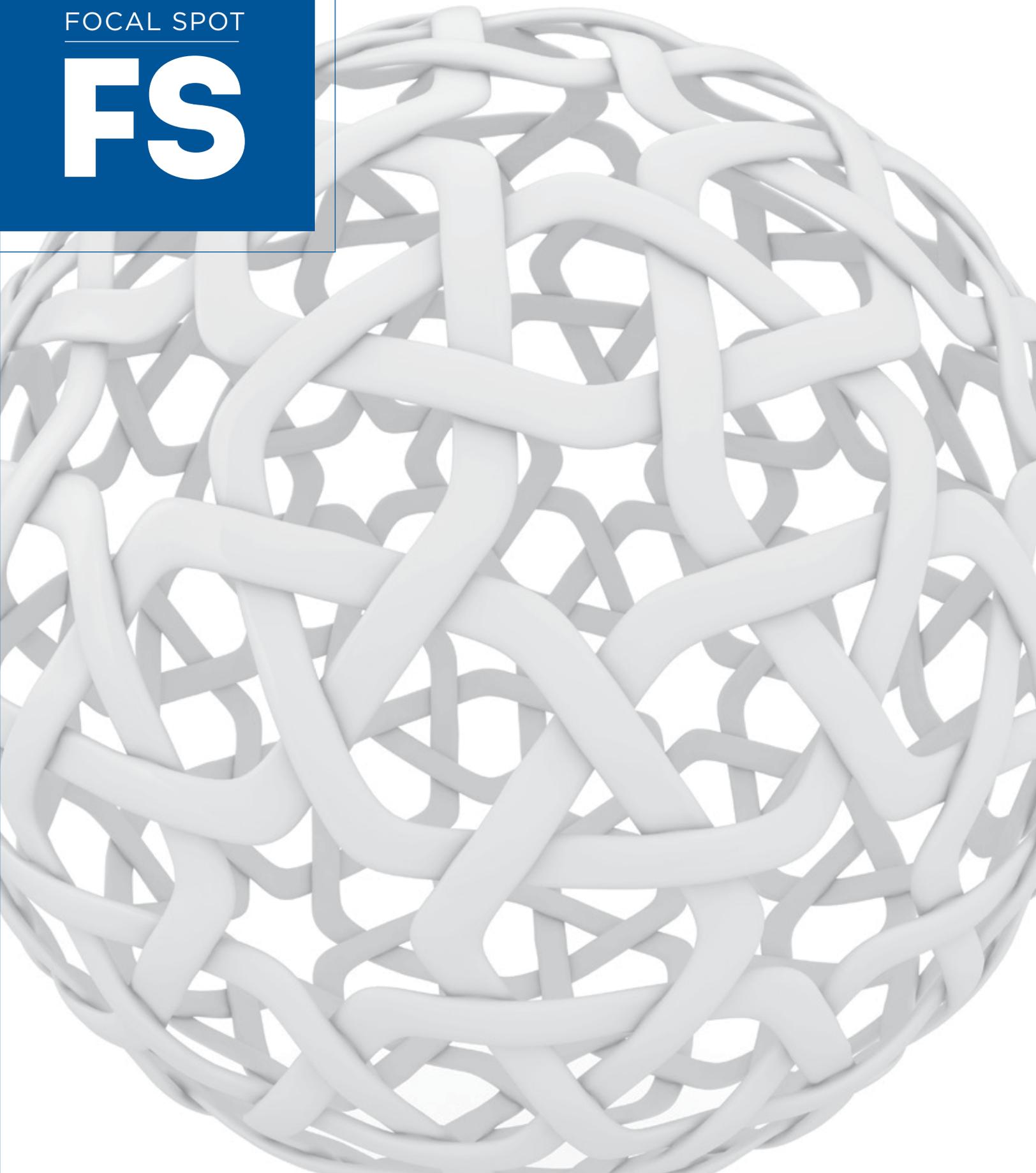


FOCAL SPOT

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SUMMER/FALL 2014 Tomosynthesis — another dimension of breast cancer treatment
MALLINCKRODT INSTITUTE OF RADIOLOGY // WASHINGTON UNIVERSITY // ST. LOUIS



6 CLOT BUSTERS

Mallinckrodt radiologists lead an ongoing NIH study to determine whether a new treatment for deep vein thrombosis (DVT) will improve patient care.



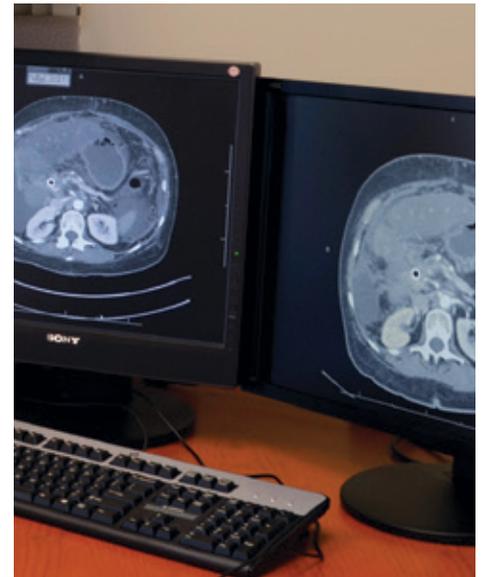
10 CONSTRUCTING CYCLOTRON TECHNOLOGY

Mallinckrodt's newest cyclotron and Good Manufacturing Practice (GMP) facility are up and running, a decade-long feat of planning and construction.



16 3D VS. 2D

Tomosynthesis — also known as 3D mammography — has the potential to enhance breast cancer screening and diagnosis, thereby improving women's health. Breast radiologists at Mallinckrodt are assessing its benefits for radiologists and the patients they serve.



20 A PATH FOR MEASURING SUCCESS

A shared resource run by Mallinckrodt faculty uses a rapid and consistent method to review cancer clinical trial study data, ensuring its accuracy and uniformity.

ON THE COVER

Tomosynthesis, when used alone or together with two-dimensional imaging, gives radiologists a 3D glimpse inside the breast. This view (illustrated here by a sphere) allows clinicians to see tissue from multiple angles by producing high-resolution, sequential images that may result in fewer false positives and higher cancer detection rates than other imaging methods.



2 SPOT NEWS



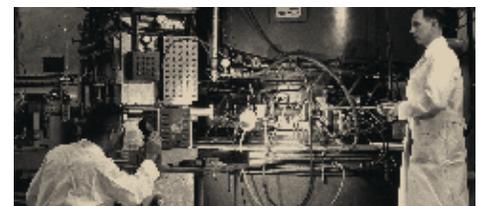
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SPOT NEWS

New MIR website debuts

It's dynamic, digital and now viewable on smart phones, tablets and laptops.

After two years of planning, information gathering, and meetings with key department stakeholders, Mallinckrodt Institute of Radiology rolled out its new website in July.

The new site targets future residents, referring physicians, and patients, and is designed to address each group's distinct needs and concerns. Additionally, the site showcases Mallinckrodt's nine clinical specialties, eight research laboratories, and 10 research support facilities — and more.

So what's new?

- Among other things, physicians can make patient referrals online, download forms for specific imaging tests, and review a current list of accepted insurance providers.
- Medical students interested in Mallinckrodt's post-graduate training can review residency programs and download fellowship applications, read about living in St. Louis, or learn about ongoing research opportunities.
- Patients can review Mallinckrodt's physician directory and find an MIR-staffed facility near them by completing an online form. In the future, the site will contain physician and



Above: A new look online

patient portals to access radiology reports and images.

- Alumni can view a global map showing locations of former MIR residents, or read stories about fellow graduates.

To keep abreast of the latest news about the people and events at Mallinckrodt, please visit mir.wustl.edu today!

Three faculty members receive ACR designation

Three distinguished Mallinckrodt Institute of Radiology faculty — Robert C. McKinstry, MD, PhD, Colin P. Derdeyn, MD, and Vamsi R. Narra, MD, recently joined the elite fellowship of the American College of Radiology (ACR).

Recognition as an ACR fellow is one of the highest honors the nearly century-old institution can bestow on a radiologist, radiation oncologist, or medical physicist.

At Mallinckrodt, McKinstry serves as chief of pediatric radiology, Derdeyn as a professor of neuroradiology, and Narra as chief of abdominal imaging and chief of radiology at Barnes-Jewish West County Hospital.

The American College of Radiology, founded in 1923, is a non-profit professional medical association composed of diagnostic radiologists, radiation oncologists, interventional radiologists, nuclear medicine physicians, and medical physicists. Fellows demonstrate a history of service to the ACR, organized radiology, teaching, or research. Approximately 12 percent of ACR members achieve this distinction.



Above: Newly named 2014 ACR fellows Robert C. McKinstry, MD, PhD, Colin P. Derdeyn, MD, and Vamsi R. Narra, MD

Schwarz takes on new leadership role

Sally J. Schwarz, MS, RPh, BCNP, research associate professor of radiology, has been elected the 2014–15 vice president-elect of the Society of Nuclear Medicine and Molecular Imaging (SNMMI).

Schwarz is co-director of the cyclotron facility and PET nuclear pharmacist for the Mallinckrodt Institute of Radiology cyclotron at Washington University School of Medicine.

“As a nuclear pharmacist, I have a unique perspective and have worked with diverse groups of people including clinicians, researchers, technologists, and regulatory groups,” says Schwarz. “I would like to facilitate movement of new imaging and therapeutic drugs into humans for clinical trials and work with the FDA to expedite the review and approval process.”



Above: Sally J. Schwarz, MS, RPh, BCNP

Schwarz’s goals for the coming year include educating SNMMI members on the documentation needed for various regulatory requirements, developing a commercial and academic group to interface with the U.S. Food and Drug Administration (FDA) on new clinical PET drugs, and gathering core resources for investigational compounds that show promise for FDA approval to help facilitate access to research compounds, thereby enabling clinical trials.

Siegel accepts nuclear medicine’s Cassen Prize



Above: Barry A. Siegel, MD

One of science’s most prestigious honors — the Benedict Cassen Prize for Research in Nuclear Medicine — recently was awarded to Washington University School of Medicine radiologist Barry A. Siegel, MD.

Considered by many in the field to be its highest honor, the award is given every two years by the Education and Research Foundation for Nuclear Medicine and Molecular Imaging to a researcher whose work has led to a major advance in basic or clinical nuclear medicine science.

Siegel is renowned for his pioneering work in positron emission tomography (PET). In recognizing his efforts, the foundation cited Siegel’s sustained contributions using PET in two areas: the enhancement of cancer diagnosis and care, and the development of a scientific methodology for evidence-based clinical trials.

Siegel, professor of radiology and of medicine, accepted the honor during the 2014 annual meeting of the Society of Nuclear Medicine and Molecular Imaging (SNMMI) held in St. Louis.

“I am truly honored by this award,” says Siegel, chief of the Division of Nuclear Medicine at Mallinckrodt Institute of Radiology. “It’s gratifying to know that my efforts, in collaboration with so many colleagues at Washington University and other institutions, have helped to achieve broader recognition of the utility of PET in clinical practice.”

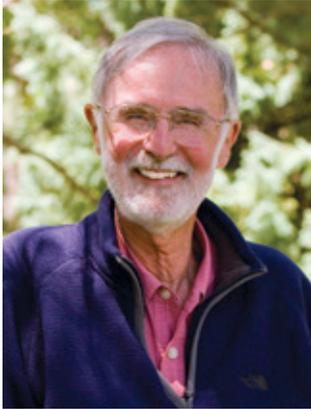
During a special plenary session at the SNMMI meeting, Siegel presented the Cassen Lecture, “What Have We Learned from the National Oncologic PET Registry?” He reviewed the history of PET reimbursement, including the accomplishments of the National Oncologic PET Registry (NOPR) and the limitations of observational registries in generating evidence that a technology leads to improved patient outcomes.

Siegel came to Washington University as an undergraduate in 1962, earned his medical degree in 1969, and then remained at Mallinckrodt for his internship, residency, and fellowship. He joined the faculty in 1973 and has been with the university for more than five decades.

