STUDIES

EXPLORING THE BENEFITS OF A GOOD NIGHT’S SLEEP
That’s Doctor Barry Siegel’s photo on the banner above the entrance to the exhibit areas at the 95th Annual Meeting of the Radiological Society of North America. Turn to page 4 for more information about MIR’s participation at RSNA.

Photograph by MIR Photography Lab.
RSNA 2009: Quality Counts
MIR faculty and staff were among the 60,000 attendees who participated in the Radiological Society of North America’s 95th annual meeting in Chicago.

Pipeline Embolization Device—Treating Brain Aneurysms
Physicians at Washington University and Mallinckrodt Institute are participating in a study involving endovascular technology that has shown impressive preliminary results.

Exploring the Benefits of a Good Night’s Sleep
Scientists in the Institute’s EON Lab have launched two studies that compare brain activity and declarative learning before and after a good night’s sleep.

Targeting Cervical Cancer
Radiation oncologists and nuclear medicine physicians use PET and IMRT to improve survival rates and to lessen complications for women with cervical cancer.

2009 MIR Research Poster Session
The Division of Radiological Sciences hosts the second annual poster exposition highlighting imaging research.

ON THE COVER Scientist Linda Larson-Prior uses electrical imaging and functional magnetic resonance imaging to study the relationship between sleep and motor-skill performance. Photograph by Tim Parker.
Picus receives faculty award

Daniel Picus, MD, vice chair of diagnostic radiology, was among the 15 Washington University School of Medicine faculty who received Distinguished Faculty Awards for excellence in clinical care, community service, research, and teaching. The awards are cosponsored by the Dean's office, the Office of Faculty Affairs, Central Administration, and the Executive Committee of the Faculty Council.

Recipients were selected from 56 nominees. Picus was one of four physicians who received a Distinguished Clinician Award.

Of note

- Colin Derdeyn, MD, professor of radiology, of neurology, and of neurological surgery, was elected to a one-year term as president of the Society of Neurornterventional Surgery.
- Bennett Greenspan, MD, assistant professor of radiology, was elected to a two-year term as president-elect of the Missouri Valley Chapter of the Society of Nuclear Medicine.
- John Kotyk, PhD, research associate professor of radiology, was elected to a two-year term on the Board of Directors of the Academy of Molecular Imaging.
- Charles Hildebolt, DDS, PhD, professor of radiology and adjunct professor of anthropology, was elected to a three-year term as treasurer of the American Academy of Oral and Maxillofacial Radiology (AAOMR). He also was named as a fellow of AAOMR—one of only 40 honorees in the Academy's 64-year history.
- Michael Penney, MD, assistant professor of radiology, has been appointed as chief of staff at Barnes-Jewish St. Peters Hospital.
- Jerold Wallis, MD, associate professor of radiology, was elected to a three-year term as a director on the American Board of Nuclear Medicine.
- Barry Siegel, MD, professor of radiology and of medicine, and chief of the Division of Nuclear Medicine, and Jennifer Prye, CNMT, PET, CCRC, nuclear medicine technologist, received the American College of Radiology Imaging Network's Outstanding Contribution Award for their work in “advancing clinical care through imaging research.”
Change in leadership

In January 2010, Jay Heiken, MD, professor of radiology, stepped down from his administrative role as chief of the Abdominal Imaging service in order to devote more time to new clinical and research initiatives. He served as chief for almost 15 years.

The leadership role for Abdominal Imaging has been passed on to Vamsi Narra, MD, associate professor of radiology. Narra will continue to serve as chief of radiology at Barnes-Jewish West County Hospital and as cochief of body magnetic resonance imaging at Mallinckrodt Institute.

University awarded ARRA grants

As part of the United States government's 2009 American Recovery and Reinvestment Act (ARRA), 175 Washington University faculty members received approximately $80 million to fund a broad range of research, including Alzheimer's disease, diabetes, climate change, and renewable energy. Nearly $73 million in grants came from the National Institutes of Health (NIH); the University ranks among the top 10 academic institutions in the amount of NIH stimulus funds received.
Quality has never mattered more than it does in the current environment of healthcare reform.

—from the welcoming message given by Gary Becker, MD, 2009 RSNA president
MIR PRESENTATIONS AT RSNA 2009

EDUCATION EXHIBITS AND SCIENTIFIC POSTERS

Jennifer Demertzis, MD; Jason Stephenson, MD; Cade McDowell, MD; John Clohisy, MD; David Rubin, MD.
“Femoroacetabular impingement: added value of 3D CT imaging for operative planning.” —EXCELLENCE IN DESIGN

Andrew Trout, MD; Christine Menias, MD; Khaled Elsayes, MD; Joel Platt, MD; Jack Li, MD.
“Imaging findings and distribution of melanoma metastases in the abdomen: What to look for.” —CERTIFICATE OF MERIT

Vincent Mellnick, MD; Christine Menias, MD; Meghan Lubner, MD; Cade McDowell, MD.
“Ins and outs of the liver: a multimodality approach to hepatic vascular occlusion.” —CERTIFICATE OF MERIT

Travis Henry, MD; Fernando Gutierrez, MD; Sanjeev Bhalla, MD; Rex Parker, MD; Kyle Shipley, MD; Clinton Jokerst, MD; Lance Reinsmith, MD.
“Primary sarcomas of the thorax.” —CERTIFICATE OF MERIT

Monica Ocampo, MD; Fernando Gutierrez, MD; Sanjeev Bhalla, MD; Cylen Javidan-Nejad, MD.
“Failed mergers: when the left atrium and pulmonary veins fail to unite.” —CERTIFICATE OF MERIT

Mittul Gulati, MD; Christine Menias, MD; Cary Siegel, MD.
“Under the RUG: urethral anatomy with emphasis on postoperative studies.”

Yihua Zhou, MD, PhD; Vamsi Narra, MD.
“A personal radiology teaching file database and presentation tool.”

Vincent Mellnick, MD; Christine Menias, MD; Sanjeev Bhalla, MD; Meghan Lubner, MD; Constantine Raptis, MD; Christine Peterson, MD.
“Across the diaphragm: intrathoracic CT findings of gynecologic disease.”

Cade McDowell, MD; Travis Henry, MD; Constantine Raptis, MD; Vincent Mellnick, MD; Meghan Lubner, MD; Christine Menias, MD.
“CT features of acute abdominal aortic injury.”

Kartikeya Kantawala, MD; Christine Menias, MD; Sushilkumar Sonavane, MD; Vamsi Narra, MD.
“Unusual causes of rectal bleeding: imaging features of atypical rectal tumors.”

OF NOTE
Mandie Street, ARRT—RSNA/AUR/APDR/SCARD Radiology Education Research Development Grant: “Using six sigma techniques to reduce radiation dose”

Meghan Lubner, MD; Christine Menias, MD; Perry Pickhardt, MD; Cynthia Santillan, MD.
“Intraabdominal fibromatosis: spectrum of imaging findings.”

Meghan Lubner, MD; Christine Menias, MD; Perry Pickhardt, MD; Dennis Balfie, MD.
“Portal venous gas in the era of increased CT use: a change in perspective.”

Photographs by MIR Photography Lab
EDUCATION EXHIBITS AND SCIENTIFIC POSTERS continued
Meghan Lubner, MD; Christine Menias, MD; Perry Pickhardt, MD; Sanjeev Bhalla, MD; Tabassum Ahmed, MD, “Post-transplant lymphoproliferative disorder: spectrum of imaging findings.”

Jessica Huang, MD; Christine Menias, MD; Sanjeev Bhalla, MD; Absar Ahmed, MD; Alexander Ho, MD, “Borne identity: CT imaging of blood-borne infections.”

Kathryn Fowler, MD; William Grande, MD; Jay Desai, MD; Constantine Raptis, MD; Perry Pickhardt, MD; Christine Menias, MD; Sanjeev Bhalla, MD, “Under pressure: the radiology of hypertension.”

Kendra Hain, MD; Christine Menias, MD; Perry Pickhardt, MD; Sanjeev Bhalla, MD; Meghan Lubner, MD, “Presacral masses: multimodality imaging of a multidisciplinary space.”

Ashish Wasnik, MD; Christine Menias, MD; Elaine Caolli, MD; Khaled Elsayes, MD; Joel Platt, MD, “Recent imaging and interpretation advances in diagnostic workup of ovarian cystic lesions.”

Paul Didomenico, MD; Christine Menias, MD; Hong Pham, MD, “The many faces of renal lymphoma.”

Kathryn Fowler, MD; Constantine Raptis, MD; Michael Lin, MD; Christine Menias, MD; Jeffrey Brown, MD; Vamsi Narra, MD; Nitin Kumar, MD, “Magnetic resonance enterography (MRE): a pictorial review with over 500 case experience.”

Sushilkumar Sonavane, MD; Kartikeya Kantawala, MD; Christine Menias, MD, “Beyond the boundaries: endometriosis—typical and atypical locations.”

Venkata Katabathina, MD; Arpit Nagar, MD; Christine Menias, MD; Srinivasa Prasad, MD; Venkateswar Sarabhi, MD; Raghu Vikram, MD, “Mesenchymal neoplasms of the kidney in adults: imaging spectrum with radiologic-pathologic correlation.”

Cylen Javidan-Nejad, MD; Shawn Teague, MD; Tillman Cyrus, MD, “Coronary CTA: a pattern-based approach to disease.”

