Breathing easier

Research breakthrough will benefit patients with lung disease
Some of the earliest cardiac angiography studies were conducted at Mallinckrodt Institute. Prior to the introduction of spiral scanning and multislice technology, as provided by computed tomography, earlier technologies were too slow to capture high-resolution cardiac images.

2 RSNA 2010: Personalized Medicine
MIR faculty and staff were among the 60,000 medical and science professionals attending the 96th Annual Meeting of the Radiological Society of North America.

10 LINC to the History of Personal Computing
An interactive exhibit currently on display in the School of Medicine’s Bernard Becker Library is a tribute to the pioneering Laboratory Instrument Computer, regarded by many as the first personal computer.

15 Cancer Research Imaging Camp 2010
For the second consecutive year, Mallinckrodt Institute hosted an intensive course on in vivo and live cell-imaging techniques, sponsored by the National Cancer Institute.

18 Breathing Easier
Scientists are using a technique, developed at Washington University Medical Center and its associated data analysis to identify living lung pathology at very early stages.

23 A History of MIR
The Mallinckrodt Institute lobby is home to a poster display depicting historical events throughout the Institute’s 75-plus years of providing top quality clinical, research, and educational services.

ON THE COVER: Dimitriy Yablonskiy, PhD, uses helium-3 morphometry and magnetic resonance imaging to measure levels of damage to the living lung. Photograph by Tim Parker.
Nanotechnology research program focuses on heart and lung diseases

An $18 million award from the National Heart, Lung, and Blood Institute of the National Institutes of Health will fund five years of collaborative research at five institutions: Washington University School of Medicine (WUSM), Texas A&M University, University of Texas Southwestern Medical Center, and the University of California, Santa Barbara and Berkeley. Coprincipal investigators are Michael Welch, PhD, professor of radiology, of chemistry, and of molecular biology and pharmacology, WUSM, and Karen Wooley, PhD, of Texas A&M University.

Aimed at finding nanotechnology-based therapies and diagnostic tools for treating heart and lung diseases, the research initiative includes four principal projects:

- Develop nanoparticles to aid clinicians in the early detection of atherosclerosis. Group leader: Pamela Woodard, MD, professor of radiology, WUSM.
- Develop targeting molecules to facilitate nanoparticle binding with cell receptors present in heart and lung diseases. Group leader: Karen Wooley, PhD.
- Develop nanoparticles for treating patients with cystic fibrosis. Group leader: Carolyn Cannon, MD, PhD, University of Texas Southwestern Medical Center.
- Use nanoparticles to diagnose and treat acute lung inflammation. Group leader: Steven Brody, MD, WUSM.

Michael Welch, PhD, professor of radiology, of chemistry, and of molecular biology and pharmacology, was one of 11 Washington University School of Medicine faculty members honored at the 2011 Distinguished Faculty Awards ceremony.

Cosponsored by the Dean’s office, the Office of Faculty Affairs, Central Administration, and the Executive Committee of the Faculty Council, the awards recognize outstanding achievement in clinical care, research, teaching, and community service.

At the award ceremony, Welch (second from right) received a Distinguished Investigator Award, presented by (left to right) Karen O’Malley, PhD, professor of anatomy and of neurobiology; Larry Shapiro, MD, executive vice chancellor for medical affairs and dean; and Diana Gray, MD, professor of obstetrics and gynecology and of radiology, and associate dean for faculty affairs. Photograph by Bob Boston, WUSM.
New edition of pediatric imaging textbook available

Pediatric Sonography, now in its fourth edition, has been called the “go-to book on pediatric ultrasound.” Authored by Marilyn Siegel, MD, professor of radiology and of pediatrics, this latest edition provides a complete working knowledge of the latest scanning technologies and the most recommended clinical applications in pediatric and adolescent patients. Seventeen chapters—including 14 site-specific chapters—and more than 1,500 ultrasound images offer expert guidance in understanding disease processes. Published by Lippincott Williams & Wilkins, Pediatric Sonography provides the clinician with the necessary tools to rapidly recognize normal and abnormal pediatric anatomy.

MIR training programs earn top rankings

In its summary review of 55 fellowship programs, the American Board of Radiology ranked Mallinckrodt Institute’s Neuroradiology Fellowship Program as number one, based on fellow performance in the examination for Certificate of Added Qualifications. Annually, nine fellows are accepted into the one-year program. Program director is Katie Vo, MD, associate professor of radiology; assistant program director, Michelle Miller-Thomas, MD, assistant professor of radiology.

AuntMinnie.com—the leading online resource for radiology professionals—annually presents awards (called The Minnies) to recognize excellence in radiology. Mallinckrodt Institute’s Diagnostic Radiology Residency Program received the 2010 top award for radiology residency training. Program director is Jennifer Gould, MD, assistant professor of radiology.

Of note

• John Kotyk, PhD, research associate professor of radiology, was elected to a one-year term as treasurer of the Academy of Molecular Imaging.

• David Loy, MD, PhD, instructor in radiology, and Jonathan McConathy, MD, PhD, assistant professor, were appointed codirectors of the Institute’s Research Residency Program.

• Jonathan McConathy, MD, PhD, assistant professor of radiology, was elected to a three-year term on the Board of Directors for the Society of Nuclear Medicine’s Molecular Imaging Center of Excellence.

• Robert McKinstry, MD, PhD, professor of radiology and of pediatrics, was appointed director of Mallinckrodt Institute’s Center for Clinical Imaging Research.

• Stephen Moore, MS, research assistant professor, received the Second Annual Ad Hoc Harley Award from Healthcare Standards for his outstanding contributions to the forwarding of healthcare standardization, ensuring that “more than 1000 products work with each other, using more than 200 different specifications.”
RSNA 2010

PERSONALIZED MEDICINE: In Pursuit of Excellence
NOVEMBER 28 - DECEMBER 3 • McCormick Place, Chicago
Exhibit LL-QSE304.1-TUA
MIR PRESENTATIONS AT RSNA 2010

EDUCATION EXHIBITS AND SCIENTIFIC POSTERS

Vincent Mellnick, MD; Russell Allman, MD; Elizabeth Sheybani, MD; Meghan Lubner, MD; Christine Menias, MD; Sanjeev Bhalla, MD, “Taking stalk: imaging and management of polyps in 2010.” — MAGNA CUM LAUDE AWARD

Meghan Lubner, MD; Marissa Simard, MD; Christine Peterson, MD; Sanjeev Bhalla, MD; Perry Pickhardt, MD; Christine Menias, MD, “Twist and shout: spectrum of non-bowel torsion.” — CUM LAUDE AWARD

Meghan Lubner, MD; Louis Hinshaw, MD; Nael Saad, MBBCh; Christine Menias, MD; Prasad Dalvie, MD; Christopher Brace, PhD; Fred Lee, MD, “Postprocedural imaging of liver-directed therapy.” — CERTIFICATE OF MERIT AWARD

Rex Parker, MD; Clinton Jokerst, MD; Vincent Mellnick, MD; Constantine Raptis, MD; Sanjeev Bhalla, MD; Jonathan Baker, MD; Katie Vo, MD, “eMeRgencles: MR imaging of emergent conditions.” — CERTIFICATE OF MERIT AWARD

Rex Parker, MD; Kathryn Fowler, MD; Seth Cardall, MD; Angela Tai, MD; Constantine Raptis, MD; Christine Menias, MD; Vamsi Narra, MD, “Thinking outside the appendix: MR imaging of the acute abdomen in pregnancy.” — CERTIFICATE OF MERIT AWARD

Kartikeya Kantawala, MD, DMRD; Sushilkumar Sonavane, MD; Christine Menias, MD, “Beyond reflux esophagitis: radiologic interpretation of strictures of the esophagus.” — CERTIFICATE OF MERIT AWARD