His current research focuses on the applications of PET for monitoring and predicting tumor response to treatment, as well as the incorporation of imaging biomarkers into multicenter clinical trials.

The Cassen Prize honors Benedict Cassen, whose invention of the rectilinear radioisotope scanner — the first instrument capable of making an image of radiotracer distribution in body organs of living patients — was seminal to the development of clinical nuclear medicine. Siegel is the 13th individual to have been presented the award since 1994.

Raichle wins Kavli Prize



Above: Marcus E. Raichle, MD

Marcus E. Raichle, MD, is one of three scientists awarded this year's prestigious Kavli Prize in Neuroscience. The 2014 laureates — the others were Brenda Milner, PhD, and John O'Keefe, PhD — were selected for the discovery of specialized brain networks for memory and cognition, for pioneering the theory of cosmic inflation, and for contributions to the field of nano-optics, respectively.

"It's rather nice," says Raichle, "that with the tremendous increase in neuroscience and recognitions at all different levels at which we work — from cells and genes, all the way up to the human brain — that this year's award involves things we can relate to the human brain."

Raichle and his colleagues have found that brain regions in the default network often are among the first areas affected by Alzheimer's disease. These changes one day may aid in early diagnosis of Alzheimer's.

Achilefu innovation award

Exciting research conducted in the laboratory of Samuel I. Achilefu, PhD, continues to gain notice. Throughout 2014, his research — particularly in the development of goggles that enable surgeons to more clearly visualize cancer — has garnered local, national, and international recognition.

Recently, the *St. Louis Business Journal* honored Achilefu, professor of radiology and of biochemistry and molecular biophysics and director of the Molecular Imaging Program, with a 2014 Innovation Award in medicine, one of nine categories designed to recognize the St. Louis business community as a breeding ground of creativity.

Achilefu and colleagues in the Optical Radiology Laboratory at Mallinckrodt Institute of Radiology use molecular and physiologic imaging to develop breakthrough image-guided therapeutic interventions.



Above: Samuel I. Achilefu, PhD

Alumnus to lead MIR



Above: Richard L. Wahl, MD

You can go home again — which is welcome news for Mallinckrodt Institute of Radiology as it concludes the search for a new director.

Richard L. Wahl, MD, has been named the Elizabeth E. Mallinckrodt Professor and head of radiology at Washington University School of Medicine in St. Louis. He also will serve as

director of Mallinckrodt Institute of Radiology.

The appointment, which begins in October, was announced by Larry J. Shapiro, MD, executive vice chancellor and dean of the School of Medicine.

"Richard is a 1978 graduate and former resident and fellow of the School of Medicine who has gone on to do groundbreaking work in developing specially targeted radiopharmaceuticals for diagnosing and treating cancer," says Shapiro. "He is a leader in the field; we are very pleased to welcome him back as the department's new director."

Wahl succeeds R. Gilbert Jost, MD, who has headed Mallinckrodt for 15 years. Jost's many accomplishments include the creation of the Center for Clinical Imaging Research (CCIR), one of the first hospital-based facilities dedicated to providing state-of-the-art imaging technology to researchers in a patient-care environment. Jost will continue to be active in research.

Wahl comes to the Mallinckrodt from Johns Hopkins University, where he is the Henry N. Wagner Jr., MD, Professor and director of the Division of Nuclear Medicine.

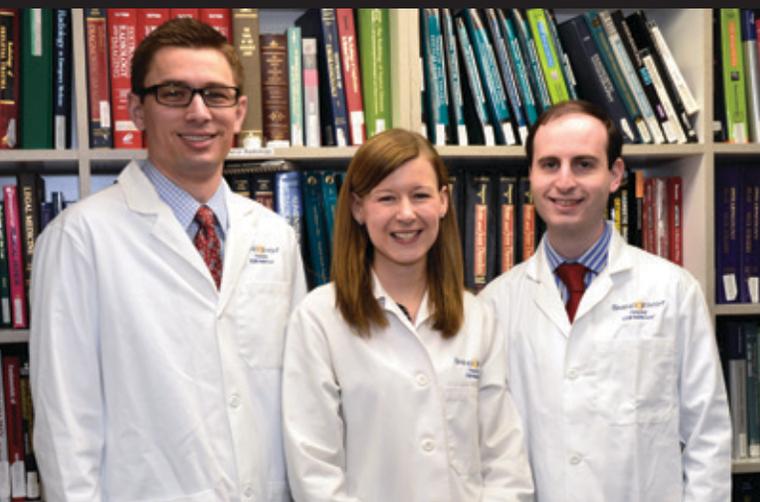
"Mallinckrodt Institute of Radiology has made many very important and influential contributions to the use of radiopharmaceuticals and cross-sectional imaging in modern medicine," says Wahl. "I'm eager to return to St. Louis to help the faculty and staff continue to provide top-notch clinical care and education and to expand the frontiers of research."

Wahl was among the first to combine radiation therapy for non-Hodgkin's lymphoma with techniques that use the immune system to precisely target treatments. The combined approach, now FDA-approved, is known as radioimmunotherapy. He also has been a leader in using positron emission tomography (PET) to diagnose a broad array of human cancers and other diseases. ▬



Poster Session

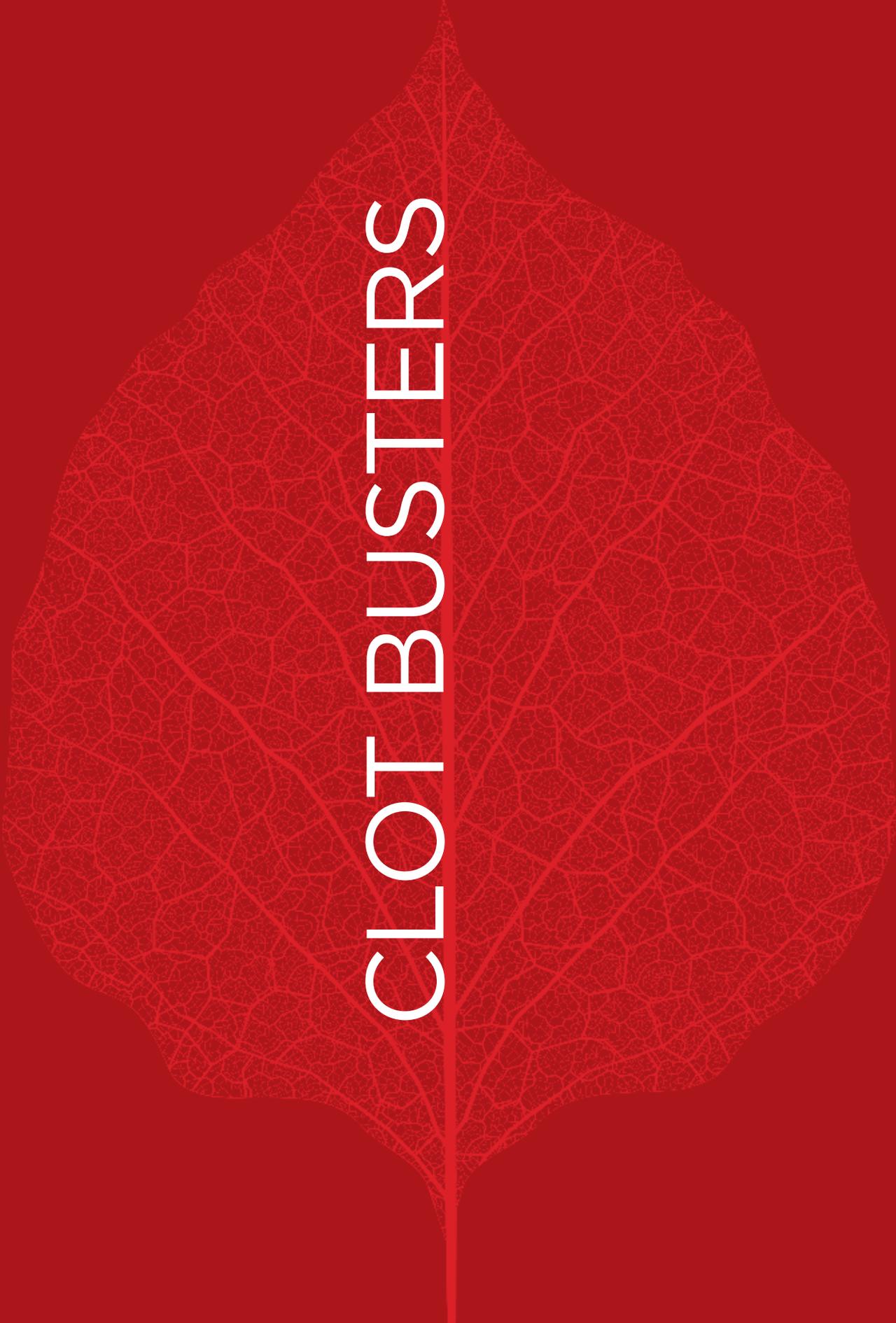
Above: About 200 attendees turned out earlier this year for the Mallinckrodt Institute of Radiology poster session held in the Farrell Learning and Teaching Center. More than 70 posters representing a vast array of basic and clinical research ongoing at Mallinckrodt were included. Although the session's focus was on research performed by junior faculty, post docs and graduate students, the work of senior researchers also was displayed.



New Chief Residents 2014-15

Chief residents for the diagnostic radiology residency program are recommended by their peers and chosen by Mallinckrodt Institute of Radiology leadership. They assist with both resident and call schedules and are responsible for organizing extracurricular activities throughout the year.

Left to Right: Daniel Holt, MD, Sarah Connolly, MD, and Mark Hammer, MD



CLOT BUSTERS

REASSESSING HOW TO TREAT ACUTE AND CHRONIC DEEP VEIN THROMBOSIS

by Pam McGrath

“Isn’t there something else we should be doing?”

That’s the question Chuck Lange, 60, repeatedly asked physicians in Cape Girardeau, Mo., as he experienced intense pain and swelling in his legs over a period of several months early in 2014.

After days of severe pain and swelling in her left leg in July 2013, St. Louisan Ann-Marie Stagoski, 46, found herself in a Kansas City, Mo., hospital awaiting an ultrasound to confirm a suspected diagnosis.

“Could it be anything else?” she asked a nurse. **“Oh, honey, you have a blood clot,”** came the reply.

Both Lange and Stagoski were experiencing deep vein thrombosis (DVT), a condition estimated to affect between 350,000 and 600,000 Americans annually.

They sought help and were eventually treated successfully by Mallinckrodt Institute of Radiology interventional radiologists who are leading a landmark study funded by the National Institutes of Health (NIH) to determine the definitive treatment for DVT.

A HISTORY OF BLOOD CLOTS

DVT results from a blood clot that forms in a vein deep in the body, usually in the lower leg or thigh. These blood clots — especially those within the thigh — can break off and travel through the bloodstream. A pulmonary embolism (PE) develops when the clot travels to an artery in the lungs and blocks blood flow. This serious condition can damage the lungs, cause heart failure, and even end in death.

DVTs are classified as acute when diagnosed within 14 days of the clot forming or chronic when the clot is more than a month old. Chronic DVT can lead to post-thrombotic syndrome (PTS), a condition with leg symptoms that include aching or cramping, a feeling of heaviness, itching or tingling, swelling, skin discoloration, and ulcers on the skin.

That’s the type of DVT Lange was experiencing. He had a history of DVTs dating to hip replacement surgeries in 2004 and 2008, one of which resulted in a PE. To help prevent a recurrence, a surgeon had implanted a filter in Lange’s inferior vena cava. The device acts as a sieve to block blood clots from reaching the lungs.

“I was fine until January of this year, when I developed viral pneumonia and was hospitalized for 16 days,” says Lange. “Then a couple of weeks after leaving the hospital, I herniated a disc in my back. I could hardly move: I was in excruciating pain, and my legs swelled up immediately.”

Following another four-day stay in the hospital, Lange returned home. His back injury improved, but his legs remained swollen.



