to health science education and innovation.

Vincent M. Mellnick, MD, professor of radiology, became a fellow of the American Society of Emergency Radiology. In addition to serving as the abdominal imaging section chief, he is co-director of the emergency radiology service at MIR.

Benzinger Installed as Hugh Monroe Wilson Professor of Radiology

Above: Pamela K. Woodard, MD, Tammie L.S. Benzinger, MD, PhD, and David H. Perlmutter, MD

Tammie L.S. Benzinger, MD, PhD, was installed as the Hugh Monroe Wilson Professor of Radiology. A celebrated physician-scientist and neuroradiologist, she studies Alzheimer's disease and related disorders, using PET and MRI to investigate biomarkers in hopes of detecting and diagnosing degenerative brain diseases before symptoms occur. She is a principal investigator in the Neuroimaging Labs Research Center, and her group serves as the imaging core for the Knight Alzheimer's Disease Research Center, the Dominantly Inherited Alzheimer Network (DIAN) and the DIAN-Therapeutic Unit. She also serves as chief of the department's MRI service. Benzinger delivered "Advancing Frontiers in Brain Imaging: Translating Alzheimer's Research into Clinical Medicine" to cap off the formal installation ceremony.

"The impact Dr. Benzinger has had on the lives of Alzheimer's patients is tremendous," said Pamela K. Woodard, MD, director of MIR and the inaugural Wilson Professor. "I cannot think of anyone more deserving of this honor than her."

The professorship honors Hugh Monroe Wilson, MD, former MIR director who served from 1949 to 1963. He is remembered as a modest man and dedicated teacher who prioritized educating students in academic radiology.

New Portrait Honors Dr. Richard Wahl

Following a nationwide search, Jamie Adams — an associate professor at the WashU Sam Fox School — was selected to paint a portrait of Richard L. Wahl, MD, who led the department for nine years until 2023. After a photo shoot, Adams crafted the oil painting in his home studio, collaborating with Wahl to capture personal details. The painting joins the portrait collection of former chairs displayed at Mallinckrodt Tower.

Benjamin E. Northrup, MD, associate professor of radiology, was elected president of the Missouri Radiological Society, the state chapter of the American College of Radiology. He succeeds **Elizabeth G. McFarland, MD**, professor of radiology.

Matthew S. Parsons, MD, professor of radiology, was named a fellow of the American College of Radiology, one of the organization's highest honors recognizing the significant contributions of its members across patient care, community service, research, education and more.

Marcus E. Raichle, MD, the Alan A. and Edith L. Wolff Distinguished Professor of Medicine, received an honorary Doctor of Medicine degree from WashU.

Thomas H. Schindler, MD, PhD, professor of radiology, was named editor-in-chief of The International Journal of Cardiovascular Imaging. After a competitive selection process, he was selected to lead the North American Society for Cardiovascular Imaging's primary journal.

Benjamin S. Strnad, MD, assistant professor of radiology, received the Early Career Award from the Barnes-Jewish Hospital Medical Staff Association. This honor is awarded to physicians within the first 10 years of their careers who demonstrate outstanding work in patient care or teaching, exceptional interpersonal skills, strong mentorship and notable potential to lead the next generation of physicians.

Zhude (Will) Tu, PhD, professor of radiology, was elected to the National Academy of Inventors' class of senior members. This honor recognizes those at NAI member institutions who have successfully produced, patented and commercialized technologies that have brought, or aspire to bring, real impact on the welfare of society and economic progress.

Pamela K. Woodard, MD, the Elizabeth E. Mallinckrodt Professor and MIR director, was selected to join the Hedwig van Ameringen Executive Leadership in Academic Medicine fellowship program at Drexel University College of Medicine. She is one of 99 participants selected to join this prestigious program dedicated to developing leaders for senior-level executive roles, honing the professional and personal skills required to lead and manage in today's complex healthcare environment.

Diagnostic Chief Residents 2026-2027

From left: Brandon W.G. Lippold, MD; Ross Vitek, MD; Kayla E. Zydeck, MD; Bradley W. Eichar, MD

MIR Hosts 2026 Grand Rounds

The Melson Memorial Lecture was presented by Olga Brook, MD, chief of abdominal imaging and vice chair of research for the Department of Radiology at Beth Israel Deaconess Medical Center. She discussed "Conquering Bleeding: From Imaging Insights to Prevention Strategies."

The William H. McAlister Lecture hosted Gary Luker, MD, the N. Reed Dunnick Research Professor of Radiology at Michigan Medicine. He presented "Science, Service and Mentorship: Lessons from Dr. McAlister."

The Hyman R. Senturia Memorial Lecture was presented by Pavan K. Kavali, MD, associate professor of radiology and director of the Pulmonary Embolism Response Team (PERT). He shared insights into the multidisciplinary work that enables rapid, advanced care for patients with PE.

The Office of Outreach hosted Efrén Flores, MD, vice chair of faculty and trainee enrichment at Mass General Brigham, for its Grand Rounds Lecture. He delivered "Community Engagement in Radiology: Progress, Pitfalls and the Path Forward."

The Wendell G. Scott Memorial Lecture was presented by Doug Frantz, PhD, vice chancellor for innovation and commercialization at WashU. He shared his approach to fostering collaboration and connecting resources to support the university's research enterprise.