Constantine Raptis, MD; Demetrios Raptis; Kathryn Fowler, MD; Travis Henry, MD; Christine Menias, MD; Sanjeev Bhalla, MD, “Pseudo-Pseudo-Pseudo! Pseudolesions of the chest, abdomen, and pelvis.” — CERTIFICATE OF MERIT AWARD

Meghan Lubner, MD; Leslie Johnson, MD; Tabassum Kennedy, MD; Lindell Gentry, MD; Perry Pickhardt, MD; Sanjeev Bhalla, MD; Christine Menias, MD, “Paragangliomas from head to toe: imaging and pathologic findings.” — CERTIFICATE OF MERIT AWARD

Carlos Restrepo, MD; Steven Bailey, MD; Eric Kumara; Fernando Gutierrez, MD; Jorge Lopata, MD; Santiago Martinez-Jimenez, MD; Rajeev Suri, MD, “Pulmonary artery stents: imaging overview.” — CERTIFICATE OF MERIT AWARD

Carlos Restrepo, MD; Santiago-Martinez-Jimenez, MD; Fernando Gutierrez, MD; Felipe Munera, MD; Terry Bauch, MD; Michael McCarthy, MD, “Cardiac trauma: the role of imaging in diagnosis and patient care.” — CERTIFICATE OF MERIT AWARD

Steven Don, MD; Bruce Whiting, PhD; Lois Rutz, MS; Bruce Apgar, MS, “New digital radiography standards simplified for radiologists and technologists.” — CERTIFICATE OF MERIT AWARD

Geetika Khanna, MD; Kristopher Cummings, MD; Gautam Singh, MD; Sanjeev Bhalla, MD, “Complications of the Fontan circulation: a review based on 40 cases with a failing Fontan circuit.” — CERTIFICATE OF MERIT AWARD

Christine Menias, MD; Kartikeya Kantawala, MD, DMRD; Sushilkumar Sonavane, MD; Khaleed Elsayes, MD, “Complications of gallstones: the Mirizzi syndrome, gallstone ileus, Bouveret syndrome, gallstone pancreatitis, and complications of lost gallstones.” — CERTIFICATE OF MERIT AWARD

Alexander Ho, MD; Mittul Gulati, MD; Ting Tao, MD, PhD; Christine Menias, MD, “Uncommon autoimmune diseases of the abdomen and pelvis: You mean it’s not inflammatory bowel disease (IBD)?” — CERTIFICATE OF MERIT AWARD

Srinivas Peddi, MD; Cade McDowell, MD; Jennifer Demertzis, MD, “MR imaging of injuries in the overhead throwing athlete.” — CERTIFICATE OF MERIT AWARD

Clinton Jokerst, MD; Frank Yu; Sara Dyrstat, MD; Michelle Miller-Thomas, MD, “MR imaging findings in glioblastoma treated with bevacizumab.” — CERTIFICATE OF MERIT AWARD

Jason Stephenson, MD; Michael Holcomb, MD; Jonathan Baker, MD; Daniel Wessell, MD, PhD, “Operative management of common adult acquired foot deformities: surgical procedures and postoperative imaging evaluation.” — CERTIFICATE OF MERIT AWARD

FOCAL SPOT, FALL/WINTER 2010-2011
Kartikeya Kantawala, MD, DMRD; Geetika Khanna, MD; Rebecca Hulett-Bowling, MD; Martin Keller, MD, “Cross-sectional imaging of blunt abdominal trauma in children: an interactive case-based review.”

Nichols Rhodes, MD; Jonathan Baker, MD; Daniel Wessel, MD, PhD; Christine Menias, MD; Sanjeev Bhalla, MD, “Bone outside the bone: the spectrum of extraskeletal ossification.”

Kristopher Cummings, MD; Laura Heyneman, MD; Narinder Paul, MD; Scott Nagle, MD, PhD; Joseph Azok, MD; Sharon D’Souza, MD; Sanjeev Bhalla, MD; Constantine Raptis, MD; Pamela Woodard, MD; Kok Tan, MD; Hrudaya Nath, MD; Jubal Watts, MD; Salman Allana, MD; Laura Juan, MD; Susan James, MD; Djeven Deva, MBCh; Jon Keevil; Vikramjit Chhokar, MD, “Cardiac case of the day.”

Vincent Mellnick, MD; Rex Parker, MD; Travis Henry, MD; Sanjeev Bhalla, MD; Christine Menias, MD, “Imaging an epidemic: a pictorial review of obesity and associated conditions.”

Alampady Shanbhogue, MD, MBBS; Raghunandan Vikram, MBBS; Venkata Kataabathina, MD; Naoki Takahashi, MD; Christine Menias, MD; Srinivasa Prasad, MD, “Genotype-phenotype taxon-omy of hepatocellular adenomas: 2010 update.”

Venkateswar Surabhi, MBBS; Heng-Hsiao Liu, MD; Alampady Shanbhogue, MD, MBBS; Christine Menias, MD; Srinivasa Prasad, MD, “Cocaine-induced abdominal catastrophes: imaging spectrum.”

Venkateswar Surabhi, MBBS; Heng-Hsiao Liu, MD; Alampady Shanbhogue, MD, MBBS; Christine Menias, MD; Srinivasa Prasad, MD, “Primary and unusual abdominal wall hernias: imaging spectrum.”

Kumaresan Sandrasegaran, MD; Christine Menias, MD; Alampady Shanbhogue, MD, MBBS; Mark Frank, MD; Temel Tirkes, MD; Mark Tann, MD; Aashish Patel, MD; Srinivasa Prasad, MD, “Findings in upper GI fluoroscopy examinations.”

Kumaresan Sandrasegaran, MD; Chandana Lall, MD; Aashish Patel, MD; Sadhna Verma, MD; Christine Menias, MD; Alampady Shanbhogue, MD, MBBS; Srinivasa Prasad, MD; William Berry, MD, “Orthotopic liver transplantation: the critical first 72 hours.”

Kumaresan Sandrasegaran, MD; Thomas Howard; Pratheeshaa Nageswaran; Chandana Lall, MD; Christine Menias, MD; Mark Tann, MD; Aashish Patel, MD, “What the oncologist and surgeon want to know in pancreatic carcinoma.”

Vilaas Shetty, MD; Rex Parker, MD; Martin Reis, MD; Christine Menias, MD; Dennis Balfe, MD; Kathryn Fowler, MD, “Get in my belly: CT imaging of benign gastric disease.”

Stacy O’Connor, MD; Perry Pickhardt, MD; Sanjeev Bhalla, MD; Meghan Lubner, MD; Kathryn Fowler, MD; Christine Menias, MD, “Liver enzymes: a radiologist’s guide.”

Kumaresan Sandrasegaran, MD; Hans Mouser, MD; Christine Menias, MD; Temel Tirkes, MD; Alampady Shanbhogue, MD, MBBS; Srinivasa Prasad, MD; Sadhna Verma, MD; Chandana Lall, MD; Mark Frank, MD, “So you think you are an expert on scrotal sonography?”

Meghan Lubner, MD; James Hanson, MD; Orhan Oztan, MD; Noel Saad, MBCh; Christine Menias, MD, “Vascular complications of solid organ transplant in the abdomen and pelvis.”

Mittul Gulati, MD; Alexander Ho, MD; Steven Sack, MD; Cary Siegel, MD, “Sometimes they come back—imaging of primary renal cell carcinoma subtypes correlated with patterns of recurrence and metastasis.”

Timothy Olsen, MS; John Paullett, MS; Kevin Archie; Mohana Ramaratnam; Daniel Marcus, PhD, “The XNAT imaging informatics platform.”

Daniel Marcus, PhD; John Paullett, MD; Timothy Olsen, MS; Jenny Gunney, MS; Kevin Archie; Mohana Ramaratnam, “An institution-wide informatics environment for managing imaging-based clinical research.”
Mikhail Milchenko, PhD; Daniel Marcus, PhD, “XNAT Desktop (XND): an open source tool for organizing and sharing research imaging data.”