Above: Chuck Lange and Ann-Marie Stagoski (shown with her daughter)

A RARE ANATOMIC VARIANT

Not all DVTs are alike. In another example, Stagoski was returning from a family vacation in July 2013, a trip during which she spent eight hours in a car barely moving due to a severe case of poison ivy. The next morning she awoke with severe pain on her left side and running down her outer left thigh. A trip to a doctor several days later for both the poison ivy and her leg pain resulted in a diagnosis of sciatica.

“The next weekend I traveled to Kansas City for my daughter’s soccer tournament, and the pain and swelling in my leg kept getting worse. A dad at the games who had experienced a blood clot told me to go to the hospital,” says Stagoski. “I really fought that idea, but after talking with my insurance company, my doctor’s nurse, and finally my doctor, I was convinced I needed to go to the emergency room.”

An ultrasound showed Stagoski had a blood clot extending from her groin down to her mid-calf. She spent three days in the hospital on blood thinners.

“Once I got home to St. Louis, I continued on a blood thinner, but the pain and swelling didn’t get better,” she says.

At the recommendation of a friend, Stagoski made an appointment with Suresh Vedantham, MD, professor of radiology and MIR interventional radiologist. Stagoski was diagnosed with May-Thurner syndrome, a rare condition that develops when the crossing right iliac artery compresses the left iliac vein, increasing the risk of DVT in the left leg.

“Ms. Stagoski had an acute DVT, which means her blood clot still had a jello-like consistency. This allowed us to perform pharmacomechanical catheter-directed thrombolysis (PCDT),” says Vedantham.

PCDT involves inserting a catheter into the blood clot and injecting it with the clot-busting drug tissue plasminogen activator t-PA. For Stagoski, the catheter was inserted into the blood clot and the t-PA was allowed to drip overnight. By the next day, the clot had dissolved, enabling Vedantham to insert two stents. Stagoski experienced immediate relief from the pain. After six months on a blood thinner, she now takes a daily dose of baby aspirin.

“Dr. Vedantham thinks there may be some valve damage, but I’ve noticed only minimal swelling when I exercise,” says Stagoski. “With daughters aged 15 and 17, I lead an active life, and I’ve been able to fully return to it.”

“After about a month, the doctors ordered an ultrasound and found clots in my legs and abdomen. Although I was taking a blood thinner, it wasn’t helping my condition,” says Lange.

Lange’s physicians suggested he see a vascular surgeon, but an almost six-week wait in Cape Girardeau prompted him to travel to the emergency department at Barnes-Jewish Hospital. There he was referred to Nael E. A. Saad, MD, assistant professor of radiology and Mallinckrodt interventional radiologist.

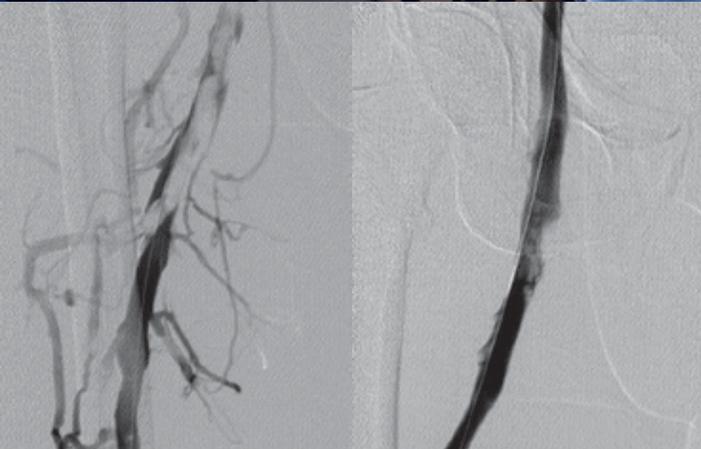
“Mr. Lange’s filter was blocked, causing a large clot to form at the filter and extend down into his abdomen and pelvis,” says Saad. “Since he had chronic DVT, the blood clots were hardened and impossible to dissolve. The only way for us to re-establish blood flow was to place stents throughout his inferior vena cava and iliac veins.”

Saad used balloon angioplasty to penetrate and push the clots open. Along the same pathway, he threaded 11 stents — small mesh tubes — to areas where the veins were narrowed.

“Relief from the pain was immediate, and overnight the swelling in my legs began to subside,” says Lange.

Over time, the hardening of blood clots damages the delicate valves within veins, and for that reason Lange’s legs will never be back to full capacity. But he is pleased with his progress and his ability to resume chores on the 20 acres of property he calls home with his partner, Teresa.

“I know I’ll be on a blood thinner for the rest of my life, and that’s OK,” he says. “My goal is to stay healthy, and thanks to Dr. Saad, I’m feeling good.”



Top: Nael E. A. Saad, MD, and Surish Vedantham, MD
Middle: Vedantham reviewing images // Photos by Tim Parker
Bottom: Deteriorating vein on left, intact vein on right after procedure

ATTRACT: A LANDMARK STUDY

Vedantham is the national principal investigator of the NIH-funded ATTRACT Study, a multicenter, randomized, controlled clinical trial designed to determine the best way to treat patients with proximal DVT (large blood clots of the leg). Saad serves as a co-investigator.

“For 60 years, the treatment for DVT has remained consistent — prescribe blood-thinning drugs to prevent new episodes and to stop the clot from moving,” says Vedantham. “Removing the existing clot hasn’t been considered an element of standard care; t-PA has been used only in select patients.”

Advances in how t-PA can be administered have raised the question of whether removing blood clots in patients with acute DVT while continuing them on blood thinners should become routine care.

“In the past, t-PA was delivered through a vein in the arm, which meant giving patients a very large dose of this powerful drug. As a result, bleeding events occurred,” says Vedantham. “We now have the technology to inject t-PA directly into the clot, which means we can inject lower doses while achieving a better target effect.”

The two-arm ATTRACT Study has one group of patients who receive the standard treatment for DVT, which consists of blood-thinning drugs and the use of elastic compression stockings. The other group receives the standard treatment as well as the PCDT clot-busting procedure. Each patient is followed for two years. The study began in 2009 and will conclude in 2016.

“Statistics show that 25 to 50 percent of patients — between 50,000 and 100,000 a year — with a first episode of DVT will develop post-thrombotic syndrome,” says Patty Nieters, RN, BSN, the ATTRACT study coordinator. “That’s a significant number of patients who will be debilitated to some degree for the rest of their lives. Once PTS develops, there is no consistently effective treatment to help patients fully recover.”

The study aims to determine if PCDT prevents PTS, improves quality of life, is safe enough, and is cost-effective. The study also has the goal of determining the mechanism by which PCDT prevents PTS.

“Currently there are two schools of thought in regard to using PCDT; some think it should be used only in very few, selected cases, while others think it should be used routinely,” says Vedantham. “This study — with leading researchers from across the nation on its steering committee and an endorsement from the U.S. Surgeon General — will give us the definitive answer about the care we need to provide to patients with DVT in the United States and throughout the world.”