Lina Nayak; Sanjeev Bhalla, MD; Cylen Javidan-Nejad, MD, “Congenital bronchial atresia: multidetector computed tomography findings.”

Cylen Javidan-Nejad, MD; Alexander Patterson, MD, “Tracheal stenosis and tracheomalacia: imaging and surgical repair.”

Kristopher Cummings, MD; Fernando Gutierrez, MD; Sanjeev Bhalla, MD; Cylen Javidan-Nejad, MD; Alan Braverman, MD, “To the root of the matter: aortic root and proximal ascending aortic anatomy and diseases.”

Travis Henry, MD; Fernando Gutierrez, MD; Kristopher Cummings, MD; Sanjeev Bhalla, MD; Constantine Raptis, MD; Alexander Ho, MD, “How can you mend a broken heart? Named cardiac surgical procedures that all radiologists should know.”

Gary Ballester, MD; Fernando Gutierrez, MD; Sanjeev Bhalla, MD; Kenneth Badillo, MD; Travis Henry, MD, “Wandering wires: importance of adequate evaluation of the sternum after cardiac surgery.”

James Duncan, MD, PhD; Mandie Street, ARRT; Stephen Currie; Henry Dalsanio, MD; Elio Beta, “Optimizing fluoroscopy use during image-guided procedures.”

Travis Henry, MD; Pamela Woodward, MD; Sanjeev Bhalla, MD; Constantine Raptis, MD; Rex Parker, MD; Tillman Cyrus, MD, “A numbers game: cardiac physiologic parameters a radiologist should know.”

Travis Henry, MD; Sanjeev Bhalla, MD; Rex Parker, MD; Doug Kitchin, MD; Celine Buckley, MD, “Go with the flow: intravascular contrast dynamics on CT.”
John O'Donnell, MD; Sanjeev Bhalla, MD; Gabrielle Konin, MD; Rakesh Shah, MD; Jesse Chusid, MD, "Abnormal uptake on PET/CT: imitators of lung malignancy."

Jonathan Chung, MD; Eric Stern, MD; Sanjeev Bhalla, MD; Sudhakar Pipavath, MD; David Goodwin, MD; Robert Carr, MD, "Granulomatous fibrosing mediastinitis (GFM): diagnosis and treatment."

Kristopher Cummings, MD; Jose Maldonado, MD; Alvaro Huete, MD; Shawn Teague, MD; Karen Ordovalos, MD; Vincent Mellnick, MD, "Cardiac case of the day."

Shiv Patel, MD; Arunabh Talwar, MD; Jesse Chusid, MD; Sanjeev Bhalla, MD; Deborah Reede, MD; Rakesh Shah, MD, "Pictorial essay: holes in the lungs."

Lance Reinsmith, MD, "Undrain my heart: a personal experience with acute pericarditis, cardiac tamponade, and effusive constricrive pericarditis with a discussion of pertinent radiologic findings."

CATEGORICAL COURSE
Jay Heiken, MD, "Gastrointestinal—acute abdomen (an interactive session). Vascular compromise and bowel obstruction."

FOCUS SESSIONS
Pamela Woodard, MD, "When CT cannot be performed: MR angiography for pulmonary embolism diagnosis—Renal insufficiency and nephrogenic systemic fibrosis: alternatives in MR imaging methodology use in PIOPED III."

David Rubin, MD; Daniel Wessell, MD, PhD; Douglas Mintz, MD; Suzanne Anderson, PhD, BMed; William Morrison, MD; Timothy Sanders, MD; Miriam Bredella, MD; Janaki Ramanathan, MD; Catherine Roberts, MD; Lawrence White, MD, "Musculoskeletal radiology quiz bowl."

INFORMATICS
Lawrence Tarbox, PhD, "Integration strategies for radiology systems—DICOM WG23 plug-ins."

Lawrence Tarbox, PhD; Patric Ljung, PhD; Gianluca Paladini, BENG, "Rapid application development with XIPTM—the eXtensible imaging platform."

MULTISESSION COURSES
Suresh Vedantham, MD, "Venous thromboembolic disease diagnosis and treatment—introduction to the problem."

Suresh Vedantham, MD, "Venous thromboembolic disease diagnosis and treatment—ATRACIT Trial."

Suresh Vedantham, MD; Alan Matsumoto, MD; William Kuo, MD, "Venous thromboembolic disease diagnosis and treatment—future directions and discussion."

REFRESHER COURSES
Pamela Woodard, MD, "Update course in diagnostic radiology: cardiac—principles and techniques of cardiac CT angiography and MR imaging and radiation reduction strategies: MR imaging."
REFRESHER COURSES continued
Maurine Spillman-Dennis, MD; Daniel Picus, MD; James Rawson, MD; Robert Zeman, MD; Geraldine McGinty, MD; Bibb Allen, MD; Richard Duszak, MD; Christopher Ullrich, MD, “How payment policy will impact technology development in the 21st century: an ACR interactive session (in conjunction with the American College of Radiology).”

Pamela Woodard, MD, “Coronary artery anomalies.”

Pamela Woodard, MD; Vincent Ho, MD, MBA, “Cardiac CT mentored case review: part I (in conjunction with the North American Society for Cardiac Imaging).”

Geoffrey Rubin, MD; Pamela Woodard, MD, “Cardiac CT mentored case review: part II (in conjunction with the North American Society for Cardiac Imaging).”

Sanjeev Bhalla, MD, “State-of-the-art imaging for penetrating trauma: thorax.”

Christine Menias, MD, “State-of-the-art imaging for penetrating trauma: abdomen.”

Fernando Gutierrez, MD; Kristopher Cummings, MD; Sanjeev Bhalla, MD, “Multidetector CT and MR imaging evaluation of congenital thoracic disease in the adult (noncardiac) (How-to-workshop).”


Pamela Woodard, MD, “Cardiac CT mentored case review: part I (in conjunction with the North American Society for Cardiac Imaging).”

Christine Menias, MD, “Gastrointestinal—gallbladder and bile ducts: malignant lesions (including gallbladder and carcinoma).”

Sharlene Teefey, MD, “Some great cases I have seen: scrotum, thyroid, and gallbladder (an interactive session). Scrotum.”

Nirvikar Dahiya, MD, “Some great cases I have seen: scrotum, thyroid, and gallbladder (an interactive session). Thyroid.”

Marilyn Siegel, MD, “Practical pediatric vascular imaging: CT imaging.”

SCIENTIFIC SESSIONS
Parinaz Massoumzadeh, PhD; Xiang He; Keith Rich, MD; Dmitriy Yablonskiy, PhD; Tammy Benzinger, MD, PhD, “Quantitative measurement of hypoxia in human brain tumors using qBOLD MRI.”

Gayatri Josh, MD; Cylen Javidan-Nejad, MD; Thomas Pilgram, PhD; Bruce Whiting, PhD, “Factors associated with decreased radiation exposure in CT-guided intrathoracic fine needle aspiration biopsy.”

Ephraim Parent, PhD; John Katzemenbogen, PhD; Michael Welch, PhD, “Predictive evaluation of 16α-[76Br/77Br]-bromo-11β-methoxyestradiol as a selective radiotherapeutic agent in estrogen receptor positive tumors.”

Sandra Halliburton, PhD; Sanjeev Bhalla, MD; Chun Yuan, PhD, “Cardiac (CT/MR imaging: phantom studies and stents).”

Joseph Azok, MD; Sushilkumar, MD; Thomas Pilgram, PhD; Sanjeev Bhalla, MD; Christine Menias, MD, “Trapped air within an inflamed appendix is a CT sign of advanced appendicitis.”

Cheryl Herman, MD, “Breast imaging (multi-modality).”

Lauren Chang Sen, MD; Michael Lin, MD; Thomas Pilgram, PhD; Kyongtae, MD, PhD; Jay Heiken, MD, “Value of histogram analysis for characterization of indeterminate adrenal nodules on noncontrast CT.”

Alok Jaju, MD; Charles Hildebolt, DDS, PhD; Geetika Khanna, MD, “Preoperative imaging for pectus excavatum: can chest X-rays replace CT?”

Elizabeth Oates, MD; Barry Siegel, MD, “Nuclear medicine (PET/CT of gastrointestinal malignancies).”

Barbara Monsees, MD; Elizabeth Burnside, MD, MPH, “Breast imaging (interventional).”

Pamela Woodard, MD, “Cardiac (CT/MR: risk stratification—part I) (SSK03).”

Alok Jaju, MD; Steven Don, MD; Rebecca Bowling, MD; Charles Hildebolt, DDS, PhD; Glenn Fletcher, PhD, “VCUG radiation dose and potential dose reduction.”

Desiree Morgan, MD Michael Macari, MD; Sharlene Teefey, MD, “Gastrointestinal (solid pancreatic tumors).”

Jeff Fidler, MD; Jay Heiken, MD; Fergus Coakley, MD, “Gastrointestinal (intestinal imaging: CT and MR imaging).”

Benjamin Jacobs, MD; James Duncan, MD, PhD; Mandie Street, ARRT; David Murray, “Optimizing radiation use during pediatric interventional radiology procedures: a continuous process improvement project.”


