

Spring 1998

Focal Spot, Spring 1998

Follow this and additional works at: http://digitalcommons.wustl.edu/focal_spot_archives

Recommended Citation

Focal Spot, Spring 1998, April 1998. Bernard Becker Medical Library Archives. Washington University School of Medicine.

This Book is brought to you for free and open access by the Focal Spot at Digital Commons@Becker. It has been accepted for inclusion in Focal Spot Archives by an authorized administrator of Digital Commons@Becker. For more information, please contact engeszer@wustl.edu.

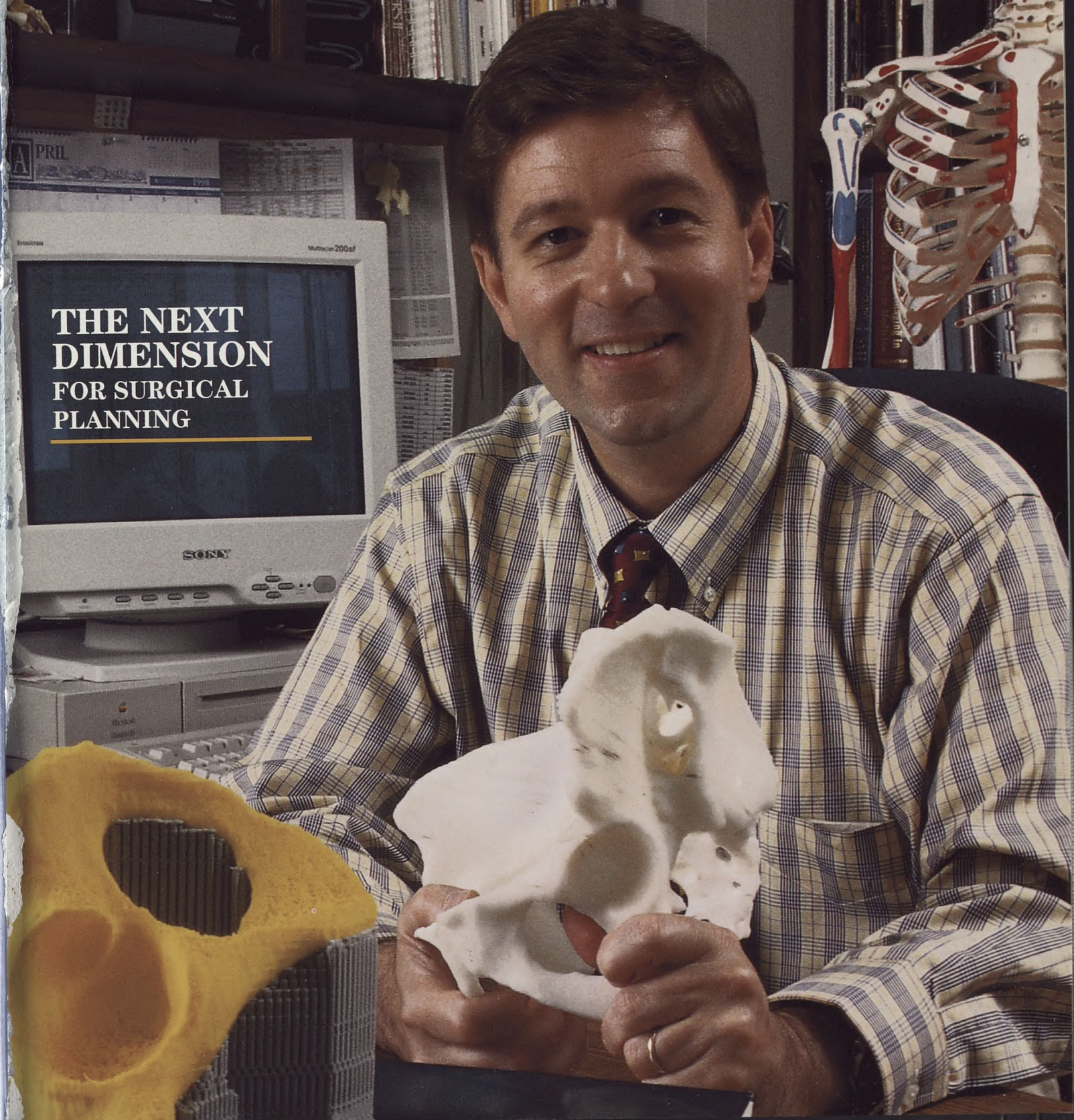
SPRING, 1998

VOLUME 29, NUMBER 1

FOCAL SPOT

MALLINCKRODT INSTITUTE OF RADIOLOGY

**THE NEXT
DIMENSION
FOR SURGICAL
PLANNING**



Technology developed by a Minnesota-based company may reform orthopaedic surgical planning techniques. Using computed tomography or magnetic resonance data and a thermal modeling process, Stratasys' device constructs plastic recreations of the body's anatomy. For more information about Mallinckrodt Institute's role in this research, turn to page 10. Photograph courtesy of Stratasys, Inc.



FOCAL SPOT

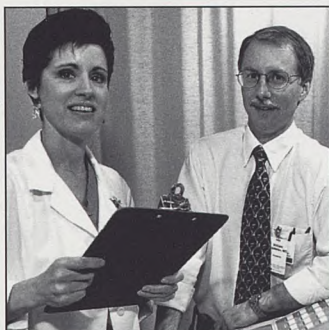
SPRING, 1998

VOLUME 29, NUMBER 1

MALLINCKRODT INSTITUTE OF RADIOLOGY

MAY 12 1998

6

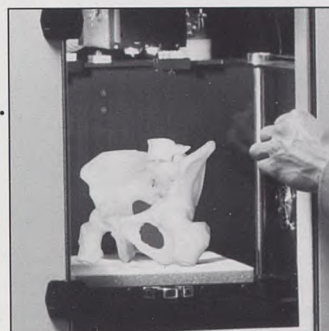


BREAKING THE ULTRASOUND BARRIER

For the past three decades, ultrasonography has provided radiologists at Mallinckrodt Institute with a non-invasive and relatively inexpensive means of imaging the human body's internal structures, especially those in the abdominal and cardiac areas. Now, orthopaedic surgeons and radiologists are reporting favorable results using ultrasonography to diagnose musculoskeletal diseases.

10 THE NEXT DIMENSION FOR ORTHOPAEDIC SURGERY

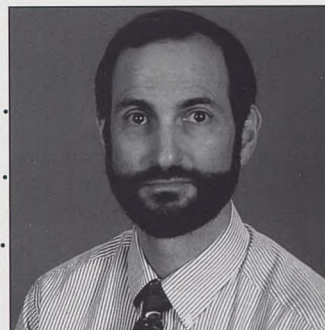
Thousands of patients undergo hip joint replacement surgery each year, and a large number of those patients experience difficulty with the fit of the prosthesis. At the Institute, research using rapid prototyping technology to translate imaging data into three-dimensional models is providing surgeons with critical preoperative information.



2 SPOT NEWS

16 FYI

24 IN MEMORIAM



MIR
MALLINCKRODT
INSTITUTE OF RADIOLOGY
WASHINGTON UNIVERSITY
MEDICAL CENTER

ON THE COVER:

Conventional radiographs often do not provide adequate or accurate information for surgeons to successfully preplan hip joint replacement surgery. Exact replicas of a patient's pelvic bone (like the one Radiologist Douglas Robertson is holding) can dramatically improve the surgeon's estimation of hip socket deterioration.

Photograph by Tim Parker.

SPOT NEWS



Dr. Lawrence Kotner (standing, third from left) is shown at the 1998 AOA Initiation Ceremony. Seated are (left to right) Elliot Abbey, MD, president of the Washington University AOA Chapter for the 1997-1998 academic year; William Peck, MD, executive vice chancellor for medical affairs and dean of Washington University School of Medicine; and guest speaker Peter Raven, director of the Missouri Botanical Garden.

Kotner elected to AOA

In recognition of his leadership quality and important contributions to medical student and radiology resident education, Lawrence Kotner, MD, associate professor of radiology, was elected as a member of the Washington University Chapter of Alpha Omega Alpha (AOA) Honorary Medical Society. Kotner was one of 27 new members, and one of two alumni, honored at the AOA initiation ceremony in March.

An MIR faculty member since 1975, Kotner received his undergraduate and medical degrees from Washington University. He completed a one-year internship in medicine at the former Jewish Hospital of St. Louis and three years of radiology training at Boston's Massachusetts General Hospital. Kotner served a two-year term as chief of radiological services at the U.S. Air Force Base in Little Rock, Arkansas, and was on the medical staff at the University of Arkansas Medical Center in Little Rock and at Massachusetts General Hospital.

Since 1988 Kotner has served as course master for the Senior Medical Student Radiology Elective and is a two-time (1989 and 1991) recipient of Washington University's Sydney S. Pearl MD '32 Award for Inspirational Teaching. Prior to the 1994 merger of the diagnostic residency programs at the former Barnes and Jewish hospitals (now, Barnes-Jewish Hospital south and north, respectively), he was director of the Radiology Residency Program at Jewish Hospital. He now serves as associate director of the Institute's four-year diagnostic radiology training program, the largest of its kind in the United States.

School of Medicine ranked third in U.S.

Washington University School of Medicine (WUSM) was named one of the top three medical schools in the country, according to the *U.S. News & World Report* 1998 annual rankings of graduate and professional programs. The medical school also was rated number one in student selectivity, a measure of student quality. The WUSM Program in Physical Therapy remained in first place, a position it has held since 1995 when the magazine first ranked physical therapy programs, and the Program in Occupational Therapy was ranked third—this is the first time the magazine has included this category. WUSM excelled in other categories as well: In medical specialties, internal medicine ranked seventh. Pediatrics and women's health each ranked eighth.