50 CREW MEMBERS
AND **30,000** HOURS
constructed the vault and facility
that houses the new cyclotron

195 CUBIC YARDS
OF BEDROCK
was removed to build the vault

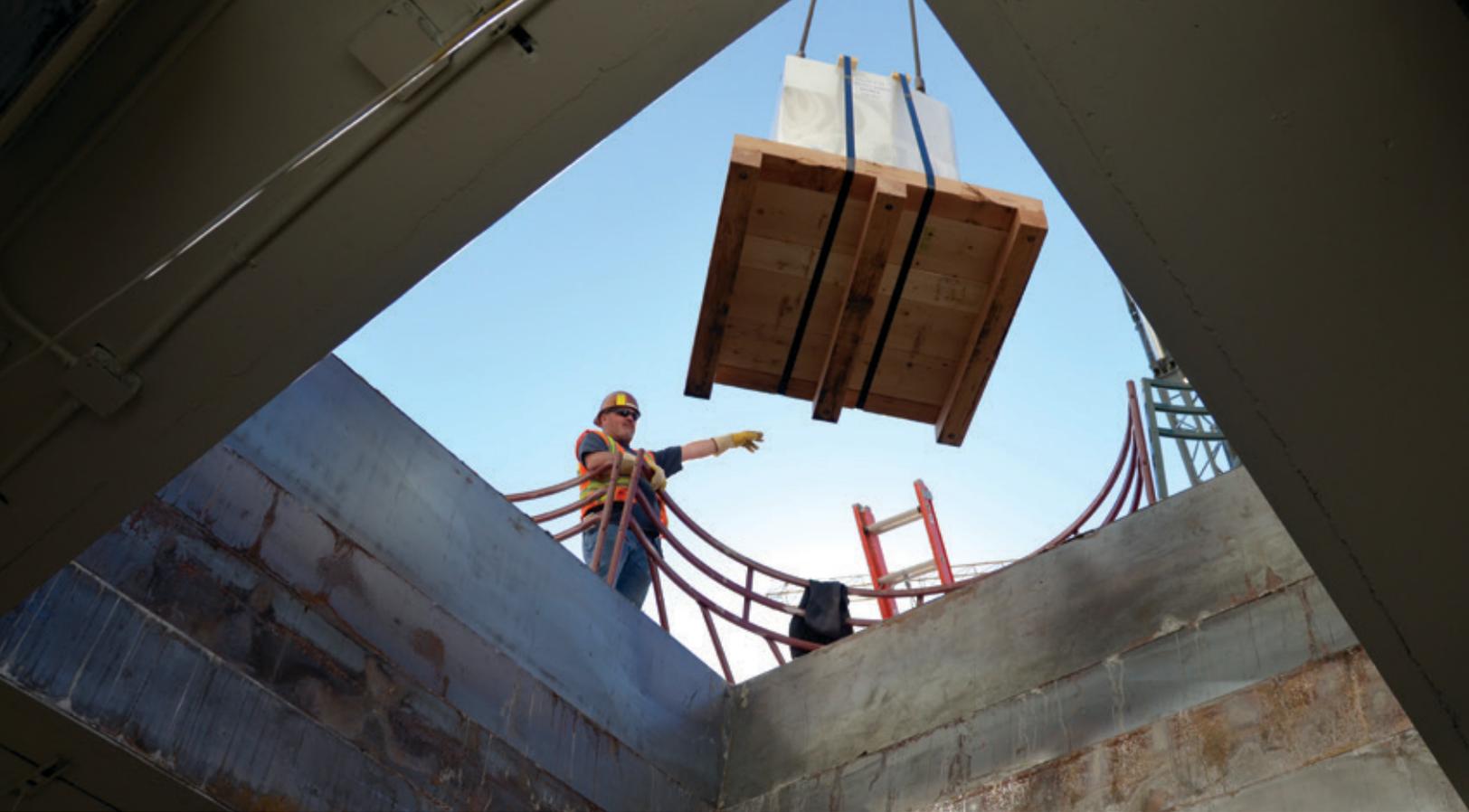
Architect: Ottolino Winters Huebner

Construction: PARIC Corporation



CONSTRUCTING CYCLOTRON TECHNOLOGY



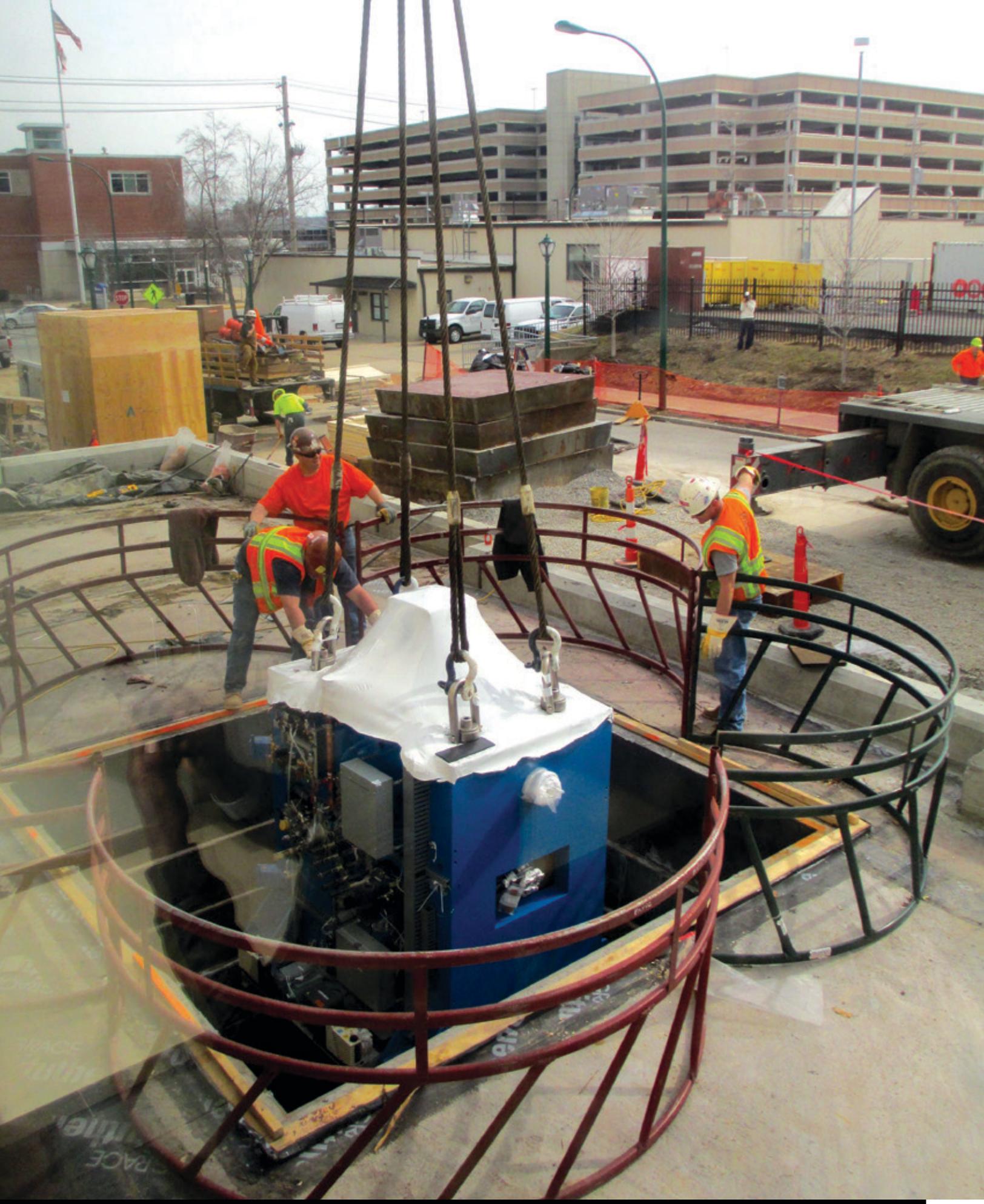


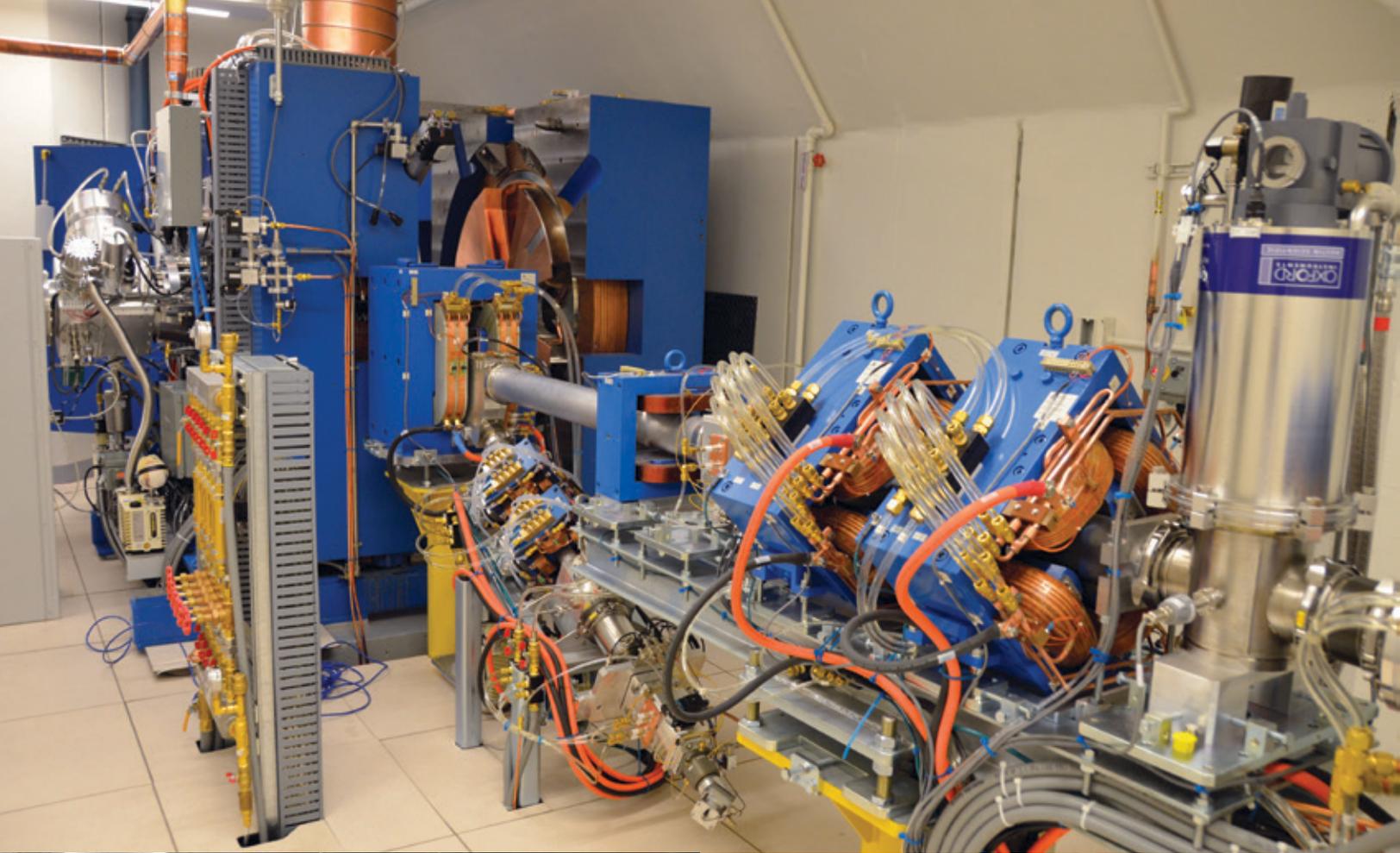
3,760,650 LBS
OF CONCRETE AND
52,000 LBS OF REBAR
were used to construct the vault, providing
shielding for the TR-19 cyclotron

9.5 TONS OF STEEL
was used to reinforce the building to support
264,334 LBS OF
LEAD SHIELDING in hot cells

50,000 LBS
is the weight of the cyclotron magnet

**FEBRUARY 22,
2014** WAS THE DAY
OF INSTALLATION
at Mallinckrodt Institute of Radiology





BIGGER, FASTER, AND BETTER —

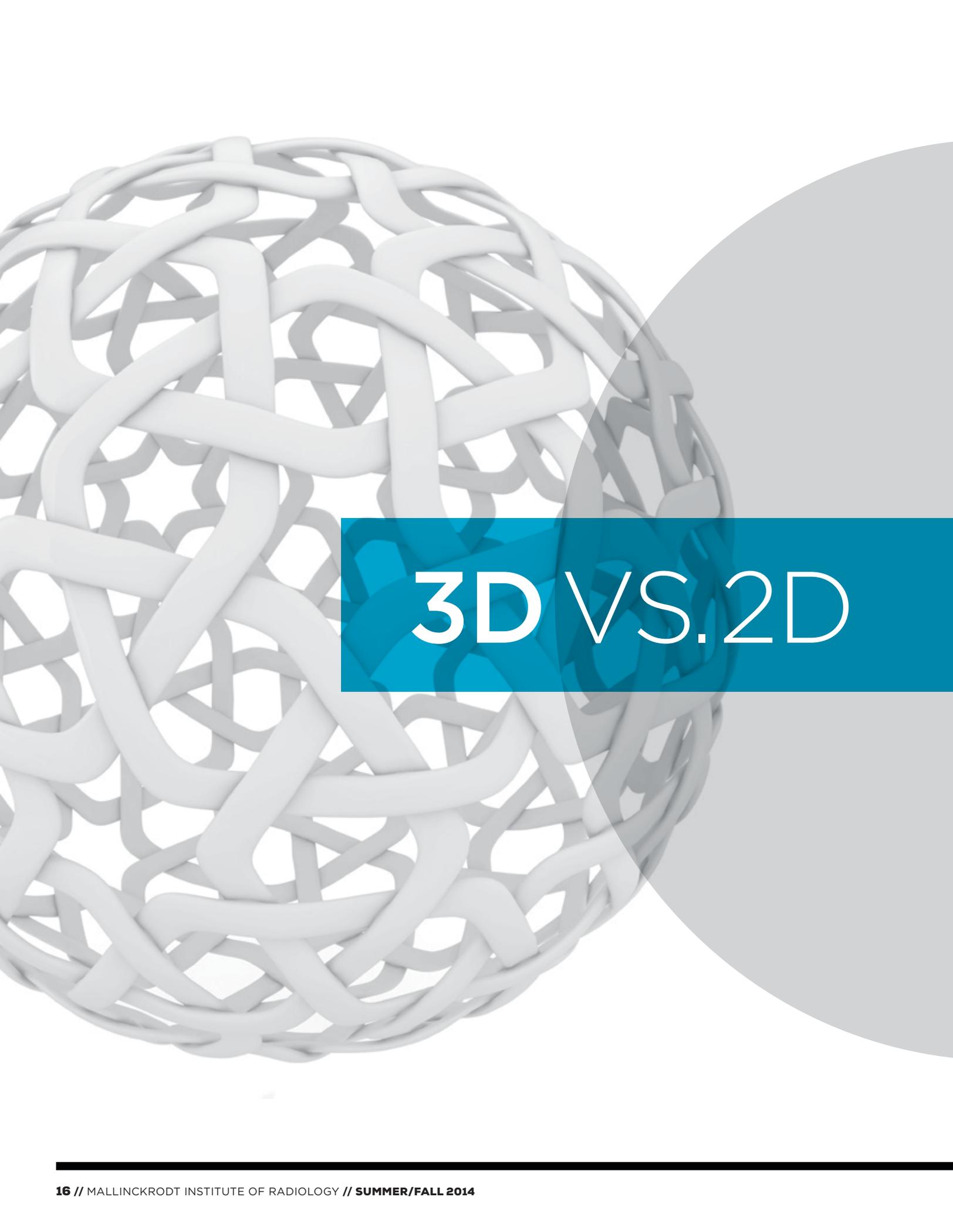
the new cyclotron and its corresponding GMP facility at Mallinckrodt Institute of Radiology provide safe, reliable, and high-quality production of radioactive compounds for use nationwide in both research and clinical practice

THREE YEARS AND \$13 MILLION DOLLARS

were the time and cost to complete this project

Pictured: The TR19/9 cyclotron (above left) and the Good Manufacturing Practice (GMP) facility





3D VS. 2D

THE BENEFITS — AND COSTS — OF TOMOSYNTHESIS

Nationally and internationally, research studies are signaling the benefits of digital breast tomosynthesis, an imaging technology that continues to gain traction as a new standard for breast cancer screening.

Often referred to as 3D mammography, tomosynthesis has the ability to image breast tissue from multiple angles and in sequential one-millimeter slices, providing radiologists with additional images that may result in fewer false positives (“false alarms”) and higher cancer detection rates than other methods. Breast specialists at Mallinckrodt Institute of Radiology are assessing tomosynthesis and its potential benefits to patients for both screening and diagnosis.