Abhijit Sunnapwar, MD; Rashmi Katre; MD Shaile Chaudhary, MD; Arpit Nagar, MBBS; Ashish Wasnik, MD; Sushilkumar Sonavane, MD, “Value of MR imaging in duodenal imaging.”

INFORMATICS
Lawrence Tarbox, PhD; Patric Ljong, PhD; Gianluca Paladini, BENG, “Rapid application development with XIP™—the eXtensible Imaging Platform.”

MULTISESSION COURSES
William Morrison, MD; David Rubin, MD; Lawrence White, MD, “Case-based review of magnetic resonance: musculoskeletal—lower extremity (in conjunction with the International Society for Magnetic Resonance in medicine).”

QUALITY STORYBOARDS
James Duncan, MD, PhD; Mandie Street, ARRT, Prathusha Tatiniy, “Improving team performance during the procedure time-out.”

James Duncan, MD, PhD; Mandie Street, ARRT, “Strategies for preventing catheter-associated bloodstream infections.”

Robert McKinstry, MD, PhD; Ronald Evens, MD; Sreevathsan Sridhar; Stephen Currie; Emily Beck; Mandie Street, ARRT; James Duncan, MD, PhD, “Optimizing radiation use during computed tomography and fluoroscopy.”

REFRESHER COURSES
Daniel Wessell, MD, PhD; Travis Hillen, MD; Jeffrey Peterson, MD; Robert Lopez-Ben, MD, “Musculoskeletal bone biopsy: an interactive session (How-to workshop).”

Marilyn Siegel, MD, “Practical pediatric vascular imaging (an interactive session): CT imaging.”

Sanjeev Bhalla, MD, “Knives and guns: imaging penetrating trauma—thorax.”

Christine Menias, MD, “Knives and guns: imaging penetrating trauma—abdomen.”

OF NOTE
RSNA Research Resident Grant
Joseph Ippolito, MD, PhD—High throughput RNA interference and pharmaceutical screens of GABA metabolism in prostate cancer hypoxia

Research Medical Student Grant
Yuan Rao, BS (Eng), WUSM—Comparison and correlation of FDG-PET and T2-PS MRI in the assessment of cervical cancer

Mentor: Perry Grigsby, MD, MBA
REFRESHER COURSES continued
Cylen Javidan-Nejad, MD; Carol Langford, MD, MHS; Tan Lucien Mohammed, MD; Aletta Frazier, MD, “CT and MR imaging of thoracic vasculitides (How-to workshop).”

Scientific Sessions

Laura Fayad, MD; David Rubin, MD, “Musculoskeletal (Quantitative imaging).”
Regina Beets-Tan, MD; Laura Carucci, MD; Sharlene Teefey, MD, “ISP: gastrointestinal (rectal cancer: advanced imaging).”
James Duncan, MD, PhD, “Showcase of quality improvement projects: Introduction to quality showcase.”
James Duncan, MD, PhD, “Showcase of quality improvement projects: Improving team performance during the procedure time-out.”

RSNA 2010
MeetIng Facts

• 60,000 international medical – and science – professional attendees
• 4,200 scientific papers, posters, and education exhibits
• 700+ technical exhibits
• 300+ refresher courses

Colin Derdeyn, MD, “Neuroradiology (interventional).”
Pamela Woodard, MD; Cylen Javidan-Nejad, MD; Bayne Selby, MD, “Cardiac (CT/MR imaging: quantitative techniques).”
Lisa Rohrer, MA; Soo Mar; Joshua Shimony, MD, PhD; Abraham Snyder, MD, PhD; Tamnie Benzinger, MD, PhD, “Neuroradiology/head and neck (white matter and diffusion): radial and axial diffusivity correlates of leukodystrophy type and severity.”
Louis Gilula, MD, “Interventional musculoskeletal pain and tumor treatment: Does vertebroplasty improve health-related quality of life?”
Gautham Reddy, MD; Richard White, MD; Pamela Woodard, MD, “Cardiac (CT/MR imaging: left atrium before and after ablation).”
Suhny Abbara, MD; Kent Yucel, MD; Andrew Bierhals, MD, “Cardiac (CT/MR imaging: cardiomyopathies III).”
Lina Nayak; Suresh Vedantham, MD, “Vascular/interventional (a day in the life of an interventional radiologist)—Post-thrombotic syndrome: early outcomes of imaging-guided endovascular.”
Jie Luo, MS; Anne Cross, MD; Pascal Sati, Dipl Eng, PhD; Dmitry Yablonskiy, PhD, “Quantitative monitoring of the multiple sclerosis progression using gradient echo plural contrast imaging technique.”
Richard Brown, MD; Yusuf Menda, MD; Bennett Greenspan, MD, “Nuclear medicine (oncology: PET).”
Richard Duszak, MD; Robert Optican, MD; Pamela Woodard, MD, “Utilization and coverage of cardiac CT and coronary CTA: early Medicare claims experience.”

SPECIAL PRESENTATIONS
Ann Leung, MD; Henry Royal, MD; Lynne Hurwitz, MD; Helen Winer-Muran, MD; Phillip Boiselle, MD, “Imaging the pregnant patient for pulmonary embolism.”
Pamela Woodard, MD, “Coronary CT angiography: Should it be part of clinical practice?”

Hajime Sakuma, MD; Cylen Javidan-Nejad, MD; Bernd Wintersperger, MD, “Cardiac (cardiac MR imaging: coronary anatomy and myocardium).”
The Annual MIR Reception at RSNA2010

NOVEMBER 29, 2010
CHICAGO CULTURAL CENTER

Above: (left to right) Russell Allman, MD; Paul Holcombe, MD; Vilaas Shetty, MD; Joanna Allman

Right: Scott Mirowitz, MD and (right) Gary Brink, RT, BS

Above: Anil Khosla, MD, and (right) Aseem Sharma, MD

Above: (left to right) Otha Linton, MSJ; Clark West, MD; and Ronald Evens, MD

Above: Sandy Ruhs, MD; David Ruhs; Dennis Balfe, MD

Left: Perry Pickhardt, MD, and (right) Gilbert Jost, MD

FOCAL SPOT, FALL/WINTER 2010-2011
On November 5, 2010, a group of graying computer scientists gathered at the School of Medicine’s Bernard Becker Medical Library for the launch of an exhibit that brought back happy memories for them – and illuminated for the crowd an overlooked piece of computing history, tied closely to Washington University. At the heart of the exhibit is a pioneering piece of equipment: a Laboratory Instrument Computer (LINC), along with an interactive display that traces the nearly 40-year history of LINC, which many regard as the first personal computer.

by Candace O’Connor
his gathering was a nostalgic event,” said Gilbert Jost, MD, professor of radiology and director of Mallinckrodt Institute of Radiology. “It gave us a chance to think back on the remarkable accomplishments of some talented individuals who, for a time, established Washington University as one of the most important centers in the world for using computers to solve biomedical problems.”

Among the crowd were some of the LINC’s developers. One was Wesley Clark, the Massachusetts Institute of Technology (MIT) researcher who created the LINC at MIT’s Lincoln Laboratory with his late colleague, Charles Molnar. Another was Mary Allen Wilkes, who wrote LINC’s interactive operating system. Still others were computer pioneer Severo Ornstein, who has written a book describing the LINC’s development, and LINC veterans Maury Pepper, Gerald Johns, and Tom Chaney who have worked in recent years with colleague Scott Robinson on LINC reconstructions.

Also present was a key member of the LINC team: Jerome Cox, DSc, professor of radiology from 1986-98 and currently senior professor in the Department of Computer Science and Engineering at Washington University. In 1963, he was appointed to a LINC Evaluation Board that chose teams to test the LINC’s usefulness in lab research. Recognizing the device’s potential, he persuaded a Washington University researcher to apply for—and win—one of the first LINCs.