Louis Gilula, MD, “Postoperative imaging of the hand and wrist.”
The Annual MIR Reception at RSNA2009

November 30, 2009
Chicago Cultural Center

Right: MIR alum Eric Hatfield, MD, and (right) James Kelly, MD, 2009-2010 diagnostic radiology chief resident

Below: Jay Heiken, MD, professor of radiology, and (right) MIR alum Anthony Wilson, MD

Below: Andrew Bierhals, MD, MPH, assistant professor of radiology, and (right) Alberto Hildego, MD

Above: (left) Sanjeev Bhalla, MD, chief of Cardiothoracic Imaging service, and MIR alum Kevin Johnson, MD

Above: Gilbert Jost, MD, director of the Institute, welcomed MIR alumni, faculty, and friends.

Abas Ahmed, MBBS, third-year diagnostic radiology resident; Amy Fowler, second-year diagnostic radiology resident; Joseph Azok, MD, third-year diagnostic radiology resident; and Jill Azok
While few would be surprised to learn that an estimated six million people in the United States have undiagnosed diabetes, lesser known is the fact that just as many people (roughly one in 50 nationwide) have a cerebral, or brain, aneurysm. An aneurysm—the abnormal ballooning of a weakened blood vessel wall—has serious and potentially lethal consequences when one ruptures within the skull. Of the six million people with brain aneurysms, approximately 25,000 suffer a rupture each year. About 50 percent of these ruptures lead to the patient's death; of the survivors, only half regain normal physical function.
Increased detection of brain aneurysms through recent advances in diagnostic imaging has heightened the demand for treatment options. But, current options are limited by the aneurysm size and location, causing patients to wait and wonder when that aneurysm might burst.

A new device is being touted as the biggest breakthrough in brain-aneurysm treatment since the mid 1990s introduction of coil embolization. Known as a Pipeline Embolization Device, or PED, the technology is currently being studied at Washington University School of Medicine (WUSM) and Mallinckrodt Institute of Radiology (MIR) in anticipation of market approval in 2011. PED has shown impressive results, exciting those clinicians who are disheartened by the limits of available techniques to treat brain aneurysms.

**Aneurysm treatment options**

Brain aneurysms have only recently been approached endovascularly (through the blood vessel in lieu of open surgery). Until 1995, nearly all brain aneurysms were treated surgically, through a technique called clipping. In this procedure, the surgeon places a metal clip across the neck of the aneurysm, the opening where the defect began. The clip prevents blood from entering the aneurysm, reducing the risk of rupture.

Craniotomies are still the most appropriate treatment for some aneurysms. But they are invasive and require long operating times and extensive hospital stays. Their use is limited to patients who are medically strong enough to endure the surgery. Also, craniotomies are ineffective for brain aneurysms of certain sizes and locations.

In 1995, aneurysm treatment was revolutionized by the Guglielmi Detachable Coil, or GDC—named for its neurosurgeon inventor, Guido Guglielmi. Unlike clipping, which attacks aneurysms from the outside, coiling treats aneurysms from within the vessel. Guided by fluoroscopic imaging, this procedure involves inserting a catheter through the femoral artery to the brain, then threading platinum coils through the catheter and into the aneurysm. The coils stimulate a clotting response, leading to scarring over the neck of the aneurysm and impeding blood flow to the aneurysm.

Coiling, however, is an imperfect system.

“The problem with coiling is that we can only fill twenty-five to thirty percent of the aneurysm,” says Christopher J. Moran, MD, professor of radiology and of neurological surgery. “Think of the aneurysm as a bucket. If you filled it with ten-pound rocks, you could only put in about ten to fifteen rocks, which, unlike filling the bucket with grains of sand, would leave some unfilled space. Coiling is like filling an aneurysm with rocks. That means blood can still get through, leading to recurrences.”

In addition to incomplete filling, coiling can be even less effective in instances of wide-neck aneurysms. Wide-neck aneurysms are prone to coil herniation, or displacement of coils into the parent vessel. To help with these cases, interventionalists inflate balloons across the aneurysm neck to prevent the coils from coming out. This method proved useful in the introduction of coils but was problematic once the balloon was deflated. The technique evolved in 2003, with the introduction of self-expanding intracranial microstents that could be left at the site of the aneurysm.
Before PED implantation, the aneurysm cavity is occluded.

“Stenting enabled us to do many more aneurysms than we could have five years earlier,” says Moran, “but it didn’t significantly improve the recurrence rate.”

The PED difference

Stents concluded one era of brain-aneurysm treatment and ushered in the next. In cases where clipping and coiling were ruled out, some interventionalists began using stents as a stand-alone treatment. Success with this technique is generally limited to very small, narrow-neck aneurysms, but it represents the first form of parent vessel reconstruction as brain-aneurysm treatment. While earlier endovascular techniques favor treating the aneurysm itself, current research is focused on the source feeding the problem—the diseased parent artery where the aneurysm begins.

Commercially available microstents may have been the first form of parent vessel reconstruction, but the Pipeline Embolization Device appears by far to be the best, especially in cases of wide-neck or otherwise difficult-to-treat aneurysms. PED, the only device of its kind to be successfully used in humans, is similar to a stent: It is a self-expanding, microcatheter-delivered metal device. The difference is in its size. The PED has thirty to thirty-five percent surface area coverage when fully deployed, a significant improvement over the six to eight percent coverage by stents. Like stents, multiple PEDs can be placed within each other in a technique called telescoping, but because PED is so thin, there is less risk of narrowing the artery. By reconstructing the entire length of the parent vessel across the aneurysm, PED addresses the problems with coiling head on, without ever having to enter the aneurysm.

Another significant advantage of PED is its structure. The device is made of cobalt chromium and platinum, and, unlike stents, incorporates platinum strands within the actual body of the device. This improves fluoroscopic visibility without obscuring computed tomography imaging of soft tissues.
Alok Jaju, MD, neuroradiology clinical fellow, and (right) Christopher Moran, MD, are in the third-floor angiography suite.

"The intracranial stents have some markers so you can see the ends, but it’s difficult," says Moran. "With PED, you can see the whole device."

The path toward approval

Trials for PED are ongoing, and it remains to be seen whether recurrence rates are lower than with coiling. Hopes are high: in what’s known as the Buenos Aires Experience trial, 63 aneurysms were treated with PED. In 94 percent of cases, PED was used as a stand-alone treatment. After six months, 93 percent of patients showed complete angiographic occlusion.

"The aneurysms that we’re treating in these trials are the ones that are really difficult—ones with recurrence rates of about fifty to seventy-five percent,” says Moran. "So a ninety-three percent cure rate with PED is superb!"

The trial at WUSM and MIR is delivering positive results as well. Pipeline for Uncollapsible or Failed Aneurysms, or PUFS, includes 100 patients from the United States, South America, and Europe. The four patients treated by Moran at Washington University Medical Center previously had been given inoperable diagnoses—their aneurysms were greater than 10 millimeters in size, with necks greater than four millimeters. Since the PED procedure, three of the four patients have received follow-up evaluation, and so far, all are showing improvement in symptoms. In two patients, the aneurysm is totally gone, and Moran expects the third patient’s aneurysm to have disappeared by the one-year mark.

A separate trial, COCOA (Complete Occlusion of Coilable Intracranial Aneurysms), is ongoing at 15 centers nationwide, studying how PED compares with coiling in the treatment of smaller, narrow-neck aneurysms.

For now, the primary focus for Chestnut Medical, PED’s manufacturer, is an approval for large, wide-neck aneurysms—the ones that present the biggest challenge for current endovascular therapies. If things go according to plan, PED could gain pre-market approval (PMA) by mid 2011, presenting an answer to the heightened demand for treatment options in challenging cases.

“This is exciting news,” says Moran. “If the PMA goes through, we will finally have an approved device.” And it may be well worth the wait for the millions of patients with brain aneurysms.
As it turns out, telling someone to “sleep on it” is sound advice. Medical literature strongly supports a connection between sleep and learning, and for decades studies have confirmed the positive effects of overnight sleep on our ability to retain information and to perform tasks. Now, sleep research is looking specifically at why and how sleep affects learning, and which types of learning stand to benefit most from a good night’s sleep. Are certain types of learning more affected by sleep than others? And what parts of the brain are involved? These are some of the questions researchers in Mallinckrodt Institute of Radiology’s Electrical and Optical Neuroimaging (EON) Lab are hoping to answer.
We are interested in which regions of the brain change as a result of overnight sleep, not as a result solely of the learning itself,” says Linda Larson-Prior, PhD, head of the electrical and optical neuroimaging section of Mallinckrodt Institute of Radiology’s Neuroimaging Laboratory and a research associate professor at Washington University School of Medicine. “Our contribution to the scientific literature will be whether there are changes in resting state networks between learning a task on day one and practicing it on day two, after a night of sleep.”

Larson-Prior’s group is launching two studies that compare brain activity when learning a task before and after a night of sleep. While earlier research has focused on correlations between sleep and motor-skill performance, the latest efforts have shifted focus to the relationship between sleep and declarative learning—the acquisition of knowledge that can be discussed.

The Task at Hand

There is abundant research tying sleep to improvements in motor learning. But connections between sleep and declarative learning are harder to come by. Larson-Prior’s lab, while not doing away with motor tasks, is largely focused on finding a link between sleep and the performance of declarative tasks. By using a new method of declarative learning assessment, EON scientists may be able to demonstrate the link that researchers suspect but have not been able to confirm.

Declarative learning is commonly assessed through paired associations—one word is given with another unrelated word, then the subject is asked to recall the associated word. Existing studies have failed to consistently show that sleep improves performance on this task, but researchers suspect this may be an issue of methodology. Larson-Prior’s team is upping the ante, using a more challenging version of declarative testing called complex associative learning.