Mallinckrodt’s clinical researchers have been working with digital breast tomosynthesis since 2009. Washington University Medical Center served as a beta test site for the first breast tomosynthesis system, Hologic’s Selenia Dimensions®, which was approved by the FDA for clinical use in 2011. Today, more than 800 such systems are in operation in the United States.

“From the beginning, we recognized that tomosynthesis was a promising technology and an advance in breast imaging,” says Catherine M. Appleton, MD, assistant professor of radiology and chief of breast imaging at Mallinckrodt. “The key for us is to define which patients most benefit from this technology.”

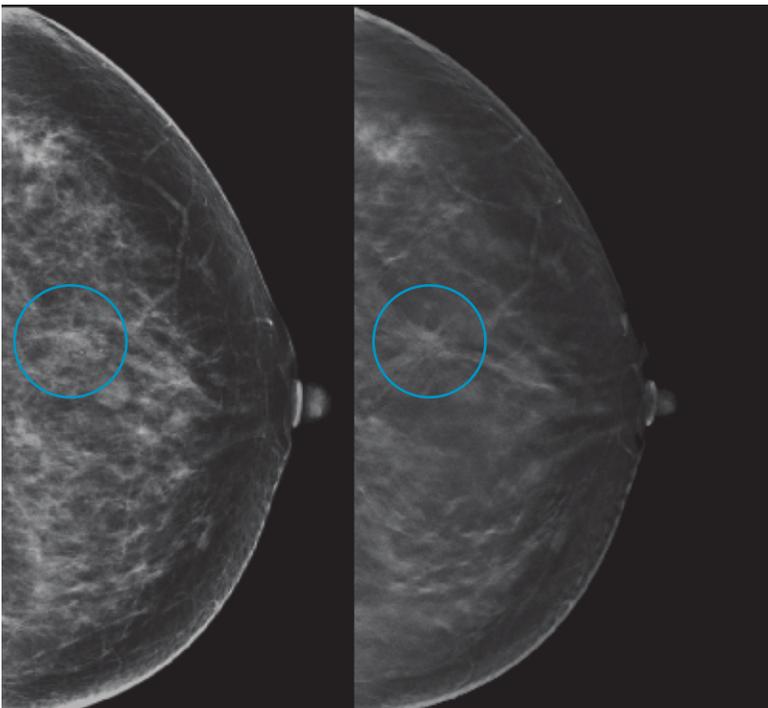
Earlier single-center studies of tomosynthesis highlight the technology’s ability to produce images of breast tissue in thin, sequential increments. Last December, a University of Pennsylvania study presented at the annual meeting of the Radiological Society of North America (RSNA) showed that, when compared to conventional 2D digital mammography, the average recall rate (the percentage of women called back for further evaluation) for women undergoing tomosynthesis decreased from 10.4 percent to 8.78 percent. At the

by Stephanie Stemmler

A wealth of detail
3D imaging enhances
understanding

same time, the cancer detection rate increased by 22.7 percent, including identification of invasive cancers.

Notably, this study also found that cancer detection improved in all tissue density categories, including very dense breast tissue. Typically, younger women have denser breast tissue than older women. Conventional digital mammography is not as effective at finding cancers in denser breast tissue because both dense tissue and cancerous tumors may have similar mammographic density. If tissue overlaps, it can obscure a tumor, resulting in a false negative.



Above: Breast imaging —2D (left), 3D (right) — with area of concern highlighted

Tomosynthesis, with its image-slicing ability, appears to decrease or, in some cases, eliminate this problem of superimposition. “The technology remains an exciting addition to the multi-modality approach we utilize in breast imaging at the Joanne Knight Breast Health Center,” says Appleton.

PATIENT SELECTION

Currently, tomosynthesis is typically used together with conventional 2D digital mammography. The combination allows radiologists to evaluate the tissue in each modality, but it also increases a woman’s exposure to radiation.

“Newer technology is being evaluated that would enable radiologists to create a 2D image from tomosynthesis imaging data,” says Susan O. Holley, MD, PhD, assistant professor of radiology. “If proven effective, this type of software enhancement could eliminate the need for both 2D and 3D imaging, and thus concern about radiation dose.”

Steven P. Poplack, MD, director of breast imaging at the Dartmouth-Hitchcock Medical Center in Lebanon, N.H., was among the initial investigators of tomosynthesis. He and his team have been studying the technology and its clinical applications for more than a decade. His conclusion: In general, tomosynthesis is a more accurate technology than traditional mammography but appears to have its greatest benefit in women with denser breast tissue.

“I’m a big proponent of using tomosynthesis, but I haven’t found it to be of added benefit in women with mostly fatty breasts,” says Poplack, the featured lecturer at Mallinckrodt’s 20th annual Hyman R. Senturia Lecture in April. In those cases, he says, 2D mammography remains appropriate.

Poplack also notes limitations with the use of tomosynthesis to characterize calcifications, small calcium deposits that are usually harmless but can be a sign of breast cancer. “In our early research, traditional mammography outperformed tomosynthesis in the assessment of calcifications,” he says. “As the tomosynthesis technology has matured, it has become more accurate in this regard, but at this point, 2D mammography is still the gold standard.”

OTHER COSTS

Mallinckrodt radiologists interpret more than 26,000 screening mammograms and 8,200 diagnostic mammograms annually. Over the past two and a half years, Appleton has overseen a transition in all of Mallinckrodt’s affiliated breast health centers (excluding the mobile mammography van) to enable digital breast tomosynthesis.

Marketing of tomosynthesis is on a rapid upswing across the country. Of particular concern with this heightened awareness is the potential for workflow issues due to the limited number of tomosynthesis systems in place and the number of patients requesting the procedure. In addition, radiological interpretation of tomosynthesis takes significantly longer.



Above: Catherine M. Appleton, MD // Tim Parker

“Evaluating a tomosynthesis exam takes roughly twice as long as a traditional 2D mammogram,” explains Holley. “As the benefits of tomosynthesis are being studied, the implementation into a successful workflow also needs to be evaluated.”

Last November, the Centers for Medicare & Medicaid Services recommended that tomosynthesis be included in the regular cost of mammography for Medicare patients. It remains to be seen if private insurers will follow suit. Currently at Washington University School of Medicine, patients who undergo combined 2D/3D breast mammography as part of their annual screening exam are not charged an additional fee for tomosynthesis.

“We offer tomosynthesis to women at the time of their annual screening mammogram,” says Holley. “Based on current knowledge and expert opinion, we recommend it for our higher-risk patients, including patients who already have had breast cancer, and women undergoing their baseline exam.”

Tomosynthesis clearly is an advancement in breast imaging technology and its impact already is being felt. Its return on cost and investment, however, still is not fully determined.

“Studies thus far have been very promising,” says Holley. “Digital breast tomosynthesis has great potential to improve performance of breast cancer screening. Although more research is needed to definitively establish the role of this technology, tomosynthesis has the potential to decrease breast cancer mortality and improve women’s health.” //

“From the beginning, we recognized that tomosynthesis was a promising technology and an advance in breast imaging. The key for us is to define which patients most benefit from this technology.”

— Catherine M. Appleton, MD, assistant professor of radiology and chief of breast imaging at Mallinckrodt

A PATH FOR MEASURING SUCCESS

by Mary Jo Blackwood, RN, MPH

ONE-TO-ONE COMPARISON IS CRITICAL IN CANCER IMAGING

For physicians who treat cancer and their patients, accurately measuring the effectiveness of a therapy is crucial: It can mean the difference between continuing a futile treatment or switching to a more productive one that might save or prolong the patient's life. Performing careful assessments of response is an important part of the treatment.

Measuring changes in tumor size is one significant part of response assessment. Tracking changes in tumor function is another. The Imaging and Response Assessment Core (IRAC) — a team of investigators from Mallinckrodt Institute of Radiology — provides analyses for both conventional and functional imaging in cancer clinical trials.

Using standardized protocols, the researchers determine when a treatment is working and quickly translate those findings to ensure that patients with cancer receive the most effective care.

Determining how well drugs are working during cancer clinical trials requires consistent, reproducible data. "The precision IRAC promulgates is important," says Marilyn J. Siegel, MD, co-director of the IRAC and professor of radiology and of pediatrics, "because measurements can affect whether or not a patient stays on a trial. Having objective criteria creates consistent measurements to gauge response to anti-cancer therapy."

Concerns such as these are what led to the IRAC's development in 2005. Funded as a supplement to the National Cancer Institute (NCI) cancer center support grant to the Alvin J. Siteman Cancer Center — a joint

effort of Barnes-Jewish Hospital and Washington University School of Medicine — the IRAC focuses on fast, accurate and reproducible assessment of imaging-based measurements in clinical cancer research. It was one of eight such centers initially funded by the NCI.

Delivery of its services through a shared resource plays an important role in testing new treatments for cancer, says Barry A. Siegel, MD, director of the Division of Nuclear Medicine and co-director of the IRAC. He notes that the IRAC contributes to the Siteman Cancer Center's overall goals by aiding with protocol development, ensuring that imaging within trials is done properly, and providing quantitative tumor response measurements using CT, MRI, nuclear medicine imaging technologies and, most recently, combined PET/MRI. The IRAC gives priority to institutional trials conducted by Siteman Cancer Center members, but also provides services for NCI National Clinical Trials Network trials and industry-sponsored oncology trials at Siteman.

The IRAC focuses on increasing the impact that quantitative imaging plays in cancer research by educating investigators about effective imaging in cancer research, providing a coordinated service for measuring tumor response, and incorporating structural and functional imaging into therapeutic trials. Advanced data analysis services also are supported by the IRAC.

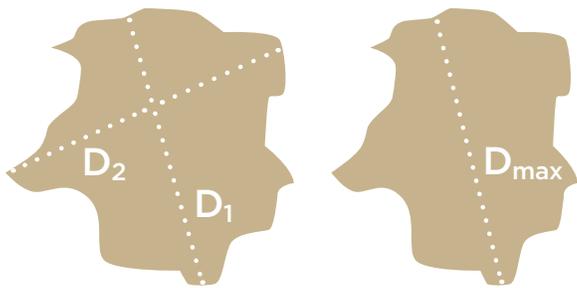
"Before the IRAC was established, we were relying on standard radiology reports," says Brian A. Van Tine, MD, PhD, assistant professor of medicine and a regular user of the IRAC's services in his study of rare tumor sarcomas. "Having a central radiology review — the same radiologists looking at the same lesions in the same way — is of the utmost importance; it improves the quality of clinical trials done at Washington University School of Medicine. In the end, it's all about getting the best results for our patients."

As the primary radiologist for CT- and MRI-based assessments, Marilyn Siegel is responsible for consultations with Siteman Cancer Center investigators. She helped to establish the IRAC tumor measurement infrastructure and oversees implementing and evaluating new imaging software and its applications in future tumor-based imaging.

Barry Siegel oversees the clinical trial services and assessments based on PET and other radionuclide imaging techniques. Critical to that effort was the 2009 installation of a new PET/MRI scanner. Facilitating studies performed on this scanner that address Siteman Cancer Center research interests is a top priority for him.

EVOLUTION OF TUMOR RESPONSE CRITERIA

The World Health Organization (WHO) issued the first version of tumor response criteria in the 1970s. Assessment of tumor burden — the number of cancer cells, size of a tumor, or amount of cancer in the body — was based on the sum of the product of the two longest perpendicular diameters ($D_1 \times D_2$) of tumors seen by imaging, referred to as target lesions. A positive response was defined as a 50 percent reduction in that number, a standard still used today for measuring lymphoma lesions.



In 2000, a new set of tumor criteria, the Response Evaluation Criteria in Solid Tumors (RECIST), was published by an international collaboration including the NCI, the European Organisation for Research and Treatment of Cancer (EORTC), and the National Cancer Institute of Canada Clinical Trials Group. The new standards were designed for determining objective response in clinical trials and employed only one measurement — the longest diameter of each tumor (D_{max}).

RECIST 1.1, based on an analysis of more than 6,500 patients with more than 18,000 target lesions, was implemented in 2009. It is now the standard for solid tumor trials. In this newest version, the measurement is the sum of the longest diameters of up to five target lesions.