Then in 1964, Cox convinced Washington University to recruit the LINC’s 20-member group to campus. After the move, they focused on further LINC development and also helped faculty members make biomedical discoveries. Versatile and powerful in its time, yet accessible to nonspecialists, LINC enabled significant research advances to be made.

“The LINC demonstrated that a computer could be used and managed by a single person.”

“The LINC demonstrated that a computer could be used and managed by a single person,” says Cox. “Researchers could write their own programs, interface the machine to their lab equipment, control experiments and analyze results. This seems commonplace today, but forty-nine years ago it was unique.”

Top: Jerome Cox, DSc (at podium), the driving force behind the LINC display
Above: Mary Allen Wilkes, speaking at the LINC exhibit launch.

THE LINC DEMONSTRATED THAT A COMPUTER COULD BE USED AND MANAGED BY A SINGLE PERSON.”
THE LINC: PIONEERING TECHNOLOGY

The LINC on display at Becker Library is a reconstruction, with many parts from an original LINC owned by the University of Wisconsin and some parts from other LINCs once owned by Washington University. Over a period of months, the veteran team of Johns, Pepper, and Robinson pieced the computer together with painstaking care in a basement room of Mallinckrodt Institute’s East Building.

Imposing by today’s standards, the LINC in its day was smaller than any existing computer and easier to use. Taking relatively little laboratory space, LINC had four modules: a control console, an oscilloscope module, a terminal module that could connect to specialized lab equipment, and the LINC tape module that stored data and programs. Its small, reliable tape drive was its most important innovation—an ancestor of later floppy disks.

In 1962, when the MIT group developed LINC, they were working within a computing world dominated by huge IBM systems, ill-suited to laboratory use. These giant machines were operated by specialists, who ran programs for a range of researchers.

But Wesley Clark and others held a dissenting view: the end users needed direct access to computers, which should become pieces of lab equipment. Thus, computers should be smaller, easier to program and maintain and less expensive.

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But Wesley Clark and others held a dissenting view: the end users needed direct access to computers, which should become pieces of lab equipment. Thus, computers should be smaller, easier to program and maintain and less expensive. Clark built a prototype device using modules supplied by Digital Equipment Corporation (DEC), founded by a former Lincoln Lab staff member, Kenneth Olsen. With Charlie Molnar, Clark took this machine to the National Institutes of Health (NIH), then eager for new ways to use computers in biomedical research. After seeing the LINC, the NIH awarded Clark and Molnar $1.5 million in development funds.

COMPETING FOR THE LINC

In 1963, the NIH appointed its LINC evaluation board, which included Cox. They publicized an irresistible deal: In exchange for coming to Boston to learn the LINCs operation and agreeing to critique its usefulness, biomedical researchers could have a LINC for their own use. From 72 applicants, Washington University neurosurgeon Sidney Goldring, MD, was chosen as one of the 12 winners. Eventually, Goldring would use his LINC to do groundbreaking work in the neurosurgical
operating room, recording the brain waves of patients undergoing surgery. Meanwhile, Cox had received a grant to build a computer for the physiology laboratory at the Central Institute for the Deaf, and he decided to visit DEC to see what modules were available.

After a conversation with Olsen, Cox went to Lincoln Lab, met with Clark, and saw the LINC prototype.

Quickly, "I realized that there was absolutely no point in trying to build something that was different from the LINC," said Cox in a 2006 oral history. "Wes was clearly well ahead of my thoughts and had a successful prototype already that did everything that I thought about doing and more. So I joined forces with Wes Clark and his team."

Hearing that the LINC team had encountered political problems at MIT, Cox, who founded the Biomedical Computer Laboratory (BCL) at Washington University in 1964, urged then Provost George Pake to recruit the LINC group. Pake was successful, and the group arrived in July 1964. They established the Computer Research Laboratory (CRL) under Papian; later, under Clark, it was renamed the Computer Systems Laboratory (CSL).

THE LINC'S ACHIEVEMENTS
While the BCL applied computer techniques to problems in biology and medicine, the CSL focused on the LINC evaluation and "macromodules," a system for creating complex computer systems. In 1984, the CSL and BCL were combined in the new Institute for Biomedical Computing, a joint venture of Washington University's engineering and medical schools. Under Molnar, it did advanced work in biomedical sciences, before ceasing operation in the 1990s.

Eventually, the LINC was superseded by new generations of computers, but during its lifetime it had a remarkable impact. At Washington University, researchers used their LINCs—ten that eventually came to campus—on auditory applications: generating precise sounds, recording responses, and displaying data faster than ever before. Tom Goblick and Russell Pfeiffer, Department of Physiology researchers, developed a new understanding of nonlinear mechanisms in cochlear sensory nerves.

Left: Charles Molnar, co-creator of the LINC. Circa mid 1970s.
Later, a LINC successor, the Programmed Console (PC), helped BCL create the first graphic radiation treatment planning system, which spun off to become Artronics and then CMS, one of the nation’s leading companies in this field. The PC was also used with a Nuclear-Chicago Pho/Gamma III camera to help James Potchen, MD, a nuclear medicine physician, perform the first on-line imaging study of brain activity.

In 1969, BCL scientists established the first computer monitoring of cardiac arrhythmias in the Coronary Care Unit at Barnes Hospital in St. Louis. Later, Molnar, biochemist Garland Marshall, and computer scientist Dave Barry developed drug design algorithms that led Marshall to spin off Tripos, Inc., to create software for the pharmaceutical industry.

The original 12 LINC institutions, and others in years to follow, used the computer to do groundbreaking biomedical research in such fields as neurophysiology, radiology, radiation treatment planning, surgery, obstetrics/gynecology, physiology, audiology, and cardiology. At the University of Wisconsin, neurophysiologists studied the physiology of the auditory system. At Johns Hopkins University, scientists used LINC to carry out classic experiments in neurophysiology.

Altogether, the LINC helped scientists make research advances in such areas as the hydrodynamics of blood flow, fetal cardiography, epileptic neural firing, osteoporosis in the aged, biophysical properties of bone, EEG brainwave analysis, digital computer technology for the coronary care unit, studies of the cochlear nucleus, and arterial shock wave measurements.

“Other examples include the first computer-based patient interviews, the first computer-based dynamic brain images, the first computer-based monitoring of cardiac arrhythmias, and the first computer-based management of neurophysiological experiments,” says Cox. “Many of today’s applications of computers in biomedical research and in medicine can be traced back to the LINC and its descendants.”

The exhibit at Becker Medical Library will be on display until July 2011, when it will be moved to Washington University’s Danforth campus.
Washington University once again hosted the annual Cancer Research Imaging Camp—an intensive course on *in vivo* small animal (eg, mouse) and live cell-imaging techniques. Sponsored by the Cancer Imaging Program of the National Cancer Institute, in partnership with Siteman Cancer Center and the American Association for Cancer Research, the Imaging Camp provided lectures and hands-on lab sessions to post doctoral fellows and early career-level faculty involved in fields related to basic cancer biology. Participants gained experience in a wide range of imaging modalities, including advanced optical imaging, computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), single photon emission tomography (SPECT), and ultrasound (US). The course also provided participants with the necessary information for selecting the appropriate imaging technique to investigate a biological hypothesis and for interpreting the imaging data.