Instead of giving one word with one association, a complex associative learning task involves one word and three associated words given in a specific order. Complex associative learning has been linked to general intelligence levels, a factor that some sleep researchers believe plays a role in whether sleep impacts a person’s learning.

“We assumed that this task would be more likely to be positively impacted by sleep because the study volunteer has to create a
STUDIES
MOD NIGHT'S SLEEP
EXPLORING
THE BENEFITS
OF A
STUDY DESIGN: SERIAL REACTION TIME TASK
A. TAP
B. SEQUENCE/RANDOM

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Volunteers, while in an MR scanner, used a specially designed device to tap out—with their nondominant hand—either a random (R) or a patterned sequence (S). They then switched to their dominant hand and tapped a single key (T=tap).

### Study Design

#### Motor Learning

The complex associative learning study will focus on subjects aged 18 through 65 and will assess change with functional magnetic resonance imaging (fMRI), a specialized brain scan that looks at blood flow as an indicator of neural activity in different areas of the brain. As an initial step, the adult volunteers are asked to learn something while inside the MRI scanner. Then they are asked to keep a sleep diary to record everything: when they went to bed, what they drank before going to bed, and how tired they were.

### Results: Motor Learning

#### Sequence Day 1

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DAY 1: Brain activity in regions associated with attention, movement execution, and visuospatial transform. Both cortical and subcortical structures are active during learning. DAY 2: Similar regions of the brain are active during task performance. Only significant change is shown in brain area involved in visuospatial planning of movements.

whole story as opposed to just a paired association that doesn’t have any real salience,” says Larson-Prior. “There’s a more vested interest in a story, so sleep is more likely to have a benefit on that task.”

Motor learning also will be assessed in both of Larson-Prior’s studies, but the emphasis will be on changes in brain activity between before-sleep and after-sleep learning, as opposed to only task performance.

“There are instances of people with brain deficits who externally perform tasks equally as well as people with healthy brains,” says Larson-Prior. “But when we look at what the injured brains are doing, we see that they are not doing the task in the same way as the healthy brains.”

This emphasis on functional connectivity data is based on Larson-Prior’s earlier sleep research, examining changes in the network activity of the brain in wake-to-sleep transitions.
they felt when they awoke. On day two, the volunteer is again placed in the scanner and asked to take the same test at exactly the same time they took it on the previous day. The pediatric epilepsy clinic at Washington University Medical Center. As in the adult study, Larson-Prior's team will monitor brain activity while the child learns a task on day one, then monitor the child again at the same time the next day, after a night of sleep. An advantage in this study will be the ability to also monitor brain activity during sleep because the children will be fitted with monitors overnight.

There are instances of people with brain deficits who externally perform tasks equally as well as people with healthy brains.

“We're controlling for circadian [daily rhythmic activity based on 24-hour intervals] timing—the volunteers are tested at exactly the same time on both days. But there is still a lot of lag time between the testing and when we see them again,” says Larson-Prior. “Ideally, the volunteers would sleep in my laboratory and I could image them first thing in the morning.”

In-lab sleeping, in addition to being more convenient and controllable, would allow Larson-Prior's team to look at sleep staging, something she hopes to tackle in future stages of this study. “The scientific literature is completely up in the air about what stage of sleep is important,” she says. “For now, we are not looking at staging. That will come later.”

A second study will use electrical imaging to measure sleep's effect on motor learning in children, aged 8 to 18. Study participants will be patients who have undergone surgical treatment for epilepsy, derived primarily from

Tracy Nolan is shown in the soundproof room used to simulate the task performance portion of the study.
Future Applications

“If the sleep–learning correlation is as robust a phenomenon as some of the existing literature suggests, there are a number of areas to go with this,” says Larson-Prior.

One of those areas involves investigating how sleep affects childhood education and cognitive abilities in aging adults. Current sleep data indicate that children and older people do not experience the same post-sleep boost in learning capability as do adults aged 20 through 30. Aside from a decrease in slow wave sleep that occurs with aging, there are no clear indicators of why the benefits of sleep on learning may be absent in younger and older groups.

“It would be valuable to know why the greatest learning boost is not happening in children, since a large amount of education happens during these years,” says Larson-Prior. “And in the case of the older population aged sixty-five-plus, is there something we can do to improve their ability to benefit from sleep? Or is it that the ability isn’t actually lost but is a result of other problems that occur with aging and are unrelated to sleep?”

Larson-Prior’s lab is hoping to shed some light on childhood learning through its pediatric electrical imaging study, and the goal is eventually to hone the general-population MRI study to focus on older people. Other long-term applications for the research include determining whether medicated sleep is as effective as non-medicated sleep and looking at how sleep restriction affects productivity.

“In the United States, we live in a society that puts a premium on sleep restriction. We don’t yet know the potential deleterious effects of that,” says Larson-Prior.

“There are many good reasons for studying sleep-related learning and a lot of questions that are potentially quite interesting.”

Editor’s Note: For more information about these studies and the Electrical and Optical Neuroimaging Lab, go to http://eon.wustl.edu.
PET and IMRT are improving survival rates and lessening complications in the battle against hard-to-spot cervical tumors.

Since 1998, radiation oncologists at Washington University School of Medicine (WUSM) have relied on intensity-modulated radiation therapy (IMRT) to achieve one of their chief goals—killing malignant tumors while minimizing damage to surrounding healthy tissue. IMRT does that by delivering a dose of radiation that roughly conforms to the tumor’s shape.

But what good is this precision instrument if you can’t make out the target?
TARGETING CERVICAL CANCER

That’s the dilemma facing radiation oncologists like Perry Grigsby, MD, professor of radiation oncology, of radiology, and of gynecologic oncology. “It’s virtually impossible to see the tumors with CT imaging,” says Grigsby, as he points to a computed tomography (CT) scan of a woman with cervical cancer. “You can’t distinguish cervical cancer from the bladder, rectum, or other tissue in the pelvis.”

Then Grigsby turns to the woman’s scan that was created with positron emission tomography (PET) using fluorodeoxyglucose (FDG) as an uptake agent to track cell metabolism. With PET, once obscure tumors become readily visible.

By combining IMRT with FDG-PET’s ability to define the tumor, radiation oncologists have a treatment for cervical cancer that promises to give patients more hope. In a recent article in the International Journal of Radiation Oncology, Biology, Physics (IJROBP), Grigsby and other Mallinckrodt Institute of Radiology (MIR) researchers demonstrated that IMRT guided by FDG-PET improved the survival rate of women with cervical cancer while reducing the complications that impair their quality of life.

Study coauthor Barry Siegel, MD, professor of radiology and of medicine, and chief of MIR’s Division of Nuclear Medicine, notes that cervical cancer joins a list of other malignancies successfully treated with these two technologies. “We’re already using PET-guided radiotherapy for lung cancer, esophageal cancer, and head and neck cancers,” says Siegel. “The goal is to focus radiation on the tumor, not on normal tissue.”

Complications that can kill

Cervical cancer ranks as the third leading cause of cancer death among women aged 15 to 34 and the fifth leading cause of cancer death among women aged 35 to 54. Before the widespread adoption of IMRT, radiation oncologists typically treated this disease with a combination of brachytherapy (which entails a radiation implant next to the cervix), external-beam, whole-pelvis radiation; and cisplatin, a chemotherapy drug that makes tissue more susceptible to radiation damage and attacks tumors in its own right.

However, due to its wide aim, external-beam, whole-pelvis radiation exposes healthy tissue to radiation. The resulting adverse effects range from merely painful to life-threatening. Scar tissue forming around lymphatic vessels, for example, can cause leg edema. Intestinal scarring can lead to bowel obstruction. Or, fistulas develop, allowing urine to spill from the bladder into other organs.

“When you irradiate cervical cancer, you want to make sure the disease doesn’t come back, but it’s frustrating when complications arise,” says Elizabeth Kidd, MD, a resident at Barnes-Jewish Hospital who’s training in WUSM’s Department of Radiation Oncology—and lead author of the IJROBP study. Brachytherapy, of course, reduces off-target radiation around the cervix, but that technique isn’t suited for tiny, scattered pelvic lymph nodes where cervical cancer first spreads. In the past, before PET became a planning tool, it was especially hard to target tumors in these tissues with IMRT because they didn’t always show up on CT scans, says Farrokh Dehdashti, MD, professor of radiology and another study coauthor.

“Typically, enlarged lymph nodes are considered metastatic and normal-sized lymph nodes are disease-free,” says Dehdashti. A CT
scan can pick up on size differences, but “sometimes an enlarged tumor may be cancer-free, while a normal-sized node may contain malignant cells.”

As a result of this diagnostic confusion, external-beam, whole-pelvis radiation had been a default therapy for these issues. FDG-PET, however, allows radiation oncologists to replace the blanket approach to irradiating lymph nodes with the accuracy of IMRT. That’s because increased FDG uptake in lymph node tumors signals cancer regardless of the tissue’s size.

Doctors Farrokh Dehdashti and Barry Siegel with the North Campus PET/CT scanner.

“... sometimes an enlarged tumor may be cancer-free, while a normal-sized node may contain malignant cells.”

However, FDG-PET doesn’t eliminate the use of CT in preparing a radiation attack plan. By fusing PET and CT images from a combined PET/CT scanner, clinicians can better detect and locate tumors as well as direct treatment. In particular, radiation oncologists need CT to measure tissue density so they can calculate the proper dose.