In RECIST 1.1, categories of response to treatment are defined as:

- > **CR (complete response):**
disappearance of all lesions
- > **PR (partial response):**
greater than 30 percent decrease in size of the sum of unidimensional lesion diameters
- > **PD (progressive disease):**
at least 20 percent increase in lesion size over lowest measurement or new lesions
- > **SD (stable disease):** Neither PR nor PD

With greater understanding of tumor biology over the last 10 years, cancer therapies have become more personalized. Some targeted chemotherapies interfere with specific molecules that promote tumor growth or the development of tumor blood vessels, so tumor necrosis can precede changes in tumor size. Thus, drugs may have effects not easily measured by size-based criteria and additional measurements may be necessary (for example, changes in tumor density or degree of contrast enhancement).

Another important approach to tumor-response measurement evaluation comes from standardized imaging of tumor metabolic activity using positron emission tomography (PET). With PET, changes in tracer uptake over time are measured rather than changes in size. Although tumor glucose metabolism is the most common functional assessment made by PET, many other biochemical and physiologic processes can be measured to monitor tumor response to treatment, or to predict the likelihood of response.

An example of the latter is the use of PET with radiolabeled estrogen to predict whether a breast cancer will respond to hormone therapy. “For trial eligibility, if we can see there is no uptake of the tracer by the tumor, that patient doesn’t belong in the trial,” explains Barry Siegel. “For patients in therapy trials, our goal is earlier detection of changes in tumor metabolism even before changes in size are evident so we can promptly decide whether the treatment is working.”

WHAT’S NEXT FOR THE IRAC?

Since pilot-scale activities began in 2006, the IRAC has gone from performing approximately 100 WHO/RECIST measurements annually for just three Siteman Cancer Center investigators to nearly 2,700 measurements for 44 investigators in 2013. Turnaround time to generate final tumor response reports is approximately one day, and several additional radiologists now provide IRAC services to meet the increasing demand.

In the future, IRAC radiologists will investigate new software tools for image evaluation, improve turnaround time and data-sharing capabilities, and integrate new, advanced analysis methods, such as tumor volumetric measurement and the latest PET radiopharmaceuticals.

Because most tumors are irregularly sized, the IRAC radiologists hope to move beyond simple, one-dimensional measurements to fully outlining lesion borders in three dimensions yielding measurements of tumor volume.

Another important focus is to facilitate Siteman Cancer Center studies performed on the new PET/MRI scanner, which has been used to great success in several research projects and recently began use for routine clinical studies. Two recently initiated institutional trials — one that will use PET/MRI for assessment of response to chemoradiation of locally advanced rectal cancer and the other a study of chemotherapy in pancreatic cancer — are already underway. █

Examples of completed IRAC projects

Use of fluorodeoxyglucose (FDG-PET) for early assessment of response to cetuximab therapy for cervical cancer and head and neck cancer

Comparison of FDG-PET and diffusion-weighted MRI for early response assessment in diffuse large B-cell lymphoma

F-18 fluorothymidine-PET for early assessment of response to chemoradiation of rectal, cervical, and lung cancers

Use of labeled monoclonal antibodies to study HER2 receptor status in breast cancer and CD30 receptor status in Hodgkin lymphoma and anaplastic large cell lymphoma

Below: Marilyn J. Siegel, MD, co-director of the IRAC and professor of radiology and of pediatrics



ALUMNI SPOTLIGHT

by Kristin Baird Rattini

CYNTHIA K. RIGSBY, MD, FACR, is a professor of radiology and of pediatrics at Northwestern University's Feinberg School of Medicine and a pediatric radiologist at the Ann & Robert H. Lurie Children's Hospital of Chicago (formerly Children's Memorial Hospital). Rigsby serves as vice chair of the hospital's Department of Medical Imaging and as division head of body imaging. Inspired by the instruction she received at Mallinckrodt Institute of Radiology during her own residency, Rigsby now uses emerging technology to prepare her own program's residents for their board exams.



Above: Cynthia K. Rigsby, MD, FACR, with a young patient

What is your day-to-day work life like at Lurie Children's?

It's really day-to-day and sometimes hour-to-hour. One-third to one-half of my time is spent doing pediatric cardiac imaging, another 20 to 30 percent is devoted to other pediatric radiology. About 10 to 15 percent is administrative time; two areas of focus are overseeing our body imaging protocols and building specialty areas within the body imaging division. My remaining time is spent on research.

Tell us about the new technology that you're using with residents.

The American Board of Radiology has changed its board exam from an oral format to a multiple-choice, computer-based exam. This computer-based exam is very different from communicating with someone in person, so we wanted to prepare residents for the new format. I'm using freeware called Socratic, a web-based program that lets you build multiple-choice questions. With a case-based discussion in front of them, the residents log in with their mobile devices and have questions fed to them. They

answer and receive immediate feedback, which is nice, and the interactive format helps keep the residents engaged! The program tallies the answers; as an instructor you can see which questions residents had trouble with. You can then use that information to fine-tune your own teaching.

Beyond clinical care and administrative duties, what are your research interests?

My clinical and research interests are in pediatric body imaging, especially CT and MRI, with a specialty interest in cardiovascular imaging. Right now, we have a five-year NIH grant to study functional 4D flow MRI in congenital heart disease. We add live blood flow to a 3D model of the heart to visualize the blood flow within the cardiovascular system. This MRI tool provides imaging information that can't be created any other way.

Last year you were invited back to Mallinckrodt as a visiting professor. How was that experience?

The medical complex has grown enough that I had a hard time getting my bearings! I spent time with Mallinckrodt faculty at St. Louis Children's Hospital. I also gave a lecture to residents on coronary artery imaging and used the Socratic software to show them some cases. I remember enjoying lectures given by visiting professors when I was a resident, so I was proud to have been asked to come back as one.

Who at Mallinckrodt left the greatest impression upon you?

I was attracted to pediatric radiology because of the role models at Mallinckrodt. Marilyn Siegel is the person I wrote my first paper with — a great experience to have as a resident. William McAlister was chief of the section at that time. During case conferences, it was hard to show an unknown case to him that he couldn't solve. Gary Shackelford was our Teacher of the Year when I was a senior resident, so obviously he influenced many people in our class — always going the extra step to

CAREER PROFILE

CYNTHIA K. RIGSBY, MD, FACR

1996 // Pediatric Radiology Fellow

Children's Hospital Medical Center,
Cincinnati, Ohio

**1995 // Diagnostic Radiology Resident
Mallinckrodt Institute of Radiology,
Washington University School
of Medicine**

1991 // Medical Intern

University of North Carolina Hospitals

2000 // Medical Intern

Feinberg School of Medicine,
Northwestern Memorial Hospital

1990 // MD

Duke University School of Medicine

1986 // BA

Duke University

teach us what we needed to learn, not only at the view box, but with procedures and ensuring we had the materials we needed. Tom Herman was an excellent clinician.

Does your time at Mallinckrodt continue to play a role in your professional life today?

Everybody's roots are in their residency program; it all starts there. At Mallinckrodt, I gained a thirst for knowledge and the desire to teach. We have to pass on the knowledge we have to our trainees. I had a wonderful mentoring program available at Mallinckrodt; I've tried to utilize that to figure out how I can mentor others.

You've been at Northwestern since 1999, but Lurie Children's just reopened with a new name and facility two years ago. How has the transition been?

It's just wonderful. We have bright new private rooms for all patients, with beautiful views of Lake Michigan. We have a state-of-the-art building with all the equipment in imaging we could ever want; I'm like a kid in a candy store. I still can't believe that when I come to work every day I'm right off Michigan Avenue, and I do a job that I love. Every day I learn something, and I come to work excited about taking care of kids.

You've also been credited on several shark research papers. How did that come about?

Years ago I held a joint birthday party for my younger daughter and a kindergarten classmate whose father is a paleontologist specializing in lamniform sharks. He was looking for someone to perform CT scans on a set of rock fossils that were millions of years old, as well as on shark specimens from around the world. So over a couple of weekends we scanned more than 30 shark specimens, including a great white shark head. To this day, he and his colleagues are working with the scans of those specimens to sort out all the findings.

What are your interests outside of radiology?

My rare spare time I spend at home with my husband, Michael, and our two daughters: Devyn, 18, and Kristen, 14. I enjoy gardening, and our home was part of the garden walk in our community this year. I was so excited about that; I felt very proud to have my work on display.

Right: Rigsby tending her home garden



IN MEMORY



Above: Louis A. Gilula, MD

Louis A. Gilula, MD, 71, a faculty member at Washington University School of Medicine for more than 30 years, died July 2, 2014, of pancreatic cancer.

A founder and longtime leader of the musculoskeletal section at the school's Mallinckrodt Institute of Radiology. Gilula was a professor of radiology, orthopaedics and of plastic and reconstructive surgery when he retired in October 2013.

Gilula was known internationally for his expertise in wrist imaging, and he authored one of the major texts on the subject. He also was a pioneer in pain management, offering patients therapeutic spine injections before they became commonplace.

"He was a giant in the field who cared deeply about patient care and teaching," says David A. Rubin, MD, Gilula's successor as director of musculoskeletal imaging. "There are radiologic landmarks known

as 'Gilula's arcs' that we still use today to assess wrist alignment."

A native of Lubbock, Texas, Gilula earned his medical degree at the University of Illinois School of Medicine in 1967. After internships and residencies at San Francisco General Hospital, Dewitt Army Hospital in Fort Belvoir, Va., and Max C. Starkloff Memorial Hospital in St. Louis, he became an instructor in radiology at Washington University School of Medicine in 1973.

Gilula regularly appeared in *Best Doctors in America*,[®] an annual list that identifies specialists considered by fellow physicians to be the most skilled in their fields and the most qualified to review and treat complex medical conditions.

Gilula's honors included fellowship in the American College of Radiology. Students and residents at MIR gave him the institute's Distinguished Teacher of

"Dr. Gilula taught his students with infinite patience, unending enthusiasm, and just enough humor and humility."

the Year Award in 2008 and 2009 and named him Teacher of the Year in 2010.

"Dr. Gilula taught his students with infinite patience, unending enthusiasm, and just enough humor and humility," Rubin says.

Gilula is survived by his wife, Deborah; son, Ian; daughter, Tanya; sister, Joan; and brothers Norton, Stanley, Stephen, and Mark. A memorial service was held July 6 at Congregation Shaare Emeth in St. Louis.

Memorial donations may be made to the Rik Knopf Fund for Pancreatic Cancer Research at Washington University, Campus Box 1204, 7425 Forsyth Blvd., Ste. 2200, St. Louis, MO 63105, or to the St. Louis Holocaust Museum and Learning Center, 12 Millstone Campus Dr., St. Louis, MO 63146.

LECTURES

Colin P. Derdeyn, MD, assistant professor of radiology and professor of radiology, neurology, and neurological surgery, presented “In Memorium: William Young, MD” at the International Stroke Conference in San Diego, Calif., on February 12, 2014. At the American Society of Neuroradiology annual meeting held in Montreal, Canada, on May 17-22, 2014, he gave two talks: “Clinical Relevance of Cerebrovascular Reserve Mapping” and “Current Indications for Intracranial Stenting.” He lectured on “Current Treatment for Intracranial Aneurysms” twice: at Southwest Medical Group in St. Louis, Mo., on May 5, 2014, and at Poplar Bluff Regional Medical Center in Poplar Bluff, Mo., on June 12, 2014.

Robert J. Gropler, MD, professor of radiology, medicine, and of biomedical engineering, presented “What’s Brewing in PET/CT: Cardiovascular Sciences” at the 2014 annual meeting of the Society of Nuclear Medicine and Molecular Imaging (SNMMI) held in St. Louis June 7-11, 2014. He also presented “Integrated Analysis of Atherosclerotic Plaques by Hybrid PET/MR,” “The Importance of Laboratory Accreditation for Ensuring Quality in Nuclear Cardiology,” “The Role of Imaging in Characterizing Sex-differences in the Myocardial Metabolic-functional Relationship,” and “Overview of Radionuclide Heart Failure Imaging: Selection of Imaging Procedures and Potential New Imaging Targets,” at the event. He served as moderator at two presentations: “Updates on New Myocardial Targets, Tracers, and Techniques” and “Vascular Imaging.”