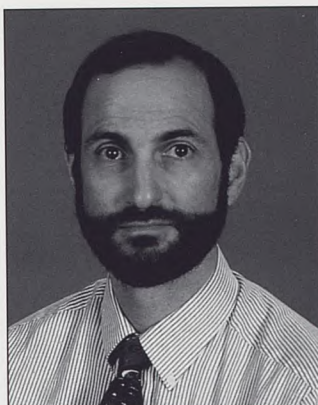
Now in its twelfth year, the *U.S. News & World Report* rankings are based on varying criteria that can include reputation; research activity; student selectivity; faculty resources; and surveys of deans, faculty, and administration. The list was published in the magazine's February 23rd issue, "America's Best Graduate Schools."

Perlmutter receives outstanding physician award

The University of Missouri Medical Alumni Organization selected Joel Perlmutter, MD, associate professor of neurology and of radiology, as the 1998 Outstanding Young Physician. The award was presented April 17 in Columbia, Missouri, in conjunction with the 140th Annual Convention of the Missouri State Medical Association.

Perlmutter, who heads the Department of Neurology's Movement Disorder section, is a nationally recognized expert in the study of physical and chemical factors associated with Parkinson's disease and dystonia. His extensive research of the basic pathophysiology of these neurological disorders, as well as his investigations of the effects of chronic medication on basal ganglia function, is providing the basis for improved treatment methods.

He serves on the Board of Scientific Counselors for the National Institute for Neurological Disease and Stroke and is a member of the Scientific Advisory Board of the Dystonia Medical Research Foundation. In 1991 Perlmutter was



Joel Perlmutter, MD

named the Benign Essential Blepharospasm Research Foundation's Mattie Lou Koster Scholar and the Missouri Chapter of Dystonia Medical Research Foundation's Honoree of the Year. In 1992, he received Washington University's Eliasson Award as Neurology Professor of the Year for Resident Teaching.

Perlmutter earned an undergraduate degree in biochemistry from Princeton University and a medical degree from the University of Missouri-Columbia School of Medicine. He completed a three-year neurology residency and a postdoctoral fellowship in brain pharmacology and positron emission tomography at Washington University. Perlmutter joined the university faculty in 1983 with a dual appointment in neurology and radiology.

Summer program provides research experiences

Now in its fifth year, MIR's Summer Research Program offers medical students and science undergraduates an excellent introduction to different aspects of radiological sciences research, a field in which these students usually receive very little hands-on experience. Coordinated by Carolyn Anderson, PhD, assistant professor of radiology and of molecular biology and pharmacology, the ten-week program provides each student with a \$3,200 fellowship. This year, of the nine participants selected, two are from Washington University, St. Louis, Missouri, and one each is from Kean University of New Jersey, Union; University of Missouri-Columbia; Trinity College, Dublin, Ireland; Tulane University, New Orleans, Louisiana; Ohio State Medical School, Columbus; Yale University, New Haven, Connecticut; and Washington University School of Medicine.

Each of the 1998 program's nine participants will be paired with a mentor who is conducting research in one or more of the following radiological science areas: contrast agent development, targeted radiotherapy, radiopharmaceutical development, positron emission

tomography, nuclear medicine, molecular pharmacology, magnetic resonance imaging, diagnostic radiology, and digital imaging. Mentors from the MIR divisions of Diagnostic Radiology, Nuclear Medicine, and Radiological Sciences are Anderson; Kelly Botteron, MD, assistant professor of psychiatry and of radiology; Colin Derdeyn, MD, assistant professor of radiology; Elizabeth McFarland, MD, assistant professor of radiology; David Piwnica-Worms, MD, PhD, associate professor of radiology and of molecular biology and pharmacology; Hanneke van Mier, PhD, research assistant professor of radiology and of neurology; and Bruce Whiting, PhD, instructor in radiology. Mentors from Washington University School of Medicine are Judith Connett, PhD, research professor of surgery, and Ruthmary Deuel, MD, professor of neurology and neurological surgery and of pediatrics.

Applications for the 1999 program will be available in November, 1998, with an application deadline of February, 1999. Students will be notified of their acceptance in March. For more information, check out the web site at <http://www.medicine.wustl.edu/~wumsama/programs/mir.html> or contact Anderson by e-mail (andersoncj@mirlink.wustl.edu).

SPOT NEWS

Taylor voted teacher of the year

The Radiation Oncology Teacher of the Year Award was established in 1989 to honor the MIR faculty member who makes a significant contribution to resident education during the academic year. The award recipient is determined by the radiation oncology residents through a nomination and voting process, with the presentation made annually in December. The 1997 Radiation Oncology Teacher of the Year is Marie Taylor, MD, instructor in radiology and chief of the Radiation Oncology Center Breast Cancer Service.

Taylor earned a Bachelor of Science *cum laude* degree and a medical degree from the University of Washington, Seattle. She completed a medicine/surgery internship at Swedish Hospital in Seattle, Washington, and three years of radiation oncology residency at the University of Washington Hospital. Since 1991, Taylor has served as medical director of the Radiation Therapy Technology School at the Washington University Medical Center. She is a past recipient of the American Cancer Society's Fellowship in Oncology and Outstanding Medical Student Award for Oncology.



Marie Taylor, MD

Past award honorees:

1989—Susan Shapiro, MD

1990—Carlos Perez, MD

1991 and 1995—Perry Grigsby, MD

1992—Jeff Michalski, MD

1993—Russell Gerber, MS

1994—Mary Graham, MD

1996—James Purdy, PhD

Internal support aims to increase grant funding

As part of Dr. Jeffrey Brown's MIR Clinical Research Group, Shelly Meese, division administrator, provides busy diagnostic radiology faculty with much-needed support in locating research funding and in preparing and submitting grant proposals. Meese joined the group in September of 1997 as part of Brown's goal to increase funding received by the Division of Diagnostic Radiology and to expand collaboration opportunities between the Division and other Washington University School of Medicine departments.

Relying on her strong scientific background and a knowledge of internal and external contacts, databases, and directories, Meese thoroughly investigates potential funding opportunities to find a match for the MIR faculty member's research interest and background. Once the "fit" is determined, Meese acts as the liaison between the faculty and the funding source. She develops an agreeable timeline to meet the hectic deadline and is responsible for the completion of all nonscientific aspects of the grant submission, including Internal Review Board approvals, biographical sketches, resources/environment information, letters of col-

laboration, and budget justifications. Meese's involvement in these processes allows the researcher to focus on developing the science for the grant proposal. She also critiques the scientific paper, verifying that key points are well indicated, and formats the final product to meet application requirements. According to Meese, she is enthusiastic about meeting whatever steps are necessary to ensure that grant proposal deadlines are met.

Meese earned an undergraduate degree in biology and chemistry and a graduate degree in health administration; she needs just a few courses to complete an MBA degree. She has a wide range of medical and scientific work experiences: medical technician for a small rural hospital, microbiology lab supervisor in the corporate arena, lipid research technician, and clinical trials coordinator for Washington University's Lipid Research Center.

"Exciting and promising research and collaborations are abundant at this medical center, and funding is available to support good science. It is encouraging to hear that the National Institutes of Health is funding at a higher percentage now than it has in the past nine years for most of the institutes," says Meese. "I encourage diagnostic radiology faculty to contact me for assistance in acquiring those funding dollars."

For more information, call Shelly Meese at (314)362-6213.

Faculty pen acclaimed textbooks

Mallinckrodt Institute faculty are editors and contributing authors of three recently published textbooks.

Advances in Radiation Therapy

James Purdy, PhD, associate director of the Radiation Oncology Center and chief of radiation oncology physics, along with Drs. Bharat Mittal of Northwestern University Medical School in Chicago and K. K. Ang of the M. D. Anderson Cancer Center in Houston, edited the first edition of *Advances in Radiation Therapy*. Released in December of 1997, the 320-page book is a comprehensive reference on how the practice of radiation oncology has been influenced by specific radiological sciences discoveries within the past 20 years. Published by The Netherlands' Kluwer Academic Publishers, the book focuses on clinical radiation therapy, radiation physics and biology, and innovative approaches to radiation oncology. In addition to editing the book, Purdy wrote Chapter 1, "Three-Dimensional Treatment Planning and Conformal Dose Delivery—A Physician's Perspective."

Computed Body Tomography with MRI Correlation

In 1982, just 10 years after the first computed tomography (CT) scanner arrived in the United States, Institute faculty members edited and authored *Computed Body Tomography*, the first comprehensive body CT textbook. According to the *American Journal of Roentgenology*, "Every radiologist performing CT should own a copy [of this book], and it should be one of the standard reference textbooks in every CT suite."

The third edition was recently published by Lippincott-Raven. Jay Heiken, MD, chief of abdominal imaging, and Stuart Sagel, MD, chief of chest radiology, (who are codirectors of the Institute's body CT service), along with former MIR faculty Joseph Lee, MD, University of North Carolina School of Medicine, and Robert Stanley, MD, University of Alabama at Birmingham, have once again produced a superb reference that the scientific journal *Radiology* pronounced as "mandatory reading for all radiologists." The two-volume set offers definitive guidance on the latest clinical applications and technological innovations of body CT, now with magnetic resonance correlation. Contributing authors include these radiologists who are currently on faculty at Mallinckrodt Institute: Claire Anderson, Dennis Balfe, Harold Bennett, Joseph Borrello, David Gierada, Harvey Glazer, Fernando Gutierrez, Heiken, Douglas Robertson, Sagel, Janice Semenkovich, Marilyn Siegel, Richard Slone, William Totty, Franz Wipold, and Pamela Woodard.

Principles and Practice of Radiation Oncology

Carlos Perez, director of the Radiation Oncology Center, and Luther Brady, MD, of the Allegheny University Hospitals-Hahnemann, are coauthors of a third-edition reference that *The Journal of the National Cancer Institute* has hailed as "the best written, most comprehensive textbook of radiation oncology available." Published by Lippincott-Raven, this classic reference is thoroughly revised and updated from cover to cover and describes the latest technical advances and clinical applications in radiation oncology, such as 3-D conformal and intensity modulated radiation therapy. New to this edition is a chapter on quality of life and supportive care for patients with cancer. Contributing authors include the following MIR physicians and scientists: Clifford Chao, MD; Robert Drzymala, PhD; Mary Graham, MD; Perry Grigsby, MD; Hsiu-san Lin, MD, PhD; Eric Klein, MS; Jeff Michalski, MD; Eduardo Moros, PhD; Robert Myerson, MD, PhD; Perez; James Purdy, PhD; Joseph Roti, PhD; Joseph Simpson, MD, PhD; Marie Taylor, MD; Todd Wasserman, MD; and Jeffrey Williamson, PhD.