All this science was the foundation for the recent investigation of the efficacy of PET-guided IMRT for cervical cancer.

**IMRT yielded better overall survival rates**

The MIR study is the largest to-date that’s looked at the clinical outcomes and adverse effects of IMRT as the primary treatment of cervical cancer (as opposed to IMRT used post-operatively). It involved 452 patients with newly diagnosed cervical cancer who underwent both external radiation and cervix-targeted brachytherapy treatment at Washington University Medical Center from June 1997 through September 2008. Pelvic lymph nodes received the full, 50 Gy dose of external radiation while the central pelvis received 20 Gy, supplementing radiation delivered by brachytherapy. In addition, 80 percent of patients received cisplatin chemotherapy.

IMRT dose distribution: axial CT (top); axial PET (bottom)

Of this cohort, the first 317 patients were treated with external whole-pelvis radiation. From March 2005 onward, the remaining 135 patients received PET-guided IMRT, the result of a decision by the Department of Radiation Oncology to switch to the more precise radiation technique on a routine basis.

Kidd and her colleagues expected that the patients treated with IMRT would suffer fewer adverse effects. They were right on the money. Only six percent of IMRT patients had developed serious bowel or bladder complications at the time of their last follow-up visit, as compared to 17 percent in the non-IMRT group.
Furthermore, none of the IMRT patients died from radiation-related complications, while three non-IMRT patients did.

What did surprise researchers was the improvement in overall survival rates among the IMRT group. At the time of their last follow-up visit, 67 percent of IMRT patients had no evidence of disease, as compared to 49 percent of the other group. And less than four percent of IMRT patients had died of cervical cancer while this rate among non-IMRT patients was 37 percent. In terms of cancer recurrence, IMRT patients also scored better, but the difference didn’t achieve statistical significance. This finding was buttressed by FDG-PET scans taken three months after treatment, showing that a virtually identical percentage of IMRT and non-IMRT—about 73 percent—had no persistent or recurrent disease. According to previous research at Washington University Medical Center, FDG-PET results at the three-month mark predict long-term survival.

Given the study’s design, researchers had more time to monitor the progress of the non-IMRT patients. On average, the time from treatment to the last follow-up visit for this group was 72 months, as compared to 22 months for IMRT patients. Despite this difference, the improved overall survival rate for IMRT patients still attained statistical significance, according to Kidd.

The study also may help to convince the Centers for Medicare and Medicaid Services to reconsider its coverage of FDG-PET, which is currently limited to one scan per patient for initial treatment strategy, says Siegel. With PET-guided IMRT for cervical cancer, two PET studies are needed: one to assess the extent of disease, and a second to plan radiation therapy while the patient is in the precise position that will be used during the treatment.

The success of PET-guided IMRT in treating cervical cancer lays the groundwork for studying a new and even more precise form of radiation therapy: “dose painting.” Right now, the entire tumor typically receives the same dosage level. However, metabolism rates (as measured by glucose or oxygen consumption) vary inside a tumor, explains Grigsby. “Less metabolically active areas need less radiation to destroy them while metabolic ‘hot spots’ require a stronger dose.” IMRT can deliver the appropriate dose to a given section of tumor, depending on its metabolism profile—a kind of radiation paint-by-numbers exercise. Again, PET will provide the definitive numbers to adjust the dosage.

What remains to be seen is whether this fine-tuning of PET and IMRT can save even more lives and further reduce adverse effects. That’s the ultimate target for these researchers.
The second annual poster exhibit was held on September 10 in the atrium of the Farrell Learning and Teaching Center. The event, sponsored by the Division of Radiological Sciences, featured scientific posters from all divisions of Mallinckrodt Institute.

Photographs by MIR Photography Lab

POSTER AUTHORS AND TITLES

Eric Hatfield; Agus Priatna; John Kotyk, PhD; Benjamin Tan; Vamsi Narra, MD, "Whole-body oncologic imaging with TimCT."

Parinaz Massoumzadeh, PhD; Xiang He; Keith Rich, MD; Joel Garbow, PhD; Dmitriy Yablonskiy, PhD; Tammie Benzinger, MD, PhD, "Quantitative measurement of hypoxia in human brain tumors using QBOLD MRI."

Wincha Chong, MD; Christine Menias, MD; Vamsi Narra, MD, "MRI of acute abdomen."

Stephen Currie; Elio Beta; Mandie Street, RT(R)(MR); Henry Dalsania, MD; James Duncan, MD, PhD, "Optimizing fluoroscopy use during image-guided procedures."

Pamela Woodard, MD; Michael Gitter, MD; Arthur Martin, MD; Paul Singh, MD; Raye Bellinger, MD; Ronald Mikolich, MD; Rubin Sheng, MD, "Iso-osmolar contrast agent influence on heart rate during coronary computed tomography angiography."

M. Lyons; Janet McGill, MD; Pilar Herrera, MS; Ibrahim Saeed, MD; Carol Recklein; Kenneth Schechtman, PhD; Robert Gropler, MD, "Impact of gender on the myocardial metabolic response to diabetic therapy."

Huie Lin, MD; Pilar Herrera, MS; Suraj Kurup, MD; Jasdeep Sidhu; Richard Stein; Robert Gropler, MD; Samuel Klein, MD; Deborah Delano, RN; Linda Peterson, MD, "Diet-induced weight loss improves myocardial glycolysis and glucose oxidation rates in obese humans."
Pablo Soto, MD; Pilar Herrero, MS; Robert Schuh; Kenneth Schechtman, PhD; Jeffrey Baumstark, MS; Faye Rao, MD; Robert Gropler, MD, “The PPAR-α activator fenofibrate fails to alter myocardial metabolism in healthy individuals despite marked peripheral effects.”

Jonathan McConathy, MD, PhD; Dong Zhou, PhD; Stephany Shockley; Lynne Jones; Elizabeth Griffin; Hsiaoju Lee; Susan Adams; Robert Mach, PhD, “Click synthesis and biological evaluation of novel fluorine-18 labeled 1H-[1,2,3]triazole substituted amino acids for brain tumor imaging.”

James Johnson; Brandon Kocher; Dustin Maxwell; Qiong Chang; Edward Barnett; David Piwnica-Worms, MD, PhD, “Caspase-activated cell-penetrating probes for in vivo optical imaging of retinal neurodegeneration.”

Claire Cobley; Leslie Au; Yiyun Cheng; Mustafa Yavuz; Kwang Hyun Song; Sara Skrabalak; Jingyi Chen; Lihong Wang, PhD; Younan Xia, “Gold nanocages for biomedical applications.”

Delphine Chen, MD; Dong Zhou, PhD; Wenhua Chu, PhD; Phillip Herrbrich; Jacquelyn Engle; Lynne Jones; Justin Rothfuss; Elizabeth Griffin; Marco Geraci; Dana Fuchs; Michael Welch, PhD; Robert Mach, PhD, “Comparison of radiolabeled isatin analogs for imaging caspase-3 activation with positron emission tomography.”

Mai Xu, PhD; Dengfeng Cao, MD, PhD; Michael Rettig, PhD; Walter Akers, PhD; Gail Sudlow; Samuel Achilefu, PhD, “Novel antibody to carbohydrate antigen for tumor targeted imaging.”

Mikhail Berezin, PhD; Adah Almutairi, PhD; Guorang Sun, PhD; Walter Akers, PhD; Jinda Fan, PhD; Steven Guillaudeu, PhD; Karen Wooley, PhD; M. J. Frechet, PhD; Samuel Achilefu, PhD, “In vitro optical characterization of fluorescent nanoparticles.”

Zongren Zhang, PhD; Duanwen Shen, PhD; Samuel Achilefu, PhD, “Free and nanoparticle-arrested optical imaging agents and their interaction with cells.”

Robert Mach, PhD; Zhude Tu, PhD; Jinbin Xu; Suwanna Yangveravong, PhD; Shihong Li, PhD; Lynne Jones; Ryuji Higashikubo, PhD; Delphine Chen, MD, “[F18]ISO-1: a novel radiotracer for imaging cell proliferation in tumors.”

Zhude Tu, PhD; J. Xu; Shihong Li, PhD; Lynne Jones; Robert Mach, PhD, “Development of PET tracer for imaging phosphodiesterase 10A (PDE 10A).”

Richard Laforest, PhD; Michael Harrod, RT(R); Mark Mintun, MD, “Optimization of 15-O-water activation studies in PET/CT.”

Albert Chang, MD; Kim Nguyen; Yunjun Guo; Alexander Zheleznyak; Carolyn Anderson, PhD, “Receptor-targeted copper-64 labeled radiopharmaceuticals for cancer imaging and therapy.”

Monica Shokeen, PhD; Julie Schwarz, MD; Alexander Zheleznyak; Jessica Wilson; Ruwu Liu, PhD; Kim Nguyen; Riccardo Ferdani, PhD; Kit Lam, MD, PhD; Carolyn Anderson, PhD, “[Positron emission tomography (PET) imaging of the pre-metastatic niche with Cu-CB-TE2A-LP2A, a high affinity ligand for integrin α4β1.”

Riccardo Ferdani, PhD; Thaddeus Wadas, PhD; Ashley Flamengo; Christopher Sherman, MS; D. J. Stigers; Lei Wei, MD, PhD; E. H. Wong; Gary Weisman, PhD; Carolyn Anderson, PhD, “In vivo evaluation of new copper-64-labeled cross-bridged tetraazamacrocyclic complexes.”