Above: (seated) Attila Kovacs, MD, associate professor of medicine
IMAGING CAMP FACULTY

WASHINGTON UNIVERSITY/MALLINCKRODT INSTITUTE

- Samuel Achilefu, PhD
- Joseph Ackerman, PhD
- Walter Akers, DVM, PhD
- John Engelbach, AS
- Joel Garbow, PhD
- Attila Kovacs, MD
- Richard Laforest, PhD
- Robert Mach, PhD
- William Spees, PhD
- Lihong Wang, PhD
- Michael Welch, PhD

OTHER INSTITUTIONS

- Cristian Badea, PhD, Duke University
- Kenneth Bielat, PhD, National Cancer Institute
- Katherine Ferrara, PhD, University of California, Davis

OTHER INSTITUTIONS CONTINUED

- Robert Gilles, PhD, Moffitt Cancer Center
- Kenneth Krohn, PhD, University of Washington
- Angelique Louie, PhD, University of California, Davis
- Anne Menkens, PhD, National Cancer Institute
- Sabrina Ronen, PhD, University of California, San Francisco
- Dean Sherry, PhD, University of Texas, Dallas
- Bonnie Sloane, PhD, Wayne State University
- Charles Springer, PhD, Oregon Health and Science University
- Pushpa Tandon, PhD, National Cancer Institute
- Simon Watkins, PhD, University of Pittsburgh

SEMINARS

- Samuel Achilefu, PhD, “Fundamentals of optical imaging and optical probes”
- Joseph Ackerman, PhD, “A battle of kingdoms: Animalia (Hominidae) vs. Plantae. Simple questions–elusive answers”
- Cristian Badea, PhD, “Fundamentals of computed tomography”
- Katherine Ferrara, PhD, “Fundamentals of ultrasound physics and imaging”; “Biological applications of ultrasound”
The Cancer Imaging Program was established by the National Cancer Institute (NCI) in 1996 as the Diagnostic Imaging Program. The current name more clearly reflects the program's mission:

- To promote and support cancer-related basic, translational, and clinical research in imaging sciences and technology.
- To promote and support the integration and application of these imaging discoveries and developments to the understanding of cancer biology and to the clinical management of cancer and cancer risk.

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The Cancer Imaging Program was established by the National Cancer Institute (NCI) in 1996 as the Diagnostic Imaging Program. The current name more clearly reflects the program's mission:

- To promote and support cancer-related basic, translational, and clinical research in imaging sciences and technology.
- To promote and support the integration and application of these imaging discoveries and developments to the understanding of cancer biology and to the clinical management of cancer and cancer risk.
Breathing easier
RESEARCH BREAKTHROUGH WILL BENEFIT PATIENTS WITH LUNG DISEASE
by Michele Munz

Helium-3 lung morphometry (a new technique developed by scientists at Washington University Medical Center for imaging the lungs with magnetic resonance imaging, or MRI), is a way to measure levels of damage to the organs’ entire microstructure—starting first in the alveoli, the honeycomb-like sacs where the exchange of oxygen and carbon dioxide take place. The discovery opens the door to studies of living lungs that have never before been possible.
Because MRI scans produce noninvasive detailed images of the body’s internal structures, they have become important diagnostic tools to detect disease within the body—except for the lungs. On diagnostic scans, an empty shadow shows up where the lungs should be.

The foam-like structure of the lungs is unlike other dense organs in the body. Lungs are mostly air and are undetectable by MRI, which picks up signals from the large amount (approximately 80 percent) of water comprising the human body. The signals are produced by what is called water’s “magnetic moments.”

Previously, biopsy was the only way to diagnose disease in the lungs at the alveolar level of a living person—excising a piece of the lung and studying it under a microscope. That small piece, however, doesn’t show what might be happening in other parts of the lungs. Also, a biopsy can only reach about the fourth level of the nearly two dozen levels of airway branches that spread throughout the lung.

Solving the problem

The use of hyperpolarized gases steered scientists to the discovery of a solution to this problem. The gas Helium-3 (\(^{3}\)He) is a light, nonradioactive isotope that has a magnetic moment, just like water. Physicists have figured out how to radiate the helium atoms, causing the atoms to be aligned and strongly magnetized—or “hyperpolarized.” About 15 years ago, scientists at Princeton University wondered if hyperpolarized gas could be used to produce an MR image of the lungs. In a study released in 1996, they showed that having a patient inhale the benign gas and then immediately scanning the patient by MRI could produce detailed images of the lungs. The discovery was groundbreaking, but it was just the beginning. What do the images mean? What is normal and what’s not? How should doctors interpret the differences? Washington University researchers jumped at the chance to make sense of these new detailed pictures of living lungs.

“When we learned about this unique opportunity, we wanted to implement it here at Washington University,” says Dmitriy Yablonskiy, PhD, professor of radiology and adjunct professor of physics. “It was a unique area of research—to look at the lungs without doing any harm to the patient and to get information not available with any other tests.”

Building the research team

Brian Saam, a Princeton University scientist who was involved with the original research and knew how to build and operate the device to hyperpolarize helium became part of the Washington University research team, which initially included Yablonskiy; Mark Conradi, PhD, professor of physics; and David Gierada, MD, professor of radiology. Also on board were Joel Cooper, MD, at that time a surgeon at Washington University, who developed lung volume reduction surgery (LVRS)—the removal of only the diseased part of lungs in patients with advanced stages of emphysema, and Stephen Lefrak, MD, professor of medicine and medical director of the Lung Volume Reduction Program at Washington University medical Center. Cooper and Lefrak were interested in how...
the MR image of the lung could be used to better determine which patients were eligible for LVRS.

The researchers used images taken of Cooper's patients to gain a better understanding of the new science using hyperpolarized gas. The images of the patients' lungs clearly showed which parts were able to take in oxygen and which were not. The scientists also were able to compare images taken before and after surgery, to see how the lungs improved overall.

"The first results were really striking. We could easily differentiate the ventilated part of the lungs," Yablonskiy says. "It gave us great hope that we might be able to use this technique as a very sensitive diagnostic tool."

The research team surmised that if they could study the motion of the helium atoms (how the atoms bounce around in the smallest structures inside the lungs), they could better understand the beginnings and progression of disease.

"If we could somehow measure, using MRI, this restricted movement, we could get information about the alveoli," Yablonskiy says.

"We likened it to a similar MRI technique called diffusion MRI that is used to detect problems in the brain by measuring water movement."

Joining the research team later was Ewald Weibel, MD, DSC, professor emeritus of anatomy at the Institute of Anatomy, University of Berne, Switzerland. Through an extremely time-consuming study of crystallized cadaver lungs, Weibel developed the gold standard for diagnosing lung disease using measurements of their microstructure. The Washington University team used these measurements to validate their in vivo Helium-3 lung morphometry.
Beginning the process

The first step involved looking at the diffusion of molecules in healthy lungs and developing a "diffusivity map," which measured how far a molecule can move inside parts of the lungs. Researchers did the same thing in lungs with emphysema and found that in those alveoli, diffusion was three times more than that of healthy lungs. The molecules in the healthy lungs were much more restricted in their movement because of the lung's sponge-like makeup than are damaged alveoli, which are more cavernous than sponge-like. Using these measurements and a theoretical model of Helium-3 gas diffusion in lungs (developed by Yablonskiy and Alex Sukstanskii, PhD, senior scientist in Mallinckrodt Institute's Division of Radiological Sciences), the scientists were able to precisely quantify the difference of MRI-captured diffusion between healthy and damaged alveoli. This allowed them to determine the parameters of the alveoli, which can be used to diagnose disease.

“We developed a mathematical theory on how gases diffuse in the lungs and developed a new MRI technique to measure damage in the lungs,” Yablonskiy says.

Benefits of the new science

The exciting part about He lung morphometry: Because it is safe and well-tolerated by the patient, it can be repeated on a regular basis. That makes it a strong tool for research, clinical, and drug development studies.

Robert Senior, MD, professor of pulmonary disease in medicine and of cell biology and physiology, is excited about the possibilities that can be applied to the research of chronic obstructive pulmonary disease (COPD): “This technology and its associated sophisticated data analysis are a brilliant and unique means of identifying lung pathology at very early stages and for quantifying small changes in lung pathology of already-diseased lungs. I see it potentially as a way to study the effects of medications and other interventions on the lungs of apparently healthy smokers and people with COPD.”