Grants

Co-investigators **Tabassum Ahmad, MD**, and **Graham A. Colditz, MD, DrPH**, received an inaugural Siteman Cancer Center Catchment Prevention and Control Trial Grant, a $100,000-per-year funding opportunity supporting prevention and control-based interventional trials. Ahmad and Colditz run the Precision Supplemental Imaging in Dense Breasts Trial, which seeks to determine the optimal use of supplemental imaging in patients with dense breast tissue by evaluating the feasibility and effectiveness of MRI as an additional screening tool.

Below, clockwise from top left: Pamela K. Woodard, MD, and Doug Frantz, PhD; William H. McAlister, MD, Gary Luker, MD, and Ting Y. Tao, MD, PhD; Efrén Flores, MD, and Monica Shokeen, PhD; Pavan K. Kavali, MD; Olga Brook, MD, and Vincent M. Mellnick, MD

David H. Ballard, MD, and **Parakkal Deepak, MBBS**, were awarded a $3.2 million grant from the Leona M. & Harry B. Helmsley Charitable Trust to advance the diagnosis and treatment of perianal fistulizing Crohn's disease with artificial intelligence. Ballard also received a $100,000 Drs. Jane & Abass Alavi Mars Shot Research Award from the Society of Nuclear Medicine and Molecular Imaging to establish a foundation for noninvasive decision-making to differentiate and treat symptomatic strictures caused by either inflammation or fibrosis in Crohn's disease.

Kevin M. Bennett, PhD, associate professor of radiology, was selected to receive a $100,000 award from the American Society of Nephrology's KidneyCure Bridge Grant Pilot Program.

Ganesh Chand, PhD, assistant professor of radiology, received a four-year, $3.2 million grant from the National Institute on Aging for "Mapping amyloid, tau, and neurodegeneration markers with neuropsychiatric phenotypes and genotypes in Alzheimer's disease continuum using machine learning."

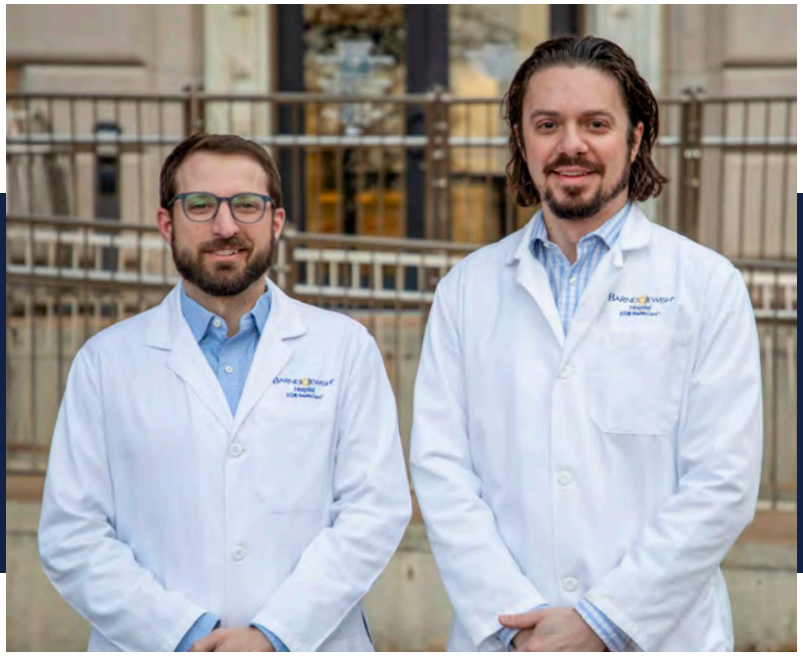
Evan M. Gordon, PhD, assistant professor of radiology, and a team of WashU researchers were awarded a three-year, $2 million grant from The Michael J. Fox Foundation for Parkinson's Research for "Precision mapping of Somato-Cognitive Action Network (SCAN)pathophysiology in Parkinson's Disease gait disturbance."

José Marcio Luna, PhD, assistant professor of radiology, received an Institutional Research Grant from the American Cancer Society and Siteman Cancer Center. His pilot project aims to use advanced imaging and computational analysis to find signals of how well a patient may respond to immunotherapy in advanced, non-small cell lung cancers.

Vikas Prasad, MD, PhD, professor of radiology, was awarded a $100,000 Mars Shot Research Fund grant from the Society of Nuclear Medicine and Molecular Imaging. The fund supports innovative, transformative, nuclear medicine imaging and radiopharmaceutical therapy research.

Patrícia M. Ribeiro Pereira, PhD, assistant professor of radiology, received part of $1.65 million in new funds awarded by the Lung Cancer Research Foundation. She was awarded a Leading-Edge Research Grant to support her work in antibody click chemistry for lung cancer therapy.

Thomas H. Schindler, MD, **Vijay Sharma, PhD**, and **Pamela K. Woodard, MD**, were awarded a $3.1 million from the National Heart, Lung, and Blood Institute to study PET imaging of chemotherapy-induced cardiotoxicity.



IR Chief Residents 2026-2027

From left: Forrest W. Williard, MD; Matthew Lommen, MD

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On June 3, faculty and trainees gathered for the annual MIR house staff photo shoot.