Carl Jenks, PhD; Ephraim Parent, PhD; Dong Zhou, PhD; Maiko Kume; Michael Welch, PhD; John Katzenellenbogen, PhD, “Radiotherapy evaluation and imaging of bromine-76 and bromine-77 labeled 16α-[151Br]bromo-11β-methoxyestradiol-17β.”
Scott Harpstrite, MS; Jothilingam Sivapackiam, PhD; Julie Prior; David Piwnica-Worms, MD, PhD; Vijay Sharma, PhD, “Validation of a 67/68Ga-radiopharmaceutical for probing MRP1 P-glycoprotein-mediated functional transport activity.”

Scott Harpstrite, MS; Julie Prior; Nigel Cairns; David Piwnica-Worms, MD, PhD; Vijay Sharma, PhD, “Evaluation of a novel SPECT agent for imaging β-amyloid in the brain.”

Jennifer Griffith; Terrie Inder, MD; Carl White; Sandra Juul, MD, PhD; Donald McCurnin, MD; Jeffrey Neil, MD, PhD, “High-dose erythropoietin reduces cerebral injury in preterm baboons.”

Jennifer Griffith; Jason Hill; Donna Dierker; Terrie Inder, MD; Jeffrey Neil, MD, PhD; David Van Essen, PhD, “The term brain: a surface based approach to studying asymmetries of shape and cortical development in the newborn.”

Pascal Sati, PhD; Anne Cross, MD; Robert Schmidt, MD, PhD; Dmitriy Yablonskiy, PhD, “In-vivo and ex-vivo evaluation of multiple sclerosis lesions using gradient echo plural contrast imaging.”

Joong Kim, PhD; David Loy, MD, PhD; Sheng-Kwei Song, PhD, “Hyper-acute evaluation of spared white matter in mouse model of contusion SCI using /in vivo/ DTI.”

Junqian Xu, PhD; Eric Klawiter, MD; Taminnie Benzinger, MD, PhD; Robert Naismith, MD; Anne Cross, MD; Sheng-Kwei Song, PhD, “Directional diffusivities in human spinal cord correlate with functional outcome.”

Brian White, MA; Joseph Culver, PhD, “Mapping the visual cortex with diffuse optical tomography.”

Robert Mach, PhD; Zhude Tu, PhD; Suwanna Vangveravong, PhD; Jinbin Xu; Shihong Li, PhD; Lynne Jones; Elizabeth Griffin; Joel Perlmutter, MD; Mark Mintun, MD, “Radiotracers for imaging dopamine D3 and D2 receptors.”

Linda Larson-Prior, PhD; Elaine Tamez; Tracy Nolan; Sandra Hale, PhD; Joel Myerson; Jeffrey Zacks, PhD, “Imaging motor learning before and after sleep.”

Carlo Sestieri, PhD; Gordon Shulman, PhD; Maurizio Corbetta, MD, “Top-down attention for memory and perception: segregated networks in the parietal lobe.”

Beau Ances, MD, PhD; Florin Valda, PhD; Melinda Yeh; Christine Liang; Richard Buxton, PhD; Scott Letendre, MD; Allen McCutchan, MD; Ronald Ellis, MD, PhD, “HIV and aging independently affect brain function.”

Alexandre Carter, MD; Serguei Astafiev, PhD; Catherine Lang, PT, PhD; Lisa Connor, PhD; Jennifer Rengachary, MSOT; Michael Strube, PhD; Daniel Pope, PhD; Gordon Shulman, PhD; Maurizio Corbetta, MD, “Resting state inter-hemispheric fMRI connectivity predicts performance after stroke.”

Colin Derdeyn, MD; P. H. Davis; S. Prabhakaran, MD; C. S. Ivan; A. Bruno; Venkatesh Aiyagari, MBBS, DM; Allyson Zazulia, MD; Tom Videen, PhD; Nancy Hantler, CCRC; Amber Tyler, PhD; J. J. Lee; Robert Grubb, MD; Gregory Zipfel, MD; Phillip Miller, “The role of cerebral hemodynamics in Moyamoya disease.”

William Powers, MD; William Clarke, PhD; Robert Grubb, MD; Harold Adams, MD; Tom Videen, PhD; Nancy Hantler, CCRC; Amber Tyler, PhD; Colin Derdeyn, MD, “Carotid occlusion surgery study (COSS).”
Colin Derdeyn, MD; Marc Chimowitz, MBChB; David Fiorella, MD, PhD; Tanya Turan, MC; Michael Lynn, PhD; Bethany Lane, RN; Scott Janis, PhD, "Stenting and aggressive medical management for preventing recurrent stroke in intracranial stenosis (SAAMPRIS)."

Rajat Dhar, MD; Allyson Zazulia, MD; Tom Videen, PhD; Gregory Zipfel, MD; Colin Derdeyn, MD; Michael Diringer, MD, "Red blood cell transfusion increases cerebral oxygen delivery in patients with subarachnoid hemorrhage."

Andria Ford, MD; Hongyu An, DSc; Rosana Ponisio, MD; Katie Vo, MD; Abdullah Nassief, MD; Colin Derdeyn, MD; William Powers, MD; Weili Lin, PhD; Jin-Moo Lee, MD, PhD, "MR-derived oxygen metabolic index predicts infarction better than ADC during hyper-acute ischemic stroke."

Walter Akers, DVM, PhD; Mikhail Berezin, PhD; Hyeran Lee; Reece Goiffon; Samuel Achilefu, PhD, "Fluorescence lifetime: the tau of in vivo optical imaging."

Barry Edwards, PhD; Walter Akers, DVM, PhD; Philip Cheney; Yunpeng Ye, PhD; Richard Laforest, PhD; Samuel Achilefu, PhD, "Monitoring receptor targeted tumor therapy with a multimodal imaging agent."

Ralph Noothdurfi, MS; Walter Akers, DVM, PhD; Samuel Achilefu, PhD; Joseph Culver, PhD, "High precision fluorescence lifetime tomography of a targeted optical probe in a living mouse."

Britney Moss; Shimon Gross, PhD; Anant Vinjamoori, MD; Christopher Contag, MD; David Piwnica-Worms, MD, PhD, "Real-time bioluminescence imaging of ligand-induced 1kTc:a signal transduction in live cells."

Kooresh Shoghi, PhD; Brian Finck, PhD; Kenneth Schechtman, PhD; Terry Sharp; Robert Gropler, MD; Michael Welch, PhD, "In vivo metabolic phenotyping of myocardial substrate metabolism in rodents: differential efficacy of metformin and rosiglitazone monotherapy."

Adil Bashir, PhD; Robert O’Connor, PhD; Robert Gropler, MD, "In vivo evaluation of high energy phosphate metabolism in myocardium."

Robert O’Connor, PhD; Gary Skolnick; Nicole Nejedly; Robert Gropler, MD; Samuel Klein, MD; Adil Bashir, PhD, "1H-MRS protocol optimization for hepatic lipid quantification."
Robert O’Connor, PhD; Jian Xu, PhD; Robert Gropler, MD; Adil Bashir, PhD, “Cross-validation of 1H-MRS quantification of myocardial lipid.”

William Spees, PhD; Tsang-Wei Tu; Sheng Kwei Song, PhD; Joel Garbow, PhD, “Separating lipid and water in high-field MR imaging using side-lobe spatial-spectral RF pulses.”

Ibrahim Ozcan, DSc, “Characterization and minimization of imaging gradients in diffusion tensor imaging.”

Adam Hajari; Dmitriy Yablonskiy, PhD; James Quirk, PhD; Alex Sukstanskii, PhD; Mark Conradi, PhD; Richard Pierce, PhD; Gaetan Deslee; Jason Woods, PhD, “Alveolar-duct geometry during expiration via 3He diffusion MRI.”

Andrea Pichler, PhD; Jayne Marasa; David Pivnic-Worms, MD, PhD, “Small molecule inhibition of mutant p53 transactivation of MDR1.”

Song Hu; Konstantin Maslov, PhD; Lihong Wang, PhD, “Monitoring the healing process of laser-induced microvascular lesions using optical-resolution photoacoustic microscopy.”

Chulhong Kim, PhD; Lihong Wang, PhD, “Photoacoustic and ultrasonic mapping of sentinel lymph nodes with an ultrasound array system.”

Heyu Wu, PhD; Daniel Keesing, PhD; Sergey Komarov, PhD; Tae Yong Song; Debasish Pal, PhD; Aswin Mathews, PhD; Joseph O’Sullivan, PhD; John Young, PhD; Yuan-Chuan Tai, PhD, “Virtual pinhole PET and application-specific PET insert devices.”

Tae Yong Song; Heyu Wu, PhD; Debasish Pal, PhD; Sergey Komarov, PhD; Joseph O’Sullivan, PhD; Stefan Siegel; Yuan-Chuan Tai, PhD, “Micro insert: extending the limit of animal PET image resolution.”

Dexing Zeng, PhD; David Reichert, PhD; Amit Desai, PhD; Tobias Wheeler, PhD; Paul Kenis, PhD, “Microfluidic radiometal labeling reactors.”

Daniel Marcus, PhD; Timothy Olsen, MS; Kevin Archie, PhD; Mohana Ramaratnam, MS; Sachin Dixit; Angela Jones, “The central imaging archive.”