According to Lefrak, being able to measure, over time, the size of the gas exchange units in the lung is a key part of treating patients with lung disease. “This is especially important in order to follow the development and progression of..."
emphysema in living patients without subjecting them to dangerous, invasive procedures and may be more sensitive than other readily available tests of lung function or structure."

The possibilities of this new science are endless:

- MRI could replace less accurate pulmonary tests for diagnosing emphysema.
- Drugs could be tested to determine if they improve the condition of alveoli in people suffering with different stages of emphysema, COPD, and other illnesses such as asthma.
- Signs of rejection in lung transplant patients could be discovered earlier.
- Radiotherapy for lung cancer could be more effective.
- Clinicians would know more about how lungs grow from infants to adults.

This will give us an initial baseline to create a more comprehensive data set to compare results.

- Researchers could determine the amount of damage done to the lungs of teens who are just beginning to smoke cigarettes and use that information for anti-smoking campaigns.

Study results

The new science has produced amazingly accurate results. Using donor lungs that had been rejected for transplantation use, researchers were able to use \(^{3}\)He lung morphometry to determine the depth, size, and number of the alveolar sleeves, ducts, and sacs. Then the specimens were frozen and examined under a microscope to see if measurements were the same. "The measurements were almost identical," Yablonskiy says. "It gave almost a perfect result. Our theory worked beyond what we expected."

The findings, "Quantification of Lung Microstructure with Hyperpolarized Helium-3 Diffusion," were published in August 2009 in the Journal of Applied Physiology.

Researchers from Washington University's Radiology, Systems Engineering, Physics and Pulmonary departments also completed another published study that produced the same accurate measurements of alveoli in both healthy and damaged lungs of mice.

The next step

The research team will use \(^{3}\)He lung morphometry to study 100 patients—of different ages and including both healthy patients and those with lung problems. The study is funded by a four-year National Institute of Health grant. "This will give us an initial baseline to create a more comprehensive data set to compare results," says Yablonskiy.

James Quirk, PhD, research instructor in radiology, and Jason Woods, PhD, assistant professor of radiology, have joined the lung imaging team and are applying Helium-3 lung morphometry to study mouse models with different lung diseases—a very important direction for understanding disease development and drug discovery.

"This new science just opens up an unimaginable number of experiments that were not possible before," says Yablonskiy.
The actinographic laboratory at Washington University Medical Center was the forerunner of Mallinckrodt Institute, one of the five largest and most modern radiological centers worldwide.

A HISTORY OF MIR

The Mallinckrodt Institute lobby is a high-traffic area. So, what better place to provide visitors with snippets of MIR history and some visual stimulation?

For the past eight years, posters featuring archival photos along with a brief description have been produced in-house as a joint effort of the MIR Publications Office and the Photography Lab. The posters are rotated monthly, with new ones being added as photos become available. The following pages include just a few of the poster series.
First visualization of a human gallbladder (volunteer was a Washington University Medical Center student nurse) following injection of a contrast agent established the cystogram as the diagnostic test for gallbladder disease.

late 1930’s
The front entrance to Mallinckrodt Institute of Radiology—when it was a free-standing building—faced Kingshighway Boulevard. On the left is a portion of St. Louis Children’s Hospital (the current hospital at One Children’s Place was built in 1984).
The A&P Bakery on Scott Avenue was purchased by Washington University School of Medicine (WUSM) in 1980. After extensive renovations, the building was reopened in 1984. The East Building, as it is now called, houses various WUSM groups, including many of Mallinckrodt Institute’s imaging research labs.

Some of the earliest cardiac angiography studies were conducted at Mallinckrodt Institute. Prior to the introduction of spiral scanning and multislice technology, as provided by computed tomography, earlier technologies were too slow to capture high-resolution cardiac images.

This Picker Cobalt-60, installed in the Institute’s Radiation Oncology Center, was one of the nation’s first modern, high-energy LINAC units used to treat cancer, especially cancer of the head and neck.
Swiss scientists arrived at Mallinckrodt Institute of Radiology (MIR) with a container full of 35,000-year-old human bone fragments found in a cave in Romania. Using high-resolution computed tomography with special software, MIR researchers fitted together matching pieces and generated a 3-D virtual model.

These reconstructed bones provided a clearer idea of what modern humans (no brow ridge and a defined chin) looked like and added important information for one of the greatest debates in anthropology today: What happened to the Neanderthals?

An ultra-high field (11.75-tesla) magnetic resonance scanner was installed in the Institute’s Scott Avenue Imaging Center for research use in the Biomedical Magnetic Resonance Laboratory.
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.

NEW FACULTY

FIRST-YEAR FELLOWS

Archana Abhyankar, MBBS, abdominal imaging clinical fellow, received an undergraduate degree from Parle College, India, and a medical degree from Topiwala National Medical College, India. She completed a surgery internship at Montefiore Medical Center, New York, and a radiology residency at Bronx-Lebanon Hospital Center, New York.

Per Amundson, MD, diagnostic neuroradiology clinical fellow, received an undergraduate degree from the University of Utah and a medical degree from the Uniformed Services University of the Health Sciences, Maryland.

Victor Anaya-Baez, MD, abdominal imaging clinical fellow, received an undergraduate degree from Pontificia Universidad de Puerto Rico and a medical degree from Universidad Central del Caribe School of Medicine, Puerto Rico. He completed an internship at Long Island College Hospital, New York, and a residency at the University of Louisville, Kentucky.

Cameron Bahr, MD, diagnostic neuroradiology clinical fellow, received an undergraduate degree from Brigham Young University, Utah, and a medical degree from the University of Utah School of Medicine. He completed an internship at the University of Utah, a residency at Hartford Hospital, Connecticut, and a musculoskeletal radiology fellowship at the University of Alabama, Birmingham.

John Burda, MD, interventional radiology clinical fellow, received an undergraduate degree from Villanova University, Pennsylvania, and a medical degree from Drexel University College of Medicine, Pennsylvania. He completed an internship at Naval Medical Center San Diego-Balboa Park, California, and a radiology residency at Hahnemann University, Pennsylvania.

Gerald Camren, MD, interventional radiology clinical fellow, received undergraduate degrees from the University of Oklahoma and from Oral Roberts University, Oklahoma, and a medical degree from the University of Oklahoma College of Medicine. He completed an internship at Tucson Medical Center, Arizona, and a radiology residency at the University of Illinois Medical Center.

Andrea Hong, MD, breast imaging clinical fellow, received an undergraduate degree from Stanford University, California, and a medical degree from Duke University, North Carolina. She completed an internship at Advocate Christ Medical Center, Illinois, and a diagnostic radiology residency at the University of Pittsburgh Medical Center, Pennsylvania.

Seth Klein, MD, interventional radiology clinical fellow, received an undergraduate degree from the State University of New York and Hebrew University, and a medical degree from the University of Buffalo School of Medicine and Biomedical Sciences, New York. He completed a surgical internship and a residency at Stony Brook University Medical Center, New York.

Meghna Krishnan, MBBS, abdominal imaging clinical fellow, received an undergraduate degree from GCSS Junior College, India, and a medical degree from Osmania Medical College, NTR University of Health Sciences, India. She completed an internship at St. Francis Hospital, Illinois, and a diagnostic radiology residency at Yale University School of Medicine, Connecticut.

Jon Machayya, MD, interventional radiology clinical fellow, received an undergraduate degree from Concordia College, Minnesota, and a medical degree from the University of North Dakota School of Medicine and Health Sciences. He completed a surgical internship at Iowa Methodist Medical Center and a residency at St. Joseph's Hospital and Medical Center.