Charles F. Hildebolt, PhD, professor of radiology and adjunct professor of anthropology, presented the keynote address, “Human Evolution: Bones and

Teeth of Contentment” at the Rolanette and Berdon Lawrence Bone Disease Program of Texas Annual Scientific Retreat and Research Award Competition on June 27, 2014, in Houston, Texas. The program operates under the auspices of MD Anderson Cancer Center and Baylor College of Medicine.

Rebecca L. Hulett, MD, assistant professor of radiology, was an RSNA visiting professor at Stellenbosch University in Cape Town, South Africa, from August 4-18, 2014. While there, she presented lectures and conducted teaching sessions on various topics in pediatric radiology.

Suzanne E. Lapi, PhD, assistant professor of radiology, gave a lecture titled “Imaging of GLP1-R for Assessment of Pancreatic Beta Cell Mass” at the 2014 annual meeting of the Society of Nuclear Medicine and Molecular Imaging (SNMMI) held in St. Louis June 7-11, 2014.

Michelle M. Miller-Thomas, MD, assistant professor of radiology, presented “CT and MR Review of Neuroradiology” at the 2014 annual meeting of the Society of Nuclear Medicine and Molecular Imaging (SNMMI) held in St. Louis June 7-11, 2014.

Koresh I. Shoghi, PhD, assistant professor of radiology, presented “‘Systems Imaging’ of Diabetes” at the 2014 annual meeting of the Society of Nuclear Medicine and Molecular Imaging (SNMMI) held in St. Louis June 7-11, 2014.

Marilyn J. Siegel, MD, professor of radiology, was a visiting professor of radiology at the Royal Hospital in Muscat, Oman, April 7-9, 2014. She presented lectures on a variety of topics: lung

diseases in neonates, congenital lung malformations, neonatal head ultrasound, mediastinal vascular anomalies, acute pediatric abdomen, congenital heart disease: CT and MRI, CT radiation issues, and pediatric renal, adrenal, and liver tumors. She attended “CT Boot Camp 2014: Principles, Pearls and Protocols” from June 26-29, 2014, in Las Vegas, Nevada, where she gave four talks on computed tomography (CT). She also attended “Updates in Oncology: Imaging and Therapy,” on a Baltic cruise from July 20-31, 2014, during which she gave seven talks: assessing response to therapy: RECIST 1.0 and 1.1, MRI methods of assessing tumor response to therapy, CT of lung cancer, pancreatic tumors: imaging evaluation, imaging of primary hepatic tumors, CT and cancer risks, and common pediatric tumors.

Jinbin Xu, PhD, instructor in radiology, presented the keynote lecture, “Imaging Neuroinflammation in the CNS Disorders,” at the Seminar of Tumor Signature and Nuclear Medicine Theranostics held April 19, 2014, in Nanjing, China. He also gave a visiting professor lecture, “Development of PET Agents for Oncology and Neurology Imaging,” at Xinxiang Medical University in Henan, China, on April 24, 2014.

Dmitriy A. Yablonskiy, PhD, professor of radiology and adjunct professor of physics, presented “How Magnetic Susceptibility Affects MR Signal Phase in Biological Tissues” at the Cross Cutting and Emerging Technologies course and “Modeling Tissue Microstructure & Morphology (Lung)” at the Quantitative Imaging and Modeling course offered at the 2014 International Society for Magnetic Resonance in Medicine (ISMRM) annual meeting held in Milan, Italy, on May 10-16, 2014.

IN FOCUS: INTERNATIONAL APPROACH TO NUCLEAR MEDICINE



Above: Carmen S. Dence, MS, center, with visiting students Juan Carlos Manrique from Mexico (left) and Pablo Buccino from Uruguay (right)

When Carmen S. Dence, MS, travels to South America, it's not just to visit family and friends in her Caribbean coastal hometown of Barranquilla, Colombia. The associate professor of radiology is a passionate advocate for advancing nuclear medicine in Latin American countries. Through her association with the International Atomic Energy Agency (IAEA), Dence has delivered lectures at scientific conferences and universities in South America and, upon invitation, has visited medical centers to evaluate their nuclear medicine processes.

"It's a labor of love," says Dence, associate professor of radiology, who became involved in IAEA in 2007 as a liaison with its technical cooperation program. The program's mission is to "build, strengthen and maintain capacities in the safe, peaceful and secure use of nuclear technology in support of sustainable socioeconomic development." Approximately 160 countries are members, including almost all those in Latin America.

Since becoming involved with IAEA, Dence has been an unofficial "ambassador" for Mallinckrodt Institute of Radiology, extolling the faculty's interests and areas of expertise. In the process, she captured the attention of five South American scientists who sought and received additional training at Mallinckrodt. The most recent student arrived in late August from São Paulo, Brazil.

Dence wants — and expects — more South American scientists to travel to St. Louis and Mallinckrodt to observe and learn.

Stateside, Dence develops custom radiopharmaceuticals for investigators who use positron emission tomography (PET) imaging in their research. She

is part of Mallinckrodt's Radiological Chemistry and Imaging Laboratory, which investigates disease stages at a molecular level. "It just seemed natural to apply my pharmacy and organic chemistry background and be part of such a team," Dence says. She has been with the medical school since 1978.

Over the past seven years, Dence has made seven trips to South America. Each trip lasts about a week and may include training students — chemists, pharmacists, medical doctors, administrators and regulatory agency representatives — in a lecture hall or on site. She works with other IAEA professionals from across the globe.

The most rewarding aspect of her travels is the one-to-one interaction with South American colleagues. "I observe their challenges to advance PET techniques and offer my help — at the bench if necessary — and evaluate their standard operating procedures," she says. Dence also gets the opportunity to work with some of the continent's brightest students.

"Traditional nuclear medicine has been an integral part of patient care in some South American countries, such as Argentina and Brazil," explains Dence. "In other countries, such as Uruguay and Chile, the growth and level of expertise has been dramatic. Colombia is on the rise and trying diligently to overcome barriers to expand nuclear medicine research. For the continent in general, there is still a long way to go due to the expensive nature of new modalities, the need to prepare scientific personnel, and the lifting of fear and misinformation in the general public and regulatory agencies that words such as 'radioactividad'

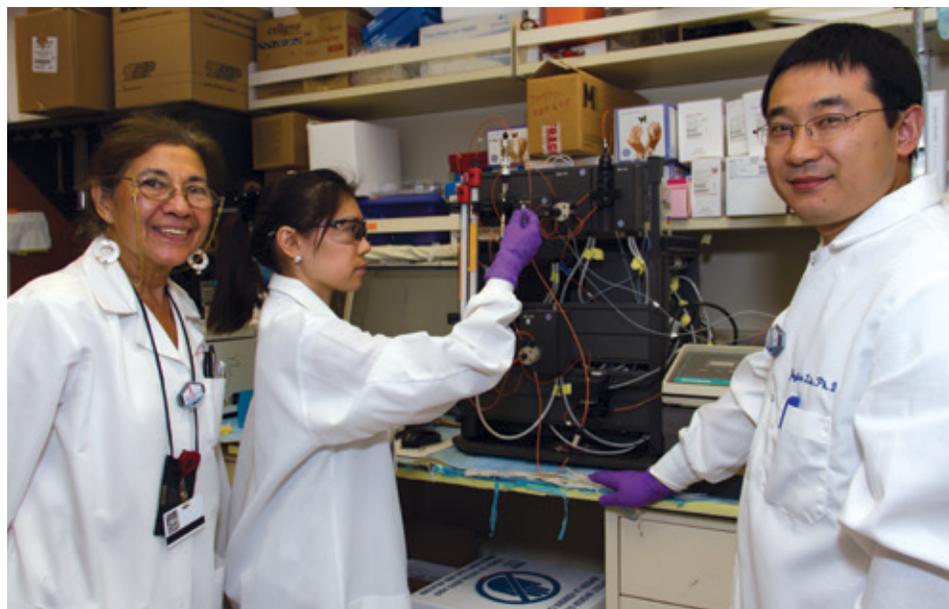
(radioactivity) bring to mind."

In addition to her native Colombia, Dence's travels have taken her to Argentina, Brazil, and Uruguay. While in Argentina, she was instrumental in training more than 150 students from several Latin American countries.

"We tried to turn as many students into experts as we could in the days we had," Dence says. In Brazil, she was able to help in training at two nuclear medical centers in São Paulo and Porto Alegre, and the University of São Paulo has invited her to participate in its 2015 nuclear medicine symposium.

It's all part of a vision Dence has to make Mallinckrodt a casting center for talent in Latin America: "As we advance the imaging field, may we not forget to involve our close neighbors and young scientists from developing countries to train and learn from us here at MIR, sharing our resources for the benefit of patient care."

— Mary Konroy & Stephanie Kolisch



Above: Dence, with Soraya Kazuma from the University of São Paulo and her mentor Yongjian Liu, assistant professor of radiology

GRANTS

Colin P. Derdeyn, MD, professor of radiology, neurology, and neurological surgery, is co-investigator on a Washington University subcontract for “Rapid, Robust and Non-invasive Cerebral Oxygenation Measurements using MRI” (PI Hongyu An, UNC) and for “Development of MRI-based Cerebral Oxygen Extraction Fraction” (PI Tim Carroll, Northwestern University).

Nael E. A. Saad, MD, assistant professor of radiology and of surgery, received a one-year, \$50,000 Research Development Award from the Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine for “4D Phase Contrast MR: Validation and Evaluation of Hypertrophy in Liver Cancer.

Dmitriy A. Yablonskiy, PhD, professor of radiology and adjunct professor of physics, received a one-year, \$50,000 grant from Washington University’s Institute of Clinical and Translational Sciences for “Quantitative Evaluation of Changes in the AD Brain using Advanced MRI.” **Marcus E. Raichle, MD, Tammie S. Benzinger, MD, PhD**, and **Yue Zhao, PhD**, are collaborators on the project.

APPOINTMENTS

Adam Q. Bauer, PhD
Instructor in Radiology

Adam T. Eggebrecht, PhD
Instructor in Radiology

Kirk E. Smith, BS
Instructor in Radiology

Malcolm Tobias, PhD
Instructor in Radiology

ELECTIONS

Dmitriy A. Yablonskiy, PhD, professor of radiology and adjunct professor of physics, was named a fellow by the Society for Magnetic Resonance in Medicine for contributions to the field and the society.

OUTSTANDING TEACHER

Mallinckrodt residents named Vincent M. Mellnick, MD, as the 2014 Teacher of the Year at the residency program’s annual end-of-the-year dinner. Mellnick, assistant professor in abdominal imaging, also is co-director of emergency radiology and of body computed tomography. This year’s distinguished teachers, also announced at the event, are: Sanjeev Bhalla, MD (cardiothoracic), Franz J. Wippold, MD (neuroradiology), Matthew S. Parsons, MD (neuroradiology), and Jonathan C. Baker, MD (musculoskeletal).



Above: Vincent M. Mellnick, MD, with R. Gilbert Jost, MD

ARTISTIC AVOCATION

Jerold W. Wallis, MD, associate professor of radiology (nuclear medicine) and of biomedical engineering, started working with stained glass in 1985. He became interested in glassblowing in 2006 and took four semesters of glassblowing courses (through Washington University’s University College) at the Third Degree Glass Factory in University City. He regularly rents studio time there, where he can focus on projects that are entirely different from his work at Mallinckrodt. “When you’re working with 2,000-degree glass, you are thinking only of the project at hand,” says Wallis.