Mikhail Milchenko; Daniel Marcus, PhD, “Ensuring research subject privacy in distribution of imaging data: anatomical surface obscuring approach.”

Kevin Cheng; Richard Laforest, PhD, “Iterative image reconstruction performance in microPET.”

Maiko Kume; Curtis Carey; Tom Voller; Carl Jenks, PhD; Suzanne Lopi, PhD; Michael Welch, PhD, “Advancements in non-standard radionuclide production and automations.”

Thaddeus Waddas, PhD; Christopher Sherman, MS; Jeffrey Miner, PhD; James Duncan, MD, PhD; Carolyn Anderson, PhD. “Using 153Gd to help determine how gadolinium chelates and renal insufficiency lead to nephrogenic systemic fibrosis (NSF).”

Andrei Vlassenko, MD, PhD; Denise Head, PhD; Yvette Sheline, MD; John Morris, MD; Mark Mintun, MD, “Preliminary data on the time course of beta-amyloid deposition.”
In this section, the names of employees who are full-time faculty or staff or who have an appointment in the Department of Radiology are highlighted in boldface type.

**PROMOTIONS**

Joseph Culver, PhD, assistant professor of radiology, was promoted to associate professor of radiology.

Kristopher Cummings, MD, instructor in radiology, was promoted to assistant professor of radiology.

Cheryl Herman, MD, instructor in radiology, was promoted to assistant professor of radiology.

Jack Jennings, MD, PhD, instructor in radiology, was promoted to assistant professor of radiology.

Michael Lin, MD, instructor in radiology, was promoted to assistant professor of radiology.

Michelle Miller-Thomas, MD, instructor in radiology, was promoted to assistant professor of radiology.

Kathryn Robinson, MD, instructor in radiology, was promoted to assistant professor of radiology.

David Rubin, MD, associate professor of radiology, was promoted to professor of radiology.

Naël Saad, MD, instructor in radiology, was promoted to assistant professor of radiology.

Akash Sharma, MD, instructor in radiology, was promoted to assistant professor of radiology.

Abraham Snyder, MD, PhD, research associate professor of radiology, was promoted to professor of radiology.

Pamela Woodard, MD, associate professor of radiology, was promoted to professor of radiology.

**JOINT APPOINTMENTS**

Igor Efimov, PhD, professor of biomedical engineering, was appointed professor of radiology and of cell biology and physiology.

Seung Kim, MD, assistant professor of radiology, was appointed assistant professor of surgery.

Naël Saad, MD, assistant professor of radiology, was appointed assistant professor of surgery.

**GRANTS**

Colin Derdeyn, MD, professor of radiology, of neurology, and of neurological surgery, as clinical site principal investigator, received a $47,715 grant from the National Institute of Neurological Disorders and Stroke for "Familial Intracranial Aneurysm (FIA) study II." Coinvestigators for the two-year grant are Christopher Moran, MD, professor of radiology and of neurological surgery; DeWitte Cross, MD, associate professor of radiology and of neurological surgery; and the Department of Neurosurgery’s Ralph Dacey, MD; Gregory Zipfel, MD; and Michael Chicoine, MD.

Geetika Khanna, MD, assistant professor of radiology, received a $14,776 grant from the National Institute of Health and National Childhood Cancer Foundation, for "A phase II study of ABT-751, an orally bioavailable tubulin binding agent, in children with relapsed or refractory neuroblastoma."

Daniel Marcus, PhD, research associate professor of radiology, as principal investigator, received a $1.5 million grant from the National Institutes of Health for "Birn resources facilitate the personalization of malignant brain tumor." Sarah Jost, MD, Swedish Neuroscience Institute, Seattle, Washington, is coprincipal investigator for the five-year grant. Coinvestigators are Tammy Benzinger, MD, PhD, assistant professor of radiology; Keith Rich, MD, professor of neurological surgery, of neurobiology, and of radiology; Abraham Snyder, PhD, MD, research associate professor of radiology and of neurology; Michael Chicione, MD, associate professor of neurological surgery; and Joel Garbow, PhD, research associate professor of radiology.

**Scott Lecture**

On November 18, William Peck, MD, director of the Center for Health Policy at Washington University in St. Louis, presented "Healthcare ‘insurance’ reform" at the Thirty-eighth Annual Wendell G. Scott Memorial Lecture.

Gilbert Jost, MD, head of the Department of Radiology and director of Mallinckrodt Institute, presented Peck (left) with a commemorative plaque.

Joel Garbow, PhD, research associate professor of radiology, was presented a certificate for his two-year grant from the National Institutes of Health. Richard L. H. Jenkins, MD, head of the Department of Radiology, presented the certificate.
Joel Perlmutter, MD, professor of neurology, of radiology, and of occupational therapy, received a $951,512 grant funded by the National Institutes of Health, American Recovery and Reinvestment Act, to study “Mechanisms of deep brain stimulation.” Coinvestigators for the two-year grant are Tamara Hershey, PhD, associate professor of psychiatry, of neurology, and of radiology; Tom Videen, PhD, professor of neurology and of radiology; Morvarid Karimi, MD, instructor in neurology; Gammon Earhart, PT, PhD, assistant professor of physical therapy and of anatomy and neurobiology; Samer Tabbal, MD, associate professor of neurology. Perlmutter, as coprincipal investigator, also received a $1.1 million subcontract from the $6 million grant for the project “The natural history and biospecimen repository for focal dystonia.” Coinvestigators for the five-year grant are Mark Watson, MD, PhD, assistant professor of pathology and immunology, and Rakesh Nagarajan, MD, PhD, associate professor of pathology and immunology. H. Jinah, MD, PhD, Emory University, Atlanta, Georgia, is principal investigator for the entire grant known as the Dystonia Coalition.

Barry Siegel, MD, professor of radiology and of medicine, as an investigator for the Washington University subcontract, received a two-year grant from the National Institutes of Health for research on “Comparative effectiveness of advanced imaging in cancer.” Anna Tosteson, ScD, Dartmouth College, Hanover, New Hampshire, is principal investigator for the grant.

APPOINTMENTS/ELECTIONS

Marcus Kessler, MD, pediatric radiology clinical fellow, was appointed to the Diagnostics Committee of the Society for Pediatric Radiology.

John Kotyk, PhD, research associate professor, was appointed to a two-year term on the Steering Committee of the Imaging Working Group, Clinical and Translations Sciences Award, Academy of Molecular Imaging.

Bradley Schlaggar, MD, PhD, associate professor of neurology, of anatomy and neurobiology, of radiology, and of pediatrics, was elected to a three-year term as member-at-large of the Washington University Research Affairs Committee.

Bruce Whiting, PhD, research assistant professor, was appointed to a three-year term on the editorial board of the journal Medical Physics.

LECTURES

Colin Derdeyn, MD, professor of radiology, of neurology, and of neurological surgery, presented “Cerebral hemodynamics/COSS trial update” at the St. Louis Cerebrovascular Surgery Course, St. Louis, Missouri, September 27. He spoke on “Endovascular neurointervention” at the Comprehensive Brain Anatomy and Neurological Assessment Course, St. Louis, Missouri, October 8. He spoke on “Acute stroke intervention” at Brain Attack 2009 (a Washington University CME course organized by the departments of Radiology, Neurology, and Neurosurgery), St. Louis, Missouri, October 10.

Bennett Greenspan, MD, assistant professor of radiology, spoke on “Nuclear medicine cases—read with the experts” at the annual meeting of the Missouri Valley Chapter, Society of Nuclear Medicine, Kansas City, Missouri, October 18.

Robert McKinstry, MD, PhD, associate professor of radiology and of pediatrics, spoke on “Brain imaging in pediatric epilepsy” at Pediatric Neurotherapeutics, St. Louis, Missouri, October 3.
Lectures

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Barry Siegel, MD, professor of radiology and of medicine, spoke on “PET/CT in thoracic oncology” and “PET/CT in women’s cancers” at the 2009 Annual Convention of the Puerto Rico Society of Nuclear Medicine, San Juan, September 25-27. As keynote speaker for the symposium “The Evolution of PET—A Decade of Pursuit for Excellence,” he presented “A decade of PET—impact on cancer management” at Hong Kong Sanatorium and Hospital, Hong Kong, October 28. The Howard Kay Memorial Lecturer, Siegel spoke on “The National Oncologic PET Registry and reimbursement for PET/CT” and also presented “Treatment response assessment with PET and PET/CT: current status” at the 23rd Annual Northeast Regional Scientific Meeting of the Greater New York and New England chapters of the Society of Nuclear Medicine, Rye Brook, New York, November 7. He spoke on “Gynecologic cancers,” “Monitoring and predicting response to therapy: part I,” and “Monitoring and predicting response to therapy: part II” at the National Diagnostic Imaging Symposium, Lake Buena Vista, Florida, December 7.

Marilyn Siegel, MD, professor of radiology and of pediatrics, spoke on “Advances in pediatric abdominal MRI” at the MRI and Clinical Application Forum, Beijing, People’s Republic of China, September 18. As visiting professor, she spoke on “Bone marrow imaging” at the Capital Institute of Pediatrics, Radiology Department, Beijing, September 19. She presented “Acute pediatric abdomen”; “CT pediatric pelvic masses”; “Pediatric CTA: advantages, applications and radiation risks”; and “CT of congenital lung anomalies” at the 14th Annual Computed Tomography 2009: National Symposium, Las Vegas, Nevada, October 15 and 16. As visiting professor, Siegel presented the 28th Annual John Patrick Caffey Memorial Lecture on “Pediatric body MRI: advances and clinical applications” and also spoke on “CT of congenital lung anomalies” and “CTA adult congenital heart disease” at noon conferences, Children’s Hospital of Pittsburgh, Pennsylvania, October 22. She spoke on “Elastometry imaging techniques of the liver” at the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition Postgraduate Course, National Harbor, Maryland, November 12.