Satheavy Moore, MD, breast imaging clinical fellow, received an undergraduate degree from Louisiana State University at Shreveport and a medical degree from Louisiana State University Health Sciences Center. She completed an internship and a residency at Louisiana State University Health Sciences Center.

Radha Popuri, MBBS, interventional radiology clinical fellow, received an undergraduate degree from GCSS Junior College, India, and a medical degree from Osmania Medical College, NTR University of Health Sciences, India. He completed the specialist registrar in radiology training at Manchester Radiology Scheme, the University of Manchester, United Kingdom.
New Faculty

Continued from page 27

Dharmesh Tailor, MD, diagnostic neuroradiology clinical fellow, received an undergraduate degree from the University of Pennsylvania and a medical degree from the David Geffen School of Medicine, University of California, Los Angeles. He completed an internship at Pennsylvania Hospital, University of Pennsylvania Health System, and a residency at the Hospital of the University of Pennsylvania.

Phuong Tran, MD, musculoskeletal radiology clinical fellow, received an undergraduate degree from the University of Missouri-Columbia and a medical degree from the University of Missouri-Columbia School of Medicine. She completed an internship and a residency at the University of Missouri Health Care.

Neel Varma, MD, abdominal imaging clinical fellow, received an undergraduate degree and a medical degree from the University of Missouri-Columbia School of Medicine. He completed a family medicine residency at the University of Manitoba and a radiology residency at Saint Louis University, Missouri.

Saurabh Agarwal, MD, received an undergraduate degree from Cornell University, New York, and a medical degree from the University of Chicago, Pritzker School of Medicine. He completed an internship at the University of Pittsburgh Medical Center.

Michael Dobson, MD, received an undergraduate degree from Brigham Young University, Utah, and a medical degree from Washington University in St. Louis School of Medicine. He completed an internship at Loyola University Medical Center, Illinois.

Guillermo Gonzalez-Araiza, MD, received an undergraduate degree from Washington University in St. Louis and a medical degree from Washington University in St. Louis School of Medicine. He completed an internship at St. Vincent’s Hospital, New York.

Ronald Loch, MD, received an undergraduate degree from Vanderbilt University, Tennessee, and a medical degree from Vanderbilt University School of Medicine.

Rachel Loomans, MD, received an undergraduate degree from the University of Wisconsin and a medical degree from the University of Wisconsin School of Medicine and Public Health.

Matthew Niemeyer, MD, received an undergraduate degree from the University of Michigan and a medical degree from the University of Michigan School of Medicine.

Benjamin Northrup, MD, received an undergraduate degree from Truman State University, Missouri, and a medical degree from Dartmouth Medical School, New Hampshire.

Joseph Owen, MD, received an undergraduate degree from Princeton University, New Jersey, and a medical degree from the University of Kentucky College of Medicine.

Saurabh Prakash, MD, received an undergraduate degree from Stanford University, California, and a medical degree from Stanford University School of Medicine.

Alireza Radmanesh, MD, received a medical degree from Tehran University of Medical Sciences, Iran. He completed a neuroradiology fellowship at Brigham and Women’s Hospital, Massachusetts.

Hillary Shaw, MD, received an undergraduate degree from Wellesley College, Massachusetts, and a medical degree from the University of Maryland School of Medicine.

Yeamie Shereif, MD, received an undergraduate degree from the University of Pennsylvania and a medical degree from Washington University in St. Louis School of Medicine.

Anup Shetty, MD, received an undergraduate degree from Duke University, North Carolina, and a medical degree from the University of Texas Southwestern Medical School. He completed an internal medicine residency at Barnes-Jewish Hospital, Missouri.

David Slat, MD, received a medical degree from Temple University, Pennsylvania. He completed an internal medicine residency at Yale University, Connecticut.

Taylor Stone, MD, received an undergraduate degree from the University of North Carolina at Chapel Hill and a medical degree from the University of North Carolina School of Medicine.

Anderanik Tomasian, MD, received a medical degree from Shahid Beheshti University of Medical Sciences, Iran. He completed an internal medicine residency at Hospital of Saint Raphael, Connecticut.

Noushin Yahyavi, MD, received an undergraduate degree from Tehran University of Medical Sciences, Iran. She completed a preliminary medicine internship at Cleveland Clinic, Ohio.
FIRST-YEAR NUCLEAR MEDICINE RESIDENTS

Garima Agrawal, MD, completed premedical studies at S.S. Medical College, India, and received a medical degree from Gandhi Medical College, India. She completed an internship and a radiology residency (chief resident) at Gandhi Medical College. She was a research associate in functional renal MR imaging in the Department of Radiology at the University of Wisconsin School of Medicine and Public Health.

Dhanashree Rajderkar, MD, received an undergraduate degree in medicine and surgery at Government Medical College, India. She completed a radiology residency at the Indira Gandhi Medical College, India. She was a research fellow in neuroradiology at the University of Southern California.

Kenneth Winkler, MD, received an undergraduate degree in biology from Loyola Marymount University, California, and a medical degree from Creighton University School of Medicine, Nebraska. He completed a diagnostic radiology residency at Southern Illinois University.

Delphine Chen, MD, assistant professor of radiology, as principal investigator, received a two-year grant of $82,500 from the Barnes-Jewish Hospital, Clinical and Translational Sciences Research Program, for “PET imaging of endotoxin-induced iNOS activation in healthy volunteers.”

As principal investigator, she received the Doris Duke Foundation Clinical Scientist Award—a three-year grant of $486,000—for research on “Noninvasive quantification of the pulmonary anti-inflammatory effect of rosiglitazone.”

Robert Mach, PhD, professor of radiology, of cell biology and physiology, and of biochemistry and molecular biophysics, as principal investigator, received a five-year grant of $1.2 million from the National Institutes of Health/National Institute on Drug Abuse, for “PET radiotracers for imaging the dopamine D3 receptor.”

Barbara Monses, MD, professor of women’s health and of radiology, as principal investigator, received a one-year grant of $29,128 from the Barnes-Jewish Hospital, Clinical and Translational Sciences Research Program, for breast imaging and cancer research.

Yuan-Chuan Tai, PhD, associate professor of radiology, as principal investigator, received a $1 million grant from the National Science Foundation for “MRI: development of a high-resolution positron imaging system dedicated to plant research.” Coinvestigators for the three-year grant are Jacob Schaefer, PhD, professor of chemistry; Lee Sobotka, PhD, professor of chemistry; Suzanne Lapi, PhD, assistant professor of radiology; and Joseph O’Sullivan, PhD, professor of electrical engineering. As principal investigator, Tai also received a $1.2 million grant from the Department of Energy for “Development of simultaneous beta-and-coincidence-gamma imager for plant imaging research.” Coinvestigators for the three-year grant are Schaefer and Sobotka.

Melson Lecture

On September 22, Byung I. Choi, MD, PhD, internationally acclaimed for his clinical, research, and teaching activities focusing on hepatocellular carcinoma, presented the Eighteenth Annual G. Leland Melson Visiting Professorship and Lecture. Choi, professor of radiology at Seoul National University and Seoul National University Hospital, spoke on “Recent advances in imaging of hepatocellular carcinoma.”

GRANTS

Tammie Benzinger, MD, PhD, assistant professor of radiology, as principal investigator, received a two-year grant of $82,500 from the Barnes-Jewish Hospital, Clinical and Translational Sciences Research Program, for “Q-BOLD MR measurements of oxygen extraction in patients with brain tumors.”

Kenneth Winkler, MD, received an undergraduate degree in biology from Loyola Marymount University, California, and a medical degree from Creighton University School of Medicine, Nebraska. He completed a diagnostic radiology residency at Southern Illinois University.