Woodard selected for fellowship

The American College of Chest Physicians (ACCP) annually honors those physicians who have made notable contributions to cardiopulmonary health and critical care. Pamela Woodard, MD, assistant professor of radiology, has been elected as an ACCP fellow. The convocation ceremony will be held at the society's annual meeting in November in Toronto, Ontario, Canada.

After completing a four-year diagnostic radiology residency at the Duke University Medical Center and a one-year fellowship in chest radiology at Mallinckrodt Institute, Woodard joined the MIR faculty in 1997. She received the 1996 Siemens Medical Systems/Radiological Society of North America Fellowship and the 1997 American Roentgen Ray Society's Melvin M. Figley Fellowship in Radiology Journalism. Woodard focuses her research on thoracic cardiovascular imaging, with special interests in magnetic resonance (MR) assessment of coronary artery disease, MR assessment of congenital heart disease, and spiral computed tomography and MR of pulmonary arteries.



BREAKING THE ULTRASOUND BARRIER

What at first glance looks like bad television reception suddenly comes to life in the ultrasound suite at Mallinckrodt Institute of Radiology (MIR). William Middleton, MD, professor of radiology and head of ultrasonography, has placed an ultrasound probe over one of his fingers. As he moves the finger, two distinct tendons can be visualized in motion as they pull different joints of his finger.

Ultrasonography of the hand? Surprising to many people and even to some physicians, ultrasound is extremely useful for examining localized problems in the musculoskeletal system.

BY JOANNA B. DOWNER

“Usually people relate to obstetrical ultrasound. Many people have also had abdominal or cardiac ultrasounds,” says Middleton. “But patients are often surprised that we’re using ultrasonography for shoulder pathology or for pathology elsewhere in the extremities.”

Obstetrical ultrasound provides many parents-to-be with the first picture of their child and lets the doctor detect possible complications before delivery. Abdominal ultrasound is performed for a number of reasons, including diagnosing gallstones or kidney obstruction and even for guiding biopsies of suspected tumors. In skilled hands the uses of ultrasonography can be multiplied. Dr. Middleton and his colleague, Sharlene Teefey, MD, associate professor of radiology, have focused much of their efforts on expanding ultrasonography in musculoskeletal disease.

Ultrasonography is a noninvasive technology that uses high frequency sound waves, above the audible range, to create an image. The sound waves are transmitted into the body by a small probe, and the echoes reflected by internal structures are analyzed by a computer to produce two-dimensional images of the body’s soft tissues and blood vessels. By using the Doppler principle, blood flow in arteries and veins can be shown in color or in a graphic display.

Ultrasound has extensive uses in all parts of the body, except for the lungs and areas covered by bone. Musculoskeletal examinations make up about 15 to 20 percent of ultrasounds performed at the Institute. And because shoulder pain, weakness, and immobility are problems encountered by many people, around half of these musculoskeletal sonograms are of the shoulder.

Rotator cuff disease, a common cause of these symptoms, is the primary reason for shoulder sonography. The rotator cuff, which supports the shoulder throughout its wide range of motion, consists of four muscles and tendons. When deciding on treatment options, it is important to know if the rotator cuff is intact or torn, and ultrasound provides that information.

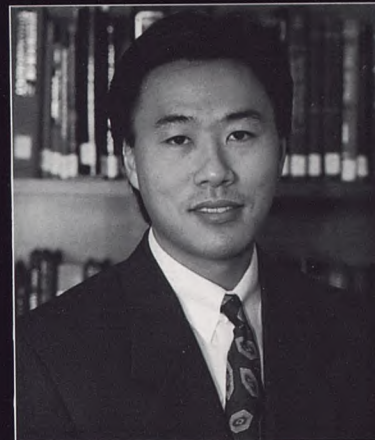
SOUNDING THE CHARGE

In the mid 1980s, Middleton’s research group was one of the first three worldwide to report ultrasound imaging of the rotator cuff. Ultrasonography is now used routinely for diagnosing rotator cuff tears. Magnetic resonance (MR) imaging also is effective in diagnosing rotator cuff tears—but at Mallinckrodt Institute, ultrasonography is the preferred technique for this specific problem.

“In most cases we encourage physicians to use ultrasonography to evaluate the rotator cuff not because it is significantly better than MR, but because it is easier, less expensive, and faster than MR,” explains Middleton.

Another advantage of ultrasound is that it can be used while the patient moves his/her shoulder, allowing the doctor to see how the muscles, tendons, and bones interact. With MR, motion must be avoided because it degrades image quality.

It takes about 15 minutes to look at both shoulders with ultrasound versus approximately one hour to examine a single shoulder with MR. The ability to look at both shoulders with ultrasound provided the data for a study presented at the Radiological Society of North America meeting in December of 1997. In that study, Middleton, Teefey, and Ken Yamaguchi, MD, an assistant professor



Ken Yamaguchi, MD





The popularity of using ultrasound for musculoskeletal examinations continues to grow, both at Mallinckrodt Institute and across the country.

of orthopaedic surgery who specializes exclusively in shoulder and elbow disorders, found that many patients also have detectable rotator cuff tears on the side without symptoms. When these patients are followed over time, about half of them eventually develop symptoms, usually when the tear enlarges.

Rotator cuff tears are repairable by either arthroscopic surgical techniques or by open surgery. When surgery is being considered, accurate preoperative information is crucial. The detail captured in ultrasound images and the sonographic interpretation provided by Middleton, Teefey, and their colleagues give the surgeons a wealth of knowledge.

"With ultrasonography, the surgeon knows exactly what is going on before surgery—not only that a tear is present but also where it is and how big it is. This knowledge aids in selecting the type of surgery," says Yamaguchi.

Yamaguchi, formerly a fellow at New York City's Columbia-Presbyterian Hospital, had previously only used MR for rotator cuff examinations. When he first arrived at Washington University Medical Center, he was skeptical about the benefits of ultrasonography. Now he is one of musculoskeletal ultrasound's biggest fans. All it took was a sonogram of his own shoulder, and Yamaguchi was sold.

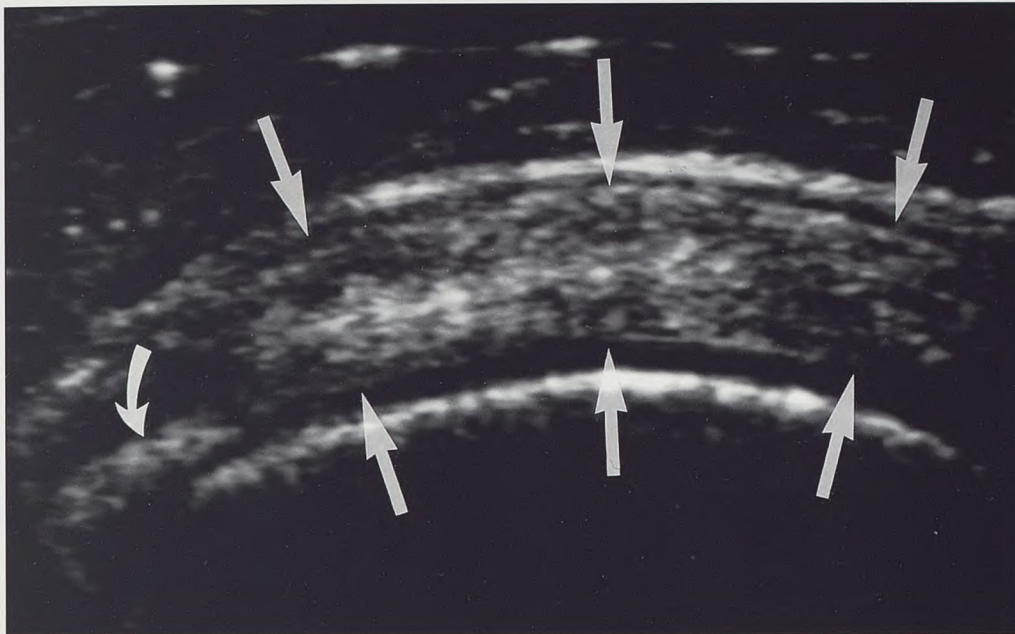
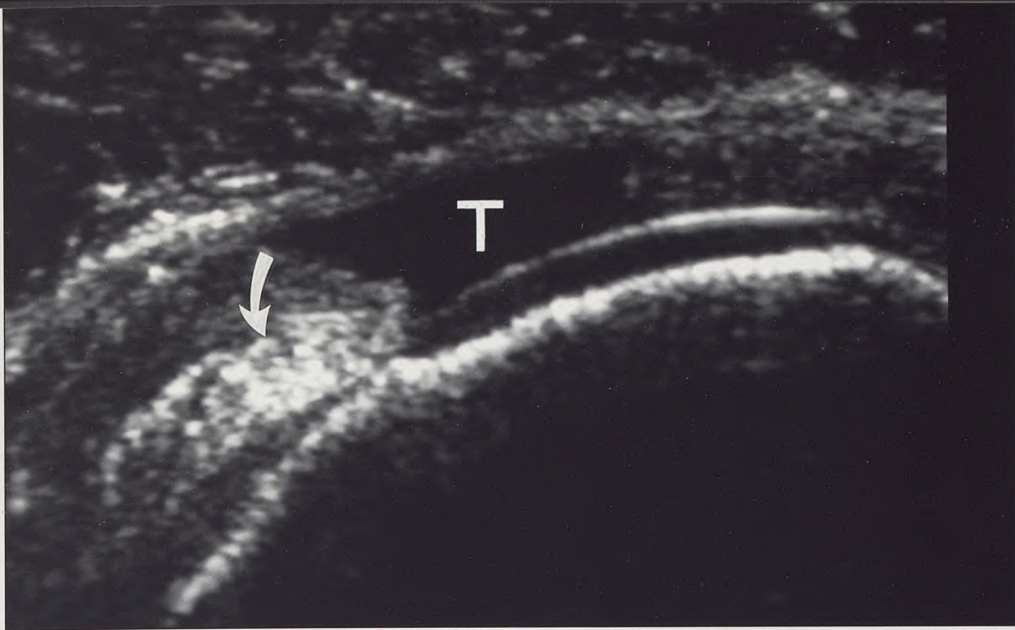
"I was amazed at how detailed the image was and how clearly it showed the anatomy of my shoulder," Yamaguchi recalls. "Since then, I've used ultrasonography. I think it is nearly one-hundred percent reliable."