Pamela Woodard, MD, professor of radiology, as the Avis K. Freimanis Visiting Professor, presented “Principles of cardiac MRI” and “Delayed contrast-enhanced MR imaging” at Michigan State University, Department of Radiology, Lansing, October 27. As invited lecturer, she presented “Advances in pulmonary CT and coronary CT angiography” at the 66th Annual Carman Lecture, sponsored by the Greater St. Louis Society of Radiologists and cosponsored by the St. Louis Metropolitan Medical Society, St. Louis, Missouri, October 29. She spoke on “Pulmonary MR angiography methods and challenges in PIOPED II” in a session on Clinical Trials: The Results of Prospective Investigation in Pulmonary Embolism Dx-III, at Chest 2009, the annual meeting of the American College of Chest Physicians, San Diego, California, November 2.

Dmitriy Yablonskiy, PhD, professor of radiology and of physics, presented “Probing lung microstructure at the alveolar level using lung morphometry with hyperpolarized 3He diffusion MR” at the 4th International Workshop on Pulmonary Functional Imaging, Harvard Medical School, Boston, Massachusetts, September 24-26. He spoke on “Quantitative T2* contrast—qBOLD, GEPCI and phase” at the 7th Bi-annual Minnesota Workshop on High Field MRI, Minneapolis, October 6-11.

Symposts

In the fall of 2009, the National Institutes of Health will celebrate 100 years of breast cancer research. Many of the advances in breast cancer research that have been made possible by clinical trials and improvements in diagnostic imaging will be presented at this year’s meeting. The 8th Annual Conference on Imaging in Breast Cancer Research, titled “Imaging in Breast Cancer: Celebrating 100 Years of Progress,” will take place October 23-25, 2009, at the New York Hilton Midtown, New York City. The conference will feature invited speakers from around the world who will present cutting-edge research on the latest developments in breast cancer imaging, focusing on the role of imaging in breast cancer research and treatment. The meeting will also feature a variety of workshops and symposia, as well as a poster session where attendees can present their own research. The program is designed to provide a comprehensive overview of the latest advances in breast cancer imaging and to foster collaboration among researchers in the field.
In this section of FYI, only those faculty and staff who have Department of Radiology appointments are listed.

**SYMPOSIA**

SOCIETY FOR MOLECULAR IMAGING

World Molecular Imaging Congress
Montreal, Canada
September 23-26, 2009

John Kotyk, PhD, “Future directions for non-invasive imaging in drug discovery.”

Jothilingam Sivapackiam, PhD; Scott Harpsrte, MS; Julie Prior; David Pivnica-Worms, MD, PhD; Vijay Sharma, PhD, “Novel 67/68 gallium-radiopharmaceuticals for monitoring MDR1 P-glycoprotein-mediated transport at the blood-brain barrier (BBB).”

Michael Welch, PhD, “Characterizing the theoretical and effective specific activity of PET radiotracers.”

Tetsuya Mori, PhD; Michael Welch, PhD, "Cu-ATSM imaging for cancer stem cell-rich regions: in vivo and in vitro characterization."

Ralph Nothdurft, MS; Joseph Culver, PhD; Samuel Achilefu, PhD, "A multi-frequency analysis of fluorescence lifetime diffuse optical tomography."

Walter Akers, DVM, PhD; Samuel Achilefu, PhD, "Optical imaging of tumors using a near-infrared synthetic probe for cell death." Robert Mach, PhD; Chenbo Zheng, PhD, "Sigma 2 receptor as potential indicator of stem cell differentiation.”

Riccardo Ferdani, PhD; Carolyn Anderson, PhD, "Cu-64 liposomal labeling methods using bifunctional chelators (CB-TE2A vs TETA) and in vivo stability.”

Delphine Chen, MD; James Kozlowski, MS; Mark Mintun, MD, “Evaluation of pulmonary anti-inflammatory response with [18F]fluorodeoxyglucose positron emission tomography.”

Thaddeus Wadas, PhD; Christopher Sherman, MS; James Duncan, MD, PhD; Carolyn Anderson, PhD, “The biodistribution of [153Gd]Gd-labeled MR contrast agents differs greatly in wild-type mice and a transgenic mouse model of renal failure.”

Duanwen Shen; Wilson Edwards, PhD, “Discovery of peptide ligands by phage display for PET/SPECT/optical imaging of PSMA.”

Walter Akers, DVM, PhD; Samuel Achilefu, PhD, “Optical imaging of tumors using a near-infrared synthetic probe for cell death.”

Ralph Nothdurft, MS; Joseph Culver, PhD; Samuel Achilefu, PhD, “A multi-frequency analysis of fluorescence lifetime diffuse optical tomography.”

David Pivnica-Worms, MD, PhD, “Introduction to reporter genes.”

**Melson Lecture**

Dushyant Sabani, MD, associate professor of radiology at Harvard University and director of CT imaging services at Massachusetts General Hospital, presented the Seventeenth Annual G. Leland Melson Visiting Professorship and Lecture on September 16. He spoke on “Novel imaging methods for oncologic treatment response assessment and monitoring angiogenesis.”

Sabani (left) is shown with Jay Heiken, MD, professor of radiology.
SYMPOSIA
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James Johnson, PhD; Brandon Kocher, PhD; Dustin Maxwell, PhD; David Piwnica-Worms, MD, PhD, "Caspase-activated cell-penetrating probes for in vivo optical imaging of retinal neurodegeneration."

Shimon Gross, PhD; Seth Gammon, PhD; Britney Moss; David Piwnica-Worms, MD, PhD, "Bioluminescence imaging of myeloperoxidase activity in vivo."

Britney Moss; David Piwnica-Worms, MD, PhD, "Real-time bioluminescence imaging of ligand-induced IκBα signal transduction in cellulo and in vivo."

Seth Gammon, PhD; James Johnson, PhD; David Piwnica-Worms, MD, PhD, "Direct injection chemotherapy of a synthetic hydraphile channel in living mice monitored by optical imaging with a near infrared fluorescent probe."

NORTH AMERICAN SOCIETY FOR CARDIO-VASCULAR IMAGING
37th Annual Meeting
Orlando, Florida
October 2-6, 2009

LECTURES
Pamela Woodard, MD, "Reimbursement issues: MR & CT."
Sanjeev Bhalla, MD, "Coronary artery anomalies."
Donna Lesniak, RN, "Patient care radiology."

PRESENTATIONS
Kyle McComnis; Raffaella Rossin; Robert Gropler, MD; Jie Zheng, PhD; Michael Welch, PhD; Pamela Woodard, MD, "Extracellular matrix deposition and natriuretic peptide receptor-C expression in restenosis after angioplasty: a MRI and PET imaging study in rabbits."
SECOND PLACE WINNER: POSTER COMPETITION

Andrew Bierhals, MD; Fernando Gutierrez, MD, "Assessing cardiovascular pacing leads: the CT and radiograph appearance of pacemaker leads.
SECOND PLACE WINNER: POSTER COMPETITION

Thomas Pilgram, PhD; Pamela Woodard, MD, "A novel method for the non-invasive assessment of homograft function in children: a Doppler echo, CT angiography, and catheterization correlative study."

POSTERS
Pamela Woodard, MD; Yoram Rudy, PhD, "Electrophysiological substrate and intraventricular dysynchrony in non-ischemic patients undergoing cardiac resynchronization therapy: observations using ECG imaging and tissue synchronization imaging."
FIRST PLACE WINNER: POSTER COMPETITION

Andrew Bierhals, MD; Sanjeev Bhalla, MD, "Multi-imaging modality assessment of aortic annulus dimension for transcatheter aortic valve replacement: TTE vs. TEE vs. CT scan."
SECOND PLACE WINNER: POSTER COMPETITION

Pamela Woodard, MD, "Iso-osmolar contrast agent influence on heart rate during coronary computed tomography angiography."

Kyle McComnis; Robert O'Connor, PhD; Donna Lesniak, RN; Robert Gropler, MD; Pamela Woodard, MD; Jie Zheng, PhD, "In vivo MRI methods for estimation of global myocardial oxygenation: initial experience."

Andrew Bierhals, MD; Sanjeev Bhalla, MD, "Manual vs. automated arterial diameter determination by CT angiography of the aorto-femoral arteries."

Donna Lesniak, RN; Thomas Pilgram, PhD; Pamela Woodard, MD, "Assessment of coronary artery vasculopathy in patients with cardiac transplantation using dual source CT."

Editor's Note: In the feature article "Sharpening the Gamma Knife" that appeared in the Summer/Fall 2009 issue of Focal Spot, Tamn Benzinger, on page 16, was incorrectly identified as an associate professor of radiology. She is an assistant professor of radiology.
More than 70 contemporary works of art are displayed in the South Building of Chicago’s McCormick Place, site of RSNA’s annual meeting. Shown is an untitled, steel-and-glass piece by Costas Varotsos.

Photograph by MIR Photography Lab.