Above: Jerold W. Wallis, MD

IN FOCUS: A PASSION FOR PIZZA

By day, Nael E. A. Saad, MD, treats patients with portal hypertension and liver tumors, threading tiny catheters into malignant tissue. At night, and during the weekend, the Mallinckrodt Institute of Radiology interventional radiologist can be found five miles away, tapping beer kegs, repairing an industrial icemaker, or developing employee schedules with Excel spreadsheets. That work is part of his after-hours duties as an owner of a new, Neapolitan-style pizzeria in Maplewood called “A Pizza Story.”

“It’s a lot of work,” says Saad, an assistant professor of radiology and of surgery. But he is not alone. He shares the load of running the business with two partners: Muhammad Alhawagri, a former research technician in Washington University School of Medicine’s Department of Orthopaedic Surgery, and Sherif Nasser, an assistant professor of marketing at the university’s Olin Business School. One of them is always present during business hours.

The pizzeria began as many enterprises do: as a conversation among friends. The three food aficionados explored their options and found an empty retail space in downtown Maplewood. It took six months to convert the former typewriter store into a pizzeria complete with a wood-burning oven. The hand-assembled oven makes the Neapolitan pizza, well, Neapolitan. “It’s the way the oven cooks,” says Saad.

Alhawagri and Nasser occasionally contribute to cooking the pizzas, alongside their chef. Saad takes the late shift but does not cook. He performs more of the management and HR duties, like hiring and training staff and monitoring business operations. But he also handles

the occasional maintenance issue such as why beer stopped dispensing one evening: The kegs were full. Upon examination, Saad, who is listed as one of the *Best Doctors in America*,[®] discovered that the CO₂ tanks were the problem. He made the repair on-site. “Every day there is a new thing,” says Saad. “It’s been a process.”

So what’s the connection between medicine and the restaurant business?

“There are things I’ve learned in medicine that have helped with the restaurant. A lot of it is basically not panicking when the unexpected occurs,” says Saad. “Think about the problem. Then fix it. I’m trained to handle things as they happen.” – *Mary Konroy* ■■■



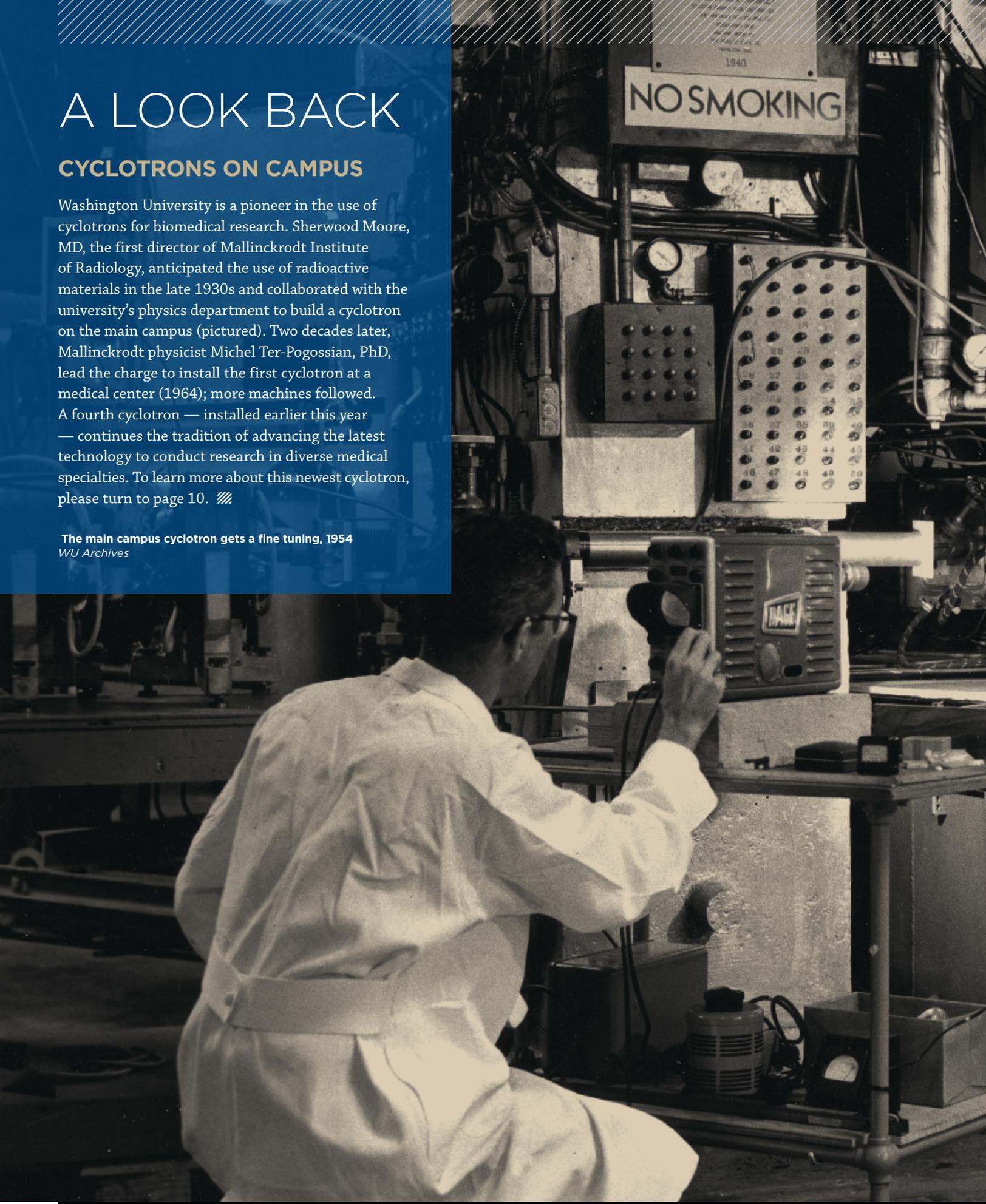
Above: Nael E. A. Saad, MD

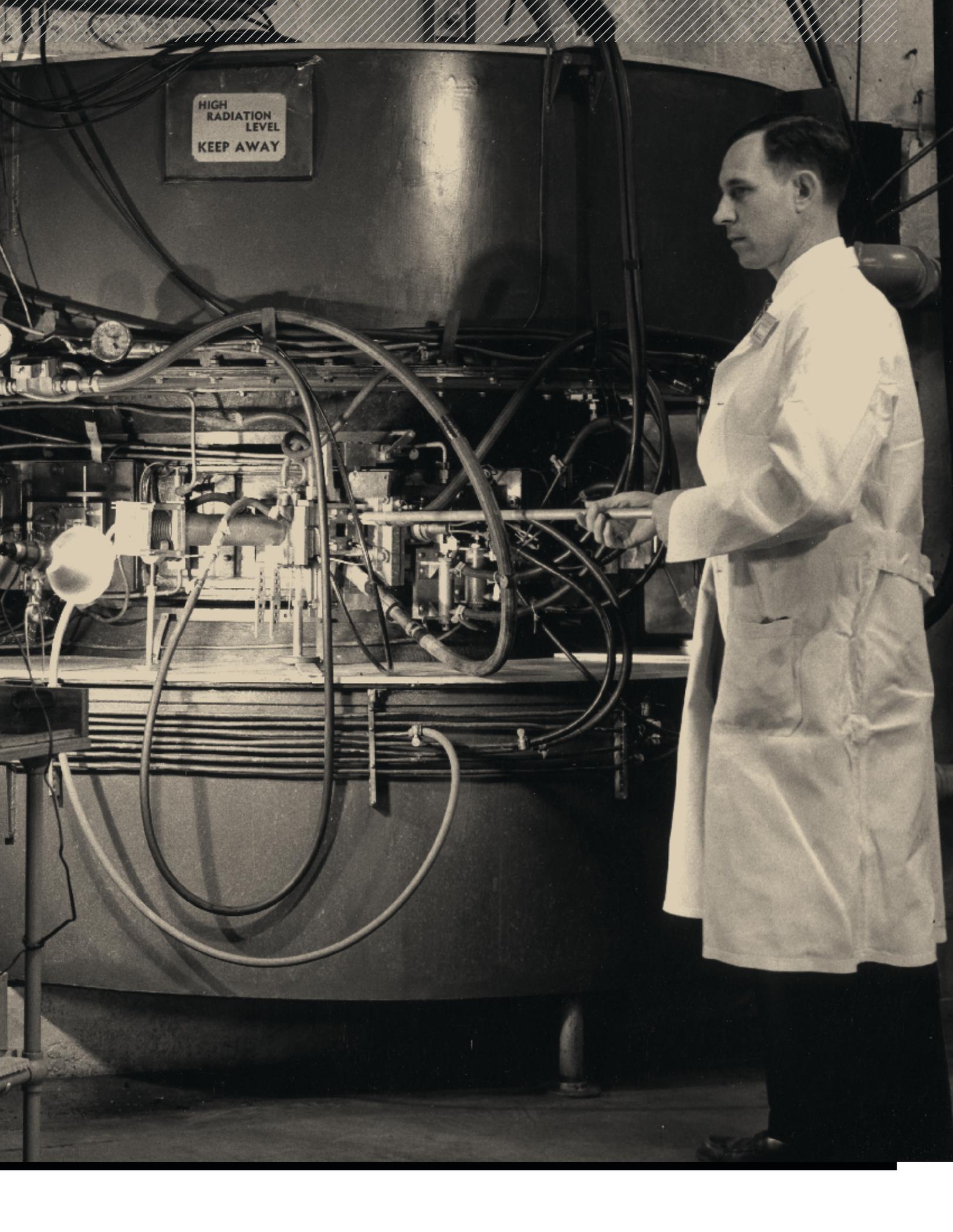
A LOOK BACK

CYCLOTRONS ON CAMPUS

Washington University is a pioneer in the use of cyclotrons for biomedical research. Sherwood Moore, MD, the first director of Mallinckrodt Institute of Radiology, anticipated the use of radioactive materials in the late 1930s and collaborated with the university's physics department to build a cyclotron on the main campus (pictured). Two decades later, Mallinckrodt physicist Michel Ter-Pogossian, PhD, lead the charge to install the first cyclotron at a medical center (1964); more machines followed. A fourth cyclotron — installed earlier this year — continues the tradition of advancing the latest technology to conduct research in diverse medical specialties. To learn more about this newest cyclotron, please turn to page 10. //

The main campus cyclotron gets a fine tuning, 1954
WU Archives





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RADIATION
LEVEL
KEEP AWAY

FOCAL SPOT

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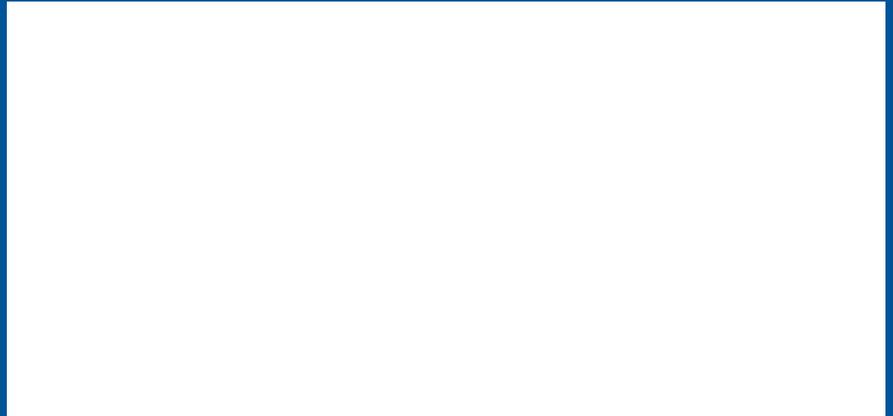
Address Service Requested

 Washington
University in St. Louis
SCHOOL OF MEDICINE

MIR Mallinckrodt Institute
of Radiology

Campus Box 8131
660 S. Euclid Avenue
St. Louis, MO 63110

mir.wustl.edu



Below: Blown glass created by Jerold W. Wallis, MD, associate professor of radiology (nuclear medicine) and of biomedical engineering, was on display at Washington University's Farrell Learning and Teaching Center throughout the summer. The exhibit — Wallis' first — was launched with an opening reception on May 28, 2014.

To learn more about Wallis and his art, please turn to page 30.