Yamaguchi still uses magnetic resonance imaging in certain instances, such as evaluating the size and quality of the muscles and determining if nerve problems exist. In addition, in patients who have had previous surgery, Yamaguchi uses both ultrasonography and MR to obtain the highest diagnostic accuracy.

RESOUNDING SUCCESS

In March of 1998 at the American Academy of Orthopaedic Surgeons, the combined radiology and orthopaedic surgery group presented their results, comparing ultrasonography and surgical findings in diagnosing rotator cuff tears. Using strict criteria, their overall accuracy in diagnosis was 97 percent, and the specificity in distinguishing intact, partially torn, and completely torn rotator cuffs was 91 percent.

"Although there is a wide range of accuracies reported in the literature in the past ten years," says Teefey, "we believe our results reflected the current capabilities of shoulder sonography."



While shoulder anatomy is complicated (some of the tendons and muscles lie under bones and require different arm positions to expose them to the sound waves), improvements in high-resolution ultrasound probes, refinements in the scanning technique, and better understanding of the findings in rotator cuff tears make shoulder sonography less difficult to learn than it has been in the past. Now, Middleton says, in many ways shoulder examinations are more focused and easier to perform than other routine ultrasound examinations.

"In some respects, shoulder examinations are easier than the abdominal exams we perform routinely," he explains. "In a patient with abdominal pain, we have to search for a large variety of possi-

ble abnormalities in many different organs. In the patients we see with shoulder pain, we are basically looking for one thing, a rotator cuff tear. If there is a tear, we measure it and localize it."

The popularity of using ultrasound for musculoskeletal examinations continues to grow, both at Mallinckrodt Institute and across the country. "I am very proud that some of the radiology fellows who trained in these techniques at the Institute have gone into the private practice community and are using musculoskeletal ultrasound," says Middleton. "The technology is becoming more understood by a broader range of radiologists." **AMR**

Top: Transverse view of the shoulder shows a tear (T) as a black defect in the rotator cuff. The curved arrow is pointing to the biceps tendon.

Bottom: Transverse view of the shoulder shows a normal rotator cuff as a band of tissue between the straight arrows. The curved arrow is pointing to the biceps tendon.

Far Left: Doctors Sharlene Teefey and William Middleton.

The MedModeler system creates plastic or wax anatomical parts from patient-specific data. Photograph courtesy of Stratasys, Inc.





The Next Dimension

for Orthopaedic Surgery

The table in the Musculoskeletal Modeling and Visualization Laboratory at Mallinckrodt Institute of Radiology (MIR) is strewn with human bones so lifelike that it is hard to believe they are actually three-dimensional models. There are skeletal hands made of white plastic, waxy femurs with realistic contours and ridges, a set of pearly teeth in red gums, and an exquisitely sculpted skull.

The bones were created with the help of new rapid prototyping technology that uses computed tomography (CT) or magnetic resonance imaging (MRI) data, gathered on a specific patient, to make detailed physical copies of the targeted body part. Only two other medical facilities—the Mayo Clinic in Rochester, Minnesota, and one in Europe—have this state-of-the-art equipment and software, which was developed by a Minnesota-based company, Stratasys, Inc., and was recently approved by the FDA for use in medical settings.

by Candace O'Connor

dimension

"We know that hip joint replacements in acetabulae with severe defects fail at a fairly high rate— fifty percent over four to five years—so we wanted to find a way to objectively look at the acetabular defects and possibly improve the results of the reconstruction."



This technology is especially exciting to Douglas Robertson, MD, PhD, assistant professor of radiology and of orthopaedic surgery, for its potential use in hip joint replacement surgery. Each year, some 200,000 patients nationwide undergo this surgery, and most have a successful outcome. But sometimes the replacement fails and the patient needs a new prosthesis. And this time, the cup-shaped hip socket (or "acetabulum") may be badly deteriorated, making the new "revision" surgery much more difficult.

"These revisions are a severe problem," says Robertson, whose own background includes postdoc-

Dr. Douglas Robertson (left) and Kirk Smith display a femoral hip prosthesis that can be produced by the rapid prototyping equipment housed in the Musculoskeletal Modeling and Visualization Laboratory.

toral training in orthopaedic biomechanics at Brigham and Women's Hospital in Boston, followed by a radiology residency at Johns Hopkins Medical Center in Baltimore. "We know that hip joint replacements in acetabulae with severe defects fail at a fairly high rate— fifty percent over four to five years—so we wanted to find a way to objectively look at the acetabular defects and possibly improve the results of the reconstruction."

In 1996, Robertson and several colleagues embarked on a three-year study, funded in part by the Whitaker Biomedical Foundation, to see whether or not physical models — similar to the ones his lab is now able to create — can better describe the acetabular defects in patients whose first hip replacements have failed than those shown in conventional radiography. A more accurate preview of the defective acetabulum, they thought, would help orthopaedic surgeons in planning the second round of hip surgery and in foreseeing possible problems.

The results of their study, recently published in the *Journal of Computer Assisted Tomography*, show that their hypothesis was correct. Radiographic depictions of the defective acetabulum proved to be “inadequate, inaccurate, and misleading,” they wrote, which means that surgeons who have only these images to rely on must do most of their planning in the operating room. By contrast, 3-D models were substantially more accurate, allowing surgeons to use the critically important factor of defect size to plan the revision. They also could choose the correct prosthesis size and type before the operation took place.

This was not an “outcome” study, Robertson stresses. In the future, they will try to determine whether or not patients whose surgeons use physical models in their surgical planning have better results or need further revision surgery less often.

BACKGROUND OF THE STUDY

Initially, patients may need joint replacement surgery for any of several reasons, such as various forms of arthritis, trauma, or certain developmental anomalies. “So they get a replacement,” says Robertson, “and that surgery is one of the most successful surgical procedures of this century. Patients regain much of their function and are relieved of most of their pain.”

In this operation, the orthopaedic surgeon replaces the worn joint with the kind of metal-and-polyethylene prosthesis that, in size and shape, will best fit the patient’s acetabulum. Some implants are large hemispherical cups, while others are smaller and more eccentrically shaped. The object is a stable fit, to minimize removal of the surrounding bone.

If all goes well, the new joint should last ten to 15 years before a replacement is needed. But sometimes the implant shifts position and the polyethylene may wear away and create particles that trigger a reaction in the patient’s body that leads to bone resorption. In either case, new surgery is necessary.

After years of resorption and remodeling, says Robertson, the acetabulum looks quite different. He holds up a plastic model of a normal pelvic bone ready for the first hip joint replacement. Then he compares it with the model of a bone damaged by years of wear from a prosthesis. The difference is dramatic; some 20 to 40 percent of the original bone is gone and the remaining bone has rough, irregular contours and edges.

“Repairing this normal bone is not too difficult technically,” he says, “but when you start off with something that should look like that [*normal pelvic bone*] but actually looks like this [*damaged pelvic bone*], surgery can be very difficult.”

STUDYING THE PROBLEM

What tools describe these defective areas best so surgeons can accurately plan their joint reconstruction surgery? That was the question posed by Robertson and his colleagues— Charles Sutherland, MD, with the Toledo Clinic in Ohio; William Maloney, MD, associate professor of orthopaedic surgery at Washington University; Thelma Lopes, MD, former MIR visiting research assistant who will be joining the Institute’s diagnostic radiology residency program in July, and Jie Yuan, PhD, research associate in radiology at the Institute—in their study of acetabular defects. Aiding them in this research were Paul Commean and Kirk Smith, both senior research engineers in the Mallinckrodt Institute Electronic Radiology Laboratory.

The researchers studied 19 patients, ranging in age from 34 to 88 years, all of whom had failed hip replacements and were candidates for revision surgery. Each one had undergone radiographic and CT studies. From the CT data, the researchers extracted information on pelvic bone contours that they then converted to computer-aided design (CAD) descriptions.

dimension

"The models have the

tactile sense that sur-

geons need." "Is the

prosthesis tight? Does

it rub? What size really

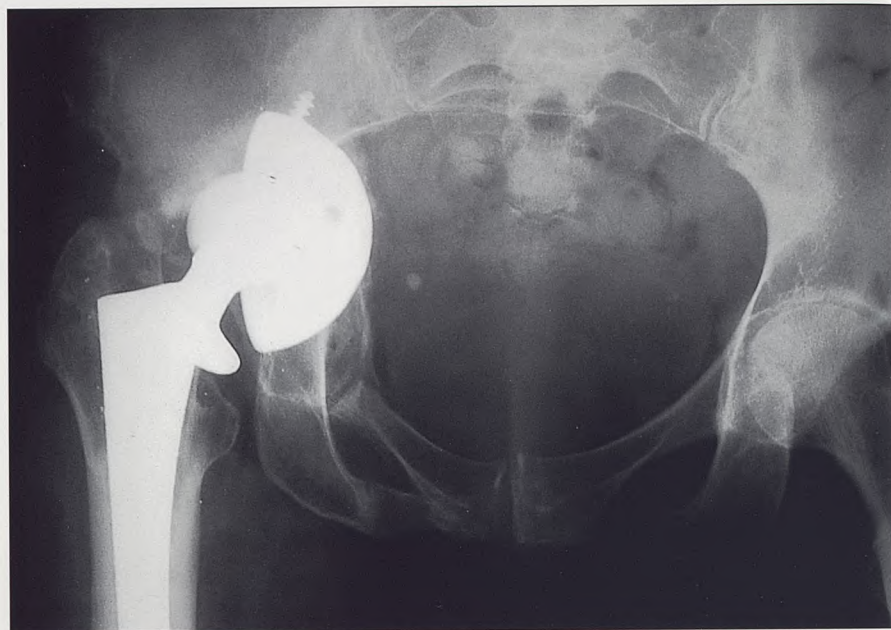
fits? Surgeons can

actually figure out

where the screws

should go, what's going

to fit, and how."