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**APPOINTMENTS/ELECTIONS**

Colin Derdeyn, MD, professor of radiology, of neurology, and of neurological surgery, was appointed to a two-year term on the American Heart Association (AHA) Oversight Committee and to a two-year term on the AHA Council Operations Committee.

Linda Larson-Prior, PhD, research associate professor of radiology, was appointed as a member of the Organizing Committee for the Neuroimaging Technologies for Optimizing Performance Workshop, sponsored by Virginia Polytechnic Institute and State University's Arlington Innovation Center for Health Research and in partnership with the United States Army Telemedicine and Advanced Technology Center, Alexandria, Virginia, September 23 and 24.

Bruce Whiting, PhD, research assistant professor of radiology, was elected Senior Member of the Optical Society of America.

**LECTURES**

- **Mikhail Berezin, PhD**, assistant professor of radiology, presented “Nanotransducers and nanothermometers for medical applications” at Washington University Frontiers, St. Louis, Missouri, September 25. He spoke on “Multiphoton FLIM with near-infrared dyes” at the 4th Boston TCSPC Workshop on Advanced TCSPC Techniques, Boston, Massachusetts, October 11 and 12.

- **Colin Derdeyn, MD**, professor of radiology, of neurology, and of neurological surgery, presented “SAMMPRIS Trial update” at the American Society of Neuroradiology Annual Meeting, Boston, Massachusetts, May 20; at the Society of NeuroInterventional Surgery Practicum, Boston, May 22; and at the Society of Neuroradiology Annual Meeting, San Diego, California, July 25.

- **Steven Don, MD**, associate professor of radiology, spoke on “Pediatric Digital Radiography Summit synopsis” at Radiology Vitals, sponsored by Carestream, Inc., Rochester, New York, September 16.


- **Pilar Herrero, ME, MS**, research associate professor of radiology, as lead author, presented “PET imaging of cardiac iNOS levels in humans using 18F-NOS: a feasibility study” at the Society for Heart and Vascular Metabolism 8th Annual Meeting, Kananaskis, Alberta, Canada, August 22-25.


**Scott Lecture**

Barry Siegel, MD, professor of radiology and of medicine and vice-chair for nuclear medicine at Mallinckrodt Institute, presented the Thirty-ninth Annual Wendell G. Scott Memorial Lecture on October 20. Siegel, who has devoted much of the last five years to the development and operation of the National Oncologic PET Registry, spoke on “Impact of PET and PET/CT on management of cancer.”

Gilbert Jost, MD, (left) presented a commemorative plaque to Siegel.
John Kotyk, PhD, research associate professor of radiology, presented “In vivo imaging of root structure and dual energy computed tomography” at Monsanto Company, St. Louis, Missouri, August 31. He spoke on "Support and services of the Human Imaging Unit of the IUH" at the American College of Radiology Imaging Network meeting, Washington, DC, September 29.

Linda Larson-Prior, PhD, research associate professor of radiology, spoke on “Modulation of functional neural networks in the transition from wake to sleep” at the 26th International Summer School of Brain Research, Amsterdam, The Netherlands, June 29-July 2, and at Samsung Medical Center, Seoul, Korea. She presented “The promise of neuroimaging in human sleep research” at the Neurosciences Research Institute, Gachon University of Medicine and Science, Incheon, Korea, September. She spoke on “The imaging neural state changes of sleep and pathologies of attention” at the Neuroimaging Technologies for Optimizing Performance Workshop, sponsored by Virginia Polytechnic Institute and State University’s Arlington Innovation Center for Health Research and in partnership with the United States Army Telemedicine and Advanced Technology Center, Alexandria, Virginia, September 23 and 24.


Robert Mach, PhD, professor of radiology, of cell biology and physiology, and of biochemistry and molecular biophysics, spoke on “New radiopharmaceuticals for PET: current status and challenges” at the 1st International Symposium on Converging Research for Frontier Medical Instruments, Seoul, Korea, May 27. He presented “The use of radiometals in nuclear medicine imaging procedures” at the 2010 Northeast Regional Meeting of the American Chemical Society, Potsdam, New York, June 3.

Barry Siegel, MD, professor of radiology and of medicine, as the 25th Eugene P. Pendergrass Lecturer, spoke on “National Oncologic PET Registry (NOPR): background and operational overview” at the Annual Pendergrass Day Symposium, University of Pennsylvania, Philadelphia. He presented “PET and PET/CT in pediatric oncology” at the 2010 Chinese National Conference on Recent Advances in Pediatric Diagnostic Imaging, Beijing, People’s Republic of China, September 1 and 2. As invited speaker, he presented “Radiation protection in pediatric imaging” at the Multidisciplinary Imaging Symposium, Vancouver, Canada, September 25. As invited lecturer, she spoke on “CT and radiation dose issues: what you need to know”; “CT imaging of the pediatric patient: cardiovascular applications”; “CT imaging of the pediatric patient: abdominal applications”; and “High resolution chest CT: principles and applications” at Essentials in Multidetector CT and CTA for the Technologists, Las Vegas, Nevada, October 7-10. Siegel spoke on “Radiation risks in CT imaging,” “Mediastinal vascular variants and anomalies,” and “CT of common abdominal masses in children” at the 15th Annual Computed Tomography 2010: National Symosium, Las Vegas, Nevada, October 21-24. She presented “CTA/MRA of hepatic masses in children,” “Congenital mediastinal vascular anomalies, and “Ultrasound as a practical tool for evaluation of the acute pediatric abdomen” at the National Diagnostic Imaging Symposium, Orlando, Florida, December 9.
SYMPOSIA
In this section of FYI, only those faculty and staff who have Department of Radiology appointments are listed.

SOCIETY OF NUCLEAR MEDICINE
57th Annual Meeting
Salt Lake City, Utah June 5-9, 2010

Farrokh Dehdashti, MD, comoderator, Oncology-Basic Science: Tumor Hypoxia.

Bennett Greenspan, MD, moderator, A Primer on Molecular Biology for Imagers—Part I and Part II; moderator, Tom Miller Memorial Lecture; organizer and moderator, Hal Anger Memorial Lecture.


Henry Royal, MD, comoderator, Radiation Risk/Toxicity Versus Benefits of Diagnostic and Therapeutic Nuclear Medicine Procedures: How to Best Put These in Perspective for Both Clinicians and Patients?

Robert Gropler, MD, "Unmet needs in cardiovascular imaging: contribution of molecular imaging"; "A tutorial on myocardial metabolism"; "Imaging the diabetic myocardial metabolic phenotype: from bench to bedside."

Oluwatayo Ikotun, PhD; Suzanne Lapi, PhD, "Investigating the potential of Cu-64-annexin V as an imaging agent for cell death."

Maiko Kume; Paul Carey; Suzanne Lapi, PhD; Michael Welch, PhD, "The development of automated Yttrium-86 processing at Washington University."

Robert Mach, PhD, "The development of a radiopharmaceutical for molecular imaging," "Basic molecular imaging to clinical PET: proliferation markers in cancer."

Zhude Tu, PhD; Shihong Li, MD; Jinbin Xu, PhD; Lynne Jones; Robert Mach, PhD, "Synthesis, radiosynthesis and in vivo evaluation of a carbon-11 labeled PET radiotracer for imaging solid tumors."

Michael Welch, PhD, "Radiopharmaceutical sciences."

Dexing Zeng, PhD; David Reichert, PhD, "Microfluidic radiolabeling of biomolecules with Cu-64."

Editor’s Note: Due to unforeseen circumstances, this issue of Focal Spot magazine was delayed. I apologize for any inconvenience this delay may have caused. Future issues will be distributed according to the regular schedule.
Dr. Jerome Cox, Jr., Director, discusses a project with a student working at the LINC.

The versatile and powerful Laboratory Instrument Computer (LINC) established Washington University as a leader in solving biomedical problems with computers. This photo was featured in the 1968 Washington University School of Medicine Bulletin.