This radiograph taken before hip joint replacement surgery shows a severe defect in the patient's hip socket and the migration of the original prosthesis.

Extracting the contour data on a normal pelvis is easy, says Robertson. But it can be difficult when there is an implant, because the metal produces on-screen "artifact" that obscures some of the information about the bone. Since the automatic contour detection no longer works, the researchers have to make manual adjustments to do the extraction.

Then, as the three-dimensional CAD images appear on a computer screen, researchers can rotate and examine them from every angle, taking important bone measurements. These images are extraordinarily life-like—so vivid, in fact, that some

might wonder why a physical model is necessary at all. But the model provides surgeons with something that the on-screen image does not.

"The models have the tactile sense that surgeons need," says Robertson. "Is the prosthesis tight? Does it rub? What size really fits? Surgeons can actually figure out where the screws should go, what's going to fit, and how."

The next step in the study involved using computer-aided manufacturing software to convert the CAD models into computer-controlled tool paths that could provide directions to



A 3-D model created for the same patient.

equipment that created physical models of the defective bone. Before the new rapid-prototyping machine arrived, Robertson and his colleagues sent the tool-path data to an outside company with computer-assisted milling machines that created the physical models.

Then researchers measured bone loss and created surgical plans based on the radiographs. A month later, without reference to the radiographs, they did the same from the physical models. Finally, they compared both the radiograph-based and the model-based surgical plans to the actual surgery performed.

The results were vivid: There was no significant difference between the surgical findings and

the model-based predictions, but there was a substantial difference between the surgical bone-loss estimates and the radiograph-based predictions, which underestimated bone loss by at least 20 percent. While the researchers selected the correct prosthesis by studying the physical models, they only chose the correct one in 50 percent of the cases when they relied on the radiographs.

PHYSICAL MODELING IN THE FUTURE

Now that Robertson's lab, a division of the Institute's musculoskeletal radiology section and the Electronic Radiology Laboratory, has a new rapid prototyping

machine called the "MedModeler," making these physical models is even easier. Researchers simply feed in the CAD data, and the machine extrudes thin layers of nontoxic wax or plastic until the model is finished. The whole process may take 12 hours but no supervision is required; it can even be done at night after the researchers have left the lab.

Price is still a factor in making these models, Robertson admits. Typically, 3-D models may cost from \$2,000 to \$4,000, but the cost of acetabular models made on this new machine has been reduced to \$850. As this new technology evolves, Robertson adds, the price will probably go down further.

Already, he is working with several Washington University School of Medicine faculty members to develop new uses for rapid prototyping in the shoulder, the distal radius, the spine, and the pelvis. There are many other possibilities, Robertson adds, and he and his colleagues are open to inquiries from any group that might have uses for this technology.

"Part of our mission is to demonstrate its usefulness," he says, "and to bring the cost down so that we provide a very valuable service for a reasonable price." ■

Editor's note: If you are interested in developing other medical uses for this technology, contact Dr. Robertson at (314)362-2911 or by e-mail at robertson@mirlink.wustl.edu.

In this section, the names of personnel who are full-time faculty or staff or who have an appointment in the Department of Radiology are highlighted in boldface type.

THE DIRECTOR'S OFFICE REPORT

PROMOTION

Bruce Whiting, PhD, research associate in radiology, was promoted to instructor in radiology.

JOINT APPOINTMENTS

Brent Allen, MD, associate professor of surgery, was appointed associate professor of radiology.

Harold Burton, PhD, professor of anatomy and neurobiology and of cell biology and physiology, was appointed professor of radiology.

Michael Darcy, MD, associate professor of radiology, was appointed associate professor of surgery.

Wayne Flye, MD, PhD, professor of surgery, was appointed professor of radiology.

Diana Gray, MD, associate professor of obstetrics and gynecology, was appointed associate professor of radiology.

Marshall Hicks, MD, associate professor of radiology, was appointed associate professor of surgery.

David Hovsepian, MD, assistant professor of radiology, was appointed assistant professor of surgery.

Eric Malden, MD, assistant professor of radiology, was appointed assistant professor of surgery.

Jeffrey Reilly, MD, assistant professor of surgery, was appointed assistant professor of radiology.

Brian Rubin, MD, assistant professor of surgery, was appointed assistant professor of radiology.

Gregorio Sicard, MD, professor of surgery, was appointed professor of radiology.

Robert Thompson, MD, assistant professor of surgery, was appointed assistant professor of radiology.

Thomas Vesely, MD, assistant professor of radiology, was appointed assistant professor of surgery.

NEW FACULTY

Linda Fletcher, MD, adjunct assistant professor of radiology, Division of Nuclear Medicine.

Juan Franquiz, PhD, instructor in radiology, Division of Nuclear Medicine.

Joseph Pierro, MD, adjunct assistant professor of radiology, Division of Diagnostic Radiology.

CHANGE IN STATUS

Duffy Cutler, PhD, assistant professor of radiology (research), was appointed assistant professor of radiology (clinical).

Hanneke van Mier, PhD, research assistant professor of neurology, was appointed research assistant professor of radiology and of neurology.

Johanna van Mier, PhD, research associate in neurology, was appointed research assistant professor of radiology.

Robert Drzymala, PhD, assistant professor of radiology, was elected to a three-year term on the Board of Chancellors for the American College of Medical Physics.

APPOINTMENTS/ELECTIONS

David Hovsepian, MD, assistant professor of radiology and of surgery, was elected to the editorial board of the scientific journal *Radiology*.

Henry Royal, MD, professor of radiology and associate director of the Division of Nuclear Medicine, was appointed to the National Academy of Science's Committee on Exposure of American People to I-131 from Nevada Atomic-Bomb Tests: Implications for Public Health and to the Institute of Medicine's Guidelines for Thyroid Cancer Screening committee. These committees will provide reports to the U.S. Department of Health and Human Services within the year.

Peter Shile, MD, assistant professor of radiology and of medicine, was appointed to a three-year term as consultant to the Radiological Devices Panel of the Food and Drug Administration's Center for Devices and Radiological Health.

Marilyn Siegel, MD, professor of radiology and of pediatrics, was appointed to the advisory board of Siemens Medical Systems.

Todd Wasserman, MD, professor of radiology, was appointed to a one-year term on the Chemoprotectants Expert Panel of the American Society of Clinical Oncology. He was appointed as chairman of the New Therapies in Lung Cancer Committee for the Alza Corporation Meeting and as cochairman of the Tenth International Conference on Chemical Modifiers of Cancer Treatment held in January in Phoenix, Arizona, and Clearwater, Florida, respectively.

FELLOWSHIPS/ GRANTS

Thomas Conturo, MD, PhD, assistant professor of radiology and adjunct assistant professor of physics, as principal investigator received a three-year grant extension in the amount of \$100,000 from the Major Grants Program of the McDonnell Center for Higher Brain Function. Coinvestigators for research on "Functional neuronal imaging with magnetic resonance in humans and primates" are **Marcus Raichle, MD**, professor of radiology and of neurology and neurobiology; **Erbil Akbudak, PhD**, instructor in radiology; **Avi Snyder, PhD, MD**, research scientist in radiology and neurology; **Robert McKinstry, MD**, instructor in radiology; **Thomas Cull, PhD**, research associate in radiology; **Harold Burton, PhD**, professor of anatomy and neurobiology, of cell biology and physiology, and of radiology; and Robert Sinclair, PhD, of Washington University's Department of Anatomy and Neurobiology. As principal investigator, Conturo also received a \$25,000 National Multiple Sclerosis Society Pilot grant for research on "MR imaging in MS." Coinvestigators are **Akbudak, Cull, Snyder**, and **Joshua Shimony, MD, PhD**, assistant in radiology.

Assen Kirov, PhD, instructor in radiology and adjunct instructor of physics, as principal investigator, received a three-year grant

in the amount of \$195,000 from the Whitaker Foundation to develop a new radiation dosimetry method. Collaborators for the project, "Three dimensional scintillation dosimetry using tomographic reconstruction" are Robert Binns, PhD, research professor of physics; **Tom Miller, MD, PhD**, professor of radiology and of electrical engineering; and **Donald Snyder, PhD**, professor of electrical engineering and of radiology.

Elizabeth McFarland, MD, assistant professor of radiology, as principal investigator, received a \$500,000 subcontract from the National Cancer Institute for research on "Spiral CT colography (virtual colonoscopy) for detection of colorectal polyps." Coinvestigators for the two-year contract are **Dennis Balfe, MD**, professor of radiology; **Jay Heiken, MD**, professor of radiology; Leonard Weinstein, MD, associate professor of clinical medicine; James Brink, MD, Yale University; Ge Wang, PhD, University of Iowa; **Bruce Whiting, PhD**, instructor in radiology; and **Paul Koppel, PhD**, radiology systems manager. McFarland's subcontract is part of a larger Washington University grant for which Gerald Andriole, MD, professor of surgery, is principal investigator.



Award Presentation

Ronald Evens, MD, director of Mallinckrodt Institute, (left), recently presented a commemorative plaque to Fred Brown, the 1997 Wendell Scott Lecturer. In October, Mr. Brown, president and chief executive officer of BJC Health System, spoke on "American healthcare in the new millennium."

Michael Welch, PhD, professor of radiology and codirector of the Division of Radiological Sciences, as principal investigator, received a \$2,317,907 grant from the National Institutes of Health/National Heart, Lung, and Blood Institute for research on positron emission tomography radiopharmaceuticals for cardiac and other studies. Coinvestigator for the five-year grant is **Timothy McCarthy, PhD**, assistant professor of radiology.

HONORS/ AWARDS

Colin Derdeyn, MD, assistant professor of radiology, received a three-year Clinical Scientist Development Award from the National Institutes of Health/National Institute for Neurological Disease and Stroke. The \$257,859 award will fund Derdeyn's research on "MR of cerebral oxygenation in ischemia." **William Powers, MD**, associate professor of neurology and of radiology, and **Mark Haacke, PhD**, professor of radiology, will serve as sponsor and cosponsor, respectively, for the project.

Eric Klein, MS, assistant professor of radiology, was named to a three-year term on the editorial board of the *International Journal of Radiation Biology and Physics*.

HONORS/ AWARDS

Continued from page 17

Robert McKinstry, MD, instructor in radiology, led the Physicians Accessing the Internet Project Workshop held at the American Medical Association House of Delegates Interim Meeting on December 8 and 9, 1997, in Dallas, Texas, and also at the Uniformed Services Academy of Family Physicians Annual Scientific Assembly in Orlando, Florida, on March 11.

Marcus Raichle, MD, professor of radiology and of neurology and neurobiology, and codirector of the Division of Radiological Sciences, received the Thomas William Salmon Medal presented by the New York Academy of Medicine for outstanding contributions to the field of medicine. As the Salmon Lecturer, Raichle spoke on "Automaticity: from reflective to reflexive behavior." He also was named to the International Advisory Council for Asia, which held its second annual meeting in Hong Kong in December, 1997.

Peter Shile, MD, assistant professor of radiology and of medicine, after completion of a two-year career development radiology research academic fellowship awarded by General Electric and the Association of University Radiologists, was named a GERRAF fellow at the February 1st induction ceremony held in Phoenix, Arizona.

LECTURES/ PRESENTATIONS

Erbil Akbudak, PhD, research instructor in radiology, presented "MR contrast agent quantitation from phase imaging" at Mallinckrodt Medical, Inc., St. Louis, Missouri, November 12, 1997.

Carolyn Anderson, PhD, assistant professor of radiology and of biomedical sciences, presented "Copper-64 labeled monoclonal antibodies for radioimmunotherapy" and co-organized the symposium "Therapeutic radionuclides: making the right choice" at the 215th Annual Spring Meeting of the American Chemical Society, Dallas, Texas, March 29-April 2.

Jeffrey Brown, MD, associate professor of radiology, director of clinical research, and codirector of magnetic resonance imaging, as visiting professor, spoke on "Contrast-enhanced MR imaging of the liver" at Radiology Grand Rounds, University of Nebraska, Omaha, December 11, 1997. He presented "Current concepts in adrenal CT and MR" at the Colorado Radiological Society, Denver, January 15. As visiting professor, Brown spoke on "Advances in body MR" at the University of Colorado, Denver, January 16.

Thomas Conturo, MD, PhD, assistant professor of radiology and adjunct assistant professor of physics, as guest lecturer, presented "Introduction to biomedical physics, to the Department of Physics, Washington University, St. Louis, Missouri,

November 10, 1997. He spoke on "MR imaging of brain function and perfusion" at Radiology Grand Rounds, Johns Hopkins Hospital, Baltimore, Maryland, March 17.

Timothy Davis, MD, PhD, assistant in radiology, presented "Hemodynamics and oxidative metabolism dynamics observed by calibration of functional MRI" at Massachusetts Institute of Technology, Cambridge, December 8, 1997.

Colin Derdeyn, MD, assistant professor of radiology, presented "Temporal stability of hemodynamic stage in patients with carotid occlusion" and "Hemodynamic and metabolic effects of middle cerebral artery stenosis and occlusion" at the Joint Section on Cerebrovascular Surgery and the American Society of Interventional and Therapeutic Neuroradiology Annual Meeting, Orlando, Florida, February 2. He spoke on "Prior ischemic events are associated with ipsilateral hemispheric hemodynamic compromise in patients with carotid occlusion" at the 23rd International Joint Conference on Stroke and Cerebral Circulation, Orlando, Florida, February 5.

Andrew Fisher, MD, instructor in radiology, spoke on "Evaluation of urolithiasis: history and imaging of cardiac valves" at University Hospitals of Cleveland, Case Western Reserve University, Cleve-

land, Ohio, December 30, 1997. He presented "Trauma imaging" at the Missouri Society of Radiologic Technologists 4th District Meeting, St. Louis, January 21. Fisher spoke on "Imaging Abdominal Trauma" at the David Grant Medical Center, Travis Air Force Base, Sacramento, California, March 30. He presented "CT/MR of the adrenal glands. Chest trauma: a case approach" at the University of South Florida, St. Petersburg, April 8.

David Gierada, MD, assistant professor of radiology, presented "Radiologic assessment in lung volume reduction surgery" at the Milwaukee Roentgen Ray Society, "Chest differential diagnosis" at the Medical College of Wisconsin, and "Quantitative CT evaluation of emphysema" at the General Electric Medical Systems CT facility, Milwaukee, Wisconsin, January 26.

Louis Gilula, MD, professor of radiology and of surgery, and chief of musculoskeletal radiology, presented "Indications to order MRI, CT, and bone scans on patients with wrist pain and normal X rays" at the Unresolved Problems in Hand Surgery Specialty Day Workshop of the American Association of Orthopedic Surgeons Meeting, New Orleans, Louisiana, March 22.

Prabhat Goswami, PhD, associate professor of radiology, presented "Simultaneous detection and quantitation of the steady-state level of proto-oncogene and GAPD MRNAs by multiplex reverse transcriptase-PCR" at the International Conference on Frontiers in Biotechnology, Trivandrum, Kerala, India, November 26 - 29, 1997.

Mary Graham, MD, assistant professor of radiology and chief of thoracic service, spoke on "Current issues in radiation therapy for non-small cell lung CA," Phoenix, Arizona, January 16 - 18.

Mark Haacke, PhD, professor of radiology and of electrical engineering and director of the magnetic resonance imaging research laboratory, spoke on "Coronary artery imaging" at The New Frontiers in MRI Meeting, St. Moritz, Switzerland, January 15. He presented "Imaging the DR Desert" at Siemens Medical Systems, Erlangen, Germany, January 20. Haacke spoke on "Veno-graphic applications to fMRI" at Yale University, New Haven, Connecticut, February 3. He presented "High resolution diffusion-weighted imaging" at St. Jude Children's Research Hospital, Memphis, Tennessee, February 17.

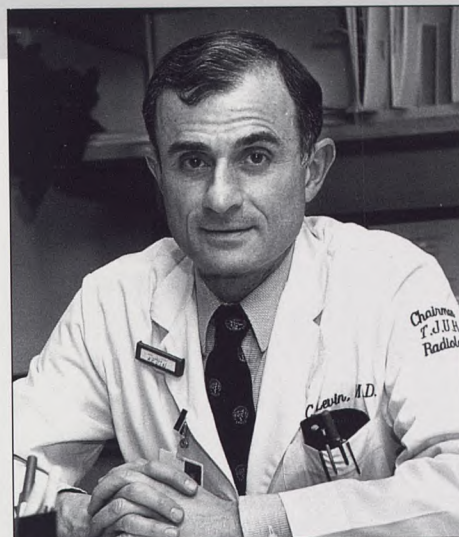
Jay Heiken, MD, professor of radiology, chief of abdominal radiology, and codirector of body computed tomography, presented "CT of the aorta: rupture, dissection, and the postoperative patient," "Imaging evaluation of small

bowel obstruction," "Hepatic masses: characterization with CT and MRI," and "Renal masses: evaluation with CT and MRI" at Advances in Imaging: 1998, sponsored by Tulane University Medical Center and Louisiana State University Medical Center, Park City, Utah, February 22-27. He spoke on "Spiral CT: practical considerations for IV contrast use" and "CT of the aorta: approach to evaluation of rupture and dissection" at the Twenty-first Annual Course of the Society of Computed Body Tomography and Magnetic Resonance, California, March 29 - April 3.

Annette Johnson, MD, instructor in radiology, spoke on "Two approaches to rationalizing the choice of imaging modality" at the University of Alabama, Birmingham, December 16, 1997. She presented "Intracranial infections in immunocompromised patients" at the Medical College of Georgia, Augusta, December 19, 1997.

Daniel Low, PhD, assistant professor of radiology, presented "The use of BANG gel for IMRT dose distributions" at the Royal Marsden Hospital, Sutton, Surrey, England, January 27.

Kathryn Luker, PhD, research associate in radiology, presented "Resistance to apoptosis in the absence of functional P-glycoprotein in MCF-7 sublines obtained using taxol in a fluctuation analysis protocol" at the American Association for Cancer Research 88th Annual Meeting, New Orleans, Louisiana, March 28.



Senturia Lecture

On February 9, Dr. David Levin, professor and chair of the Department of Radiology at Thomas Jefferson University Medical Center in Philadelphia, presented the Fourth Annual Hyman R. Senturia lecture. Dr. Levin spoke on "Turf battles: What can organized radiology and we as individuals do about them?"

Gary Luker, MD, instructor in radiology, presented "Cells expressing MDR1 Pgp have increased esterification of plasma membrane cholesterol that is dissociated from drug transport activity" at the American Association for Cancer Research 88th Annual Meeting, New Orleans, Louisiana, March 28.

Elizabeth McFarland, MD, assistant professor of radiology, spoke on "Colorectal polyp detection with 3D spiral CT colography: technical evaluation of CT imaging protocol—Work in progress" at the Association

of University Radiologists 46th Annual Meeting, New Orleans, Louisiana, March 25-29. She presented "Pseudohaustation artifacts with spiral CT colography: demonstration of pitch and angle dependence using in vitro colon phantom" at the Twenty-first Annual Course of the Society of Computed Body Tomography and Magnetic Resonance, Rancho Mirage, California, March 29 - April 3.

Robert McKinstry, MD, instructor in radiology, as invited lecturer, presented "Functional neuroimaging with magnetic resonance" at The Association of Vascular and Interventional Radiographers, St. Louis Chapter, Winter Symposium, St. Louis, Missouri, February 21.

LECTURES/ PRESENTATIONS

Continued from page 19

Jeff Michalski, MD, assistant professor of radiology, spoke on "Innovations in treatment planning and quality assurance" at the Radiotherapy Towards 2000: Current Role in Prospectives in Oncology, Milan, Italy, March 31 - April 2.

Tom Miller, MD, PhD, professor of radiology and of electrical engineering, presented "Comparison of current vendor offerings for attenuation correction in SPECT" at the Society of Nuclear Medicine Midwinter Meeting, Las Vegas, Nevada, February 3.

Scott Mirowitz, MD, associate professor of radiology, radiologist-in-chief at Barnes-Jewish Hospital north, and codirector of body magnetic resonance imaging, spoke on "Pitfalls in abdominal MRI" and "Fast MR imaging" at the Annual Course of the Society of Computed Body Tomography and Magnetic Resonance, Palm Springs, California, March 29 - April 3.

Carlos Perez, MD, professor of radiology and director of the Radiation Oncology Center, presented "Treatment of carcinoma of the cervix: results and complications" to the New York Roentgen Society, New York City, January 12. He spoke on "Breast conservation

therapy," "Multimodality treatment of locally advanced breast cancer," and "Current issues in the management of carcinoma of the breast" at the Breast Symposia and "Radiotherapy in carcinoma of the vulva" and "Radiotherapy in cancer of the cervix" at the Gynecological Symposia, held at the University of the Witwatersrand, South Africa, January 27 and January 28, respectively. Perez presented "Definitive irradiation in localized carcinoma of the prostate: technical factors and outcome" at the Instituto Portugues de Oncologia, Lisbon, Portugal, March 5. He spoke on "Carcinoma of the vulva and vagina," "Radiation therapy in cervical cancer," and "Radiation therapy versus prostatectomy in carcinoma of the prostate" at the Radiation Oncology Update, Georgetown University, Washington, DC, March 27.

James Purdy, PhD, professor of radiology, associate director of the Radiation Oncology Center, and chief of radiation oncology physics, as visiting professor, spoke on "Dose and volume specification in 3D treatment planning," "Multi-institutional 3D dose escalation trials," and "Intensity modulated radiation therapy" at the University of Arizona, Tucson, January 22 and 23.

Marcus Raichle, MD, professor of radiology and of neurology and neurobiology, and codirector of the Division of Radiological Sciences, spoke on "A mysterious medial parietal area" at the University of Miami School of Medicine, Florida, January 22 and 23.

Vallabhenani Rao, PhD, instructor in radiology and in molecular biology and pharmacology, presented "MDRI Pgp mediates the blood-cerebrospinal fluid permeability barrier in choroid plexus epithelium" at the American Association for Cancer Research 88th Annual Meeting, New Orleans, Louisiana, March 28.

Stuart Sagel, MD, professor of radiology, chief of chest radiology, and codirector of body computed tomography, spoke on "Helical CT in the thorax," "CT of mediastinal lesions (vascular and nonvascular)," and "Anatomic variants and pitfalls in thoracic CT" at the Johns Hopkins Course in Cutting-Edge CT, Orlando, Florida, February 5 - 8. As visiting professor, he presented "Digital chest radiography," "Anatomic variants and pitfalls in thoracic CT," "CT of focal lung lesions," and "CT of the mediastinum" to the Department of Radiology, Michigan State University, Lansing, February 24. Sagel spoke on "Anatomic variants and pitfalls in thoracic CT" and "Current role of CT in bronchogenic carcinoma" at the Twenty-first Annual Course of the Society of Computed Body Tomography, Rancho Mirage, California, March 29 - April 3.

Vijay Sharma, PhD, research assistant professor of radiology, spoke on "Schiff base and amine phenol gallium(III) complexes for functional PET imaging of MDR1 P-glycoprotein" at the American Chemical Society Annual Meeting, Dallas, Texas, March 30.

Peter Shile, MD, assistant professor of radiology and of medicine, as invited lecturer, spoke on "Clinical perspectives on workstation design for digital mammography" and cochaired a session on "Workstation design" at the workshop Digital mammography: Digital Displays and Workstation Design, sponsored by the National Cancer Institute and Department of Health and Human Services, Washington, DC, March 9 and 10.

Marilyn Siegel, MD, professor of radiology and of pediatrics, as visiting professor, spoke on "Sonography of the acute pediatric abdomen," "Pediatric pelvic imaging," and "Pediatric thy-mus" at the University of New Mexico, Albuquerque, February 8. She spoke on "Spiral CT pediatric airway and great vessels" at the 4th International Somatom Plus CT Scientific User Conference, Rotterdam, Holland, March 7. Siegel presented "Ultrasonography of the acute pediatric abdomen" at the American Institute of Medicine Annual Meeting, Boston, Massachusetts, March 23. She spoke on "Pediatric mediastinum: problems and pitfalls" and "MR of bone marrow diseases" at the Twenty-first Annual Course of the Society of Computed Tomography, Rancho Mirage, California, March 29 - April 3.

Celette Sugg Skinner, PhD, assistant professor of radiology, presented scientific exhibits, "Do older African American women perceive psychological benefits from mammography?" and "Response to risk assessment counseling invitations by first-degree relatives with lower perceived risk and anxiety" at the annual meeting of the Society of Behavioral Medicine, New Orleans, Louisiana, March 25 - 29.

Richard Slone, MD, assistant professor of radiology, presented "Radiologic manifestations of emphysema" at Clinical Pulmonary Update: A View of Emphysema in the 20th Century, St. Louis, Missouri, March 20. He presented "Comparison of section thickness, sampling frequency, and phase of respiration for subjective and quantitative assessment of emphysema in volume reduction surgery candidates," at the Twenty-first Annual Course of the Society of Computed Tomography, Rancho Mirage, California, March 29 - April 3.

Jerold Wallis, MD, associate professor of radiology, presented "A Java-enhanced nuclear medicine teaching file" at the 23rd International Symposium on Radioactive Isotopes in Clinical Medicine and Research, Badgastein, Austria, January 16.

Todd Wasserman, MD, professor of radiology, spoke on "Amifostine as a radioprotector" at the Ethylol Investigators Workshop: Recent Developments and Emerging Options in the

Role of Amifostine as a Broads Cytoprotective Agent, sponsored by Alza Corporation/Mediphacs Healthmark, Inc., San Juan, Puerto Rico, January 23 and 24.

Michael Welch, PhD, professor of radiology and codirector of the Division of Radiological Sciences, spoke on "Production of radionuclides for therapy using small cyclotrons," "New metal complexes of indium, gallium, and copper for medical applications," "Application of a 3.7-MeV tandem cascade accelerator for PET radionuclide production," "Relationship of hot-atom chemistry to PET radionuclide production," and "Development and application of radiopharmaceuticals designed to monitor cancer therapy" at the 215th Annual Spring Meeting of the American Chemical Society, Dallas, Texas, March 29 - April 2.

Pamela Woodard, MD, assistant professor of radiology, presented "Diagnostic imaging of PE" at Medicine Grand Rounds, Barnes-Jewish Hospital, St. Louis, Missouri, December 18. She presented "Congenital heart disease" to the Department of Radiology, Bowman-Gray School of Medicine, Winston-Salem, North Carolina, January 13. Woodard spoke on "The one-stop shop" in the Diagnosis of Ischemic Heart Disease: Can MRI Satisfy This Need? Workshop at the Society of Thoracic Radiology Annual Meeting and Postgraduate Course, San Juan, Puerto Rico, March 11.



Biello Lecture

As part of the City-Wide Radiology Conferences, Ronald Van Heertum, MD, presented the Twelfth Annual Daniel R. Biello Lecture on March 9. Dr. Van Heertum, professor of radiology and director of nuclear medicine at Columbia-Presbyterian Medical Center in New York City, spoke on "The role of brain SPECT imaging in 1998." At right is Barry Siegel, MD, professor of radiology and director of the Division of Nuclear Medicine, who coordinates the Biello Lecture.

SYMPOSIA

SOCIETY FOR NEUROSCIENCE

*27th Annual Meeting
New Orleans, Louisiana
October 12 - 30, 1997*

Short Course I: Brain Imaging
Steven Petersen, PhD,
organizer.

SLIDE PRESENTATIONS
Cognition: learning and memory—humans: declarative memory
Randy Buckner, PhD,
chair.

Visual cortex: extrastriate II
Maurizio Corbetta, MD;
Erbil Abudak, PhD;
Thomas Conturo, MD,
PhD; John Ollinger, DSc;
Abraham Snyder, MD;
PhD; Steven Petersen,
PhD; Marcus Raichle, MD,
"Functional anatomical overlap between visuospatial attention and saccadic eye movements in human parietal and frontal cortex."

Neuropsychiatric disorders: imaging II
Mokhtar Gado, MD;
Michael Miller, PhD,
"Brain structure volume and shape metrics as markers of neuropsychiatric disease."

SYMPOSIA

Neuropsychiatric disorders: imaging III

Joseph Simpson, graduate research assistant; Marcus Raichle, MD, "Amygdala hypermetabolism in unipolar and bipolar depression: correlation with plasma cortisol."

POSTER PRESENTATIONS**Visual cortex: estrastriate III**

Steven Petersen, PhD; Erbil Akbudak, PhD; Thomas Conturo, MD, PhD; Abraham Snyder, MD, PhD; Marcus Raichle, MD; Maurizio Corbetta, MD, "Direction cueing in a motion coherence task studied with fMRI."

Basal ganglia: task-dependent activity

Tom Videen, PhD; Joel Perlmutter, MD, "A new technique for combined PET neuroimaging and electrophysiologic investigation of the primate basal ganglia."

Cognition: learning and memory—humans: memory and children

William Powers, MD, "Neonatal cerebral blood flow (PET) and childhood relational memory performance."

Cognition: learning and memory—humans: neuro-imaging of declarative memory

Randy Buckner, PhD; Marcus Raichle, MD; Steven Petersen, PhD, "Comparison of visual word encoding and unfamiliar face encoding using PET."

Kathleen McDermott, PhD; Erbil Akbudak, PhD; Abraham Snyder, MD, PhD; Thomas Conturo, MD, PhD; John Ollinger, DSc; Steven Petersen, PhD; Marcus Raichle, MD, "An fMRI study of recognition memory using blocked and single trial designs."

Visual cortex: striate IV

Adina Roskies, PhD; Erbil Akbudak, PhD; John Ollinger, DSc; Thomas Conturo, MD, PhD; Marcus Raichle, MD; Steven Petersen, PhD, "Characterization of magnitude and spread of fMRI response in V1 to discrete visual stimulus."

Cognition: learning and memory—humans: skill learning

Hanneke Van Mier, PhD; Erbil Akbudak, PhD; Thomas Conturo, MD, PhD; Marcus Raichle, MD; Steven Petersen, PhD, "Practice related changes in motor learning measured by fMRI."

Cognition: language—higher level processes

Marcus Raichle, MD; Steven Petersen, PhD, "Comparison of overt and silent verb generation using PET."

Motivation and emotion III

Joseph Simpson, graduate research assistant; Ann Mary MacLeod, research assistant; Marcus Raichle, MD, "Blood flow decreases in human medial inferior prefrontal cortex and hypothalamus correlate with anxiety self-rating and with practice-related changes on a cognitive task."

Degenerative disease: Parkinson's IV

Joel Perlmutter, MD, "Association studies of cutochrome P45011D6 gene polymorphisms with familial and sporadic Parkinson's disease."

Brain metabolism and blood flow: functional imaging

Joseph Simpson, graduate research assistant; Marcus Raichle, MD, "Linear versus non-linear warps of neuroimages."

Ann Mary MacLeod, research assistant; Marcus Raichle, MD; Abraham Snyder, MD, PhD; Stephen Moerlein, PhD; Michael Welch, PhD, "A comparison of oxygen-15 labeled water and butanol in a somatosensory activation paradigm with PET."

Peptides: anatomy and physiology IV

Kevin Black, MD; Joel Perlmutter, MD, "Regional blood flow changes induced by L-DOPA methyl ester in normal monkeys."

Effects of injury and disease II

Joel Perlmutter, MD; Tom Videen, PhD, "PET investigations of essential tremor and thalamic stimulation."

Joel Perlmutter, MD, "Essential tremor: kinematics and EMG during electrical stimulation of thalamus."

MEDICAL IMAGING 1998

Sponsored by The International Society for Optical Engineering
San Diego, California
February 21 - 27, 1998

PLENARY PRESENTATION

Marcus Raichle, MD, "Images of mind: the past, present, and future of functional brain imaging."

WORKSHOP: CHARACTERIZATION OF CRT DISPLAY SYSTEMS

Richard Slone, MD, panelist.

PACS DESIGN AND EVALUATION: ENGINEERING AND CLINICAL ISSUES

James Blaine, DSc, conference cochair.

Keynote Session 1: Integrating the healthcare enterprise
Gilbert Jost, MD, chair.

Session 3: PACS Infrastructure II
Stephen Moore, MS; David Beecher, MS, "Image acquisition system for a hospital enterprise."

Session 7: Workflow
David Melson, BS; James Blaine, DSc; Gilbert Jost, MD; Richard Slone, MD, "Impact of a voice recognition system on report cycle time and radiologist dictation time."

Session 9: DICOM—Experience and New Applications
Stephen Moore, MS, chair.

Session 12: Information Systems Integration
James Blaine, DSc; Gilbert Jost, MD, "Information and image integration: project spectrum."

PHYSICS OF MEDICAL IMAGING

Session 6: Imaging theory
Bruce Whiting, PhD; Edward Muka, MSE, "Image characterization: statistics and modeling."

ALUMNI NEWS



Jeffrey Ellis, MD, died this past September from a myocardial infarction. He was 48 years old. From 1975 to 1979, he was a diagnostic radiology resident at the Institute and served as chief resident, 1978-1979. In an interview for the fall 1978 issue of *Focal Spot* magazine, Dr. Ellis revealed that he "was into math" at the University of Illinois when he discovered that "theoreti-

cal math was not as interesting [to him] as chemistry and biology"—an interest that led to a medical degree from Loyola University of Chicago, Stritch School of Medicine. An exemplary student, Dr. Ellis graduated Phi Beta Kappa from the University of Illinois and was a member of the Alpha Omega Alpha honorary medical society. A radiology rotation in medical school

and a summer radiology externship fueled his decision to specialize in radiology. "Radiology is a pleasurable, dynamic field but also requires a certain amount of hard work," he said during the 1978 interview. "You never stop learning and an interesting film is always exciting." Dr. Ellis is survived by his parents, Mr. and Mrs. Ernest Ellis of LaGrange, Illinois.



In this photo of the Mallinckrodt Institute of Radiology 1978-1979 residents, fellows, and trainees, Dr. Ellis is seated, third from right.

IN MEMORIAM

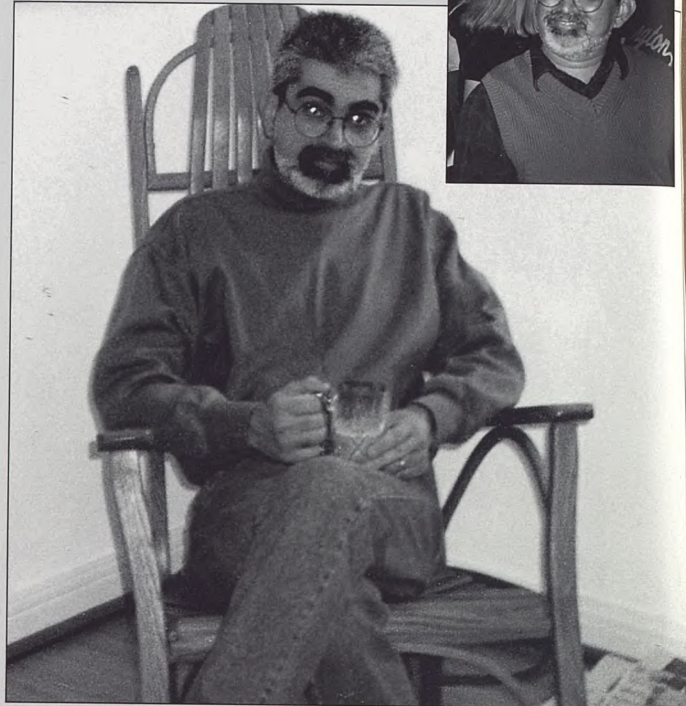
Kondapuram S. Sampathkumaran, a scientist and research assistant professor at Washington University's Mallinckrodt Institute of Radiology, died on December 18, 1997, from a blood disorder. "Sampath," as he was known to friends and colleagues, was 47 years old and is survived by his wife Kathy; his mother, who lives in India; and siblings in India and the United States.

Prior to joining the Washington University School of Medicine faculty in 1978 as a research assistant in nuclear medicine, Sampath was a scientific programmer from 1972 to 1975 at the National Aeronautical Laboratory in Bangalore, India. From 1975 to 1977, he was a teaching assistant at McMaster University in Hamilton, Ontario, Canada. In 1986 he was named a research assistant professor in Mallinckrodt Institute's Division of Nuclear Medicine. In 1988, Sampath received a dual appointment as adjunct instructor at Saint Louis University School of Allied Health.

The following tribute to Sampath was written by Barry Siegel, MD, professor of radiology and medicine, and director of the MIR Division of Nuclear Medicine, and Tom Miller, MD, PhD, professor of radiology and of electrical engineering.

During his almost 20 years in the Division of Nuclear Medicine, Sampath developed and managed the Division's progressively expanding system of image processing computers, while simultaneously conducting research in several areas. He wrote a library of software for clinical nuclear medicine applications that even today is unique in the world. This software, along with the digital network he designed to connect the three hospitals at the Washington University Medical Center, is used in the Division of Nuclear Medicine for all processing and display of clinical studies. While many academic centers employ small components of their own software, no other nuclear medicine clinic relies so completely on "homemade" software. Even with the rapid improvement in commercial software, Sampath's system continues to be used because of its versatility, ease of operation, and power. This accomplishment was truly a work of art and a labor of love that will be an enduring monument to Sampath's skill and dedication to nuclear medicine and to the care of our patients.

Sampath's other absorbing interest was research. Over his years at the Institute, he worked most closely with Dr. Tom Miller in digital filtering, coauthoring papers that are widely referenced even today. He also collaborated with Drs. Barry Siegel and the late Daniel Biello in computer-based methods for analysis of cardiac function. In more recent years Sampath collaborated with Dr.



Robert Gropler to develop important software for cardiac PET research.

Sampath had a personal quality that made him a true scientist: He was always drawn to new, fresh ideas. This tendency motivated his clinical software development. He appreciated the value of the newest computer hardware, giving us the most powerful, modern computers long before others had them. Sampath was fascinated by the Unix operating system and was attracted at an early stage to the windows-based style of computing, thus giving the Division of Nuclear Medicine and its patients the best possible clinical software. Sampath was remarkably dedicated to the Division and to its clinical mission. He knew that proper and uninterrupted operation of

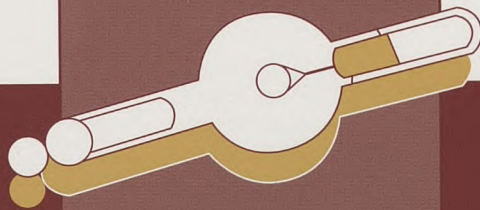
our computers was vital to patient care, and he always made himself available to troubleshoot the system if problems in operation arose.

As much as Sampath was admired for his accomplishments as a computer scientist, he was also genuinely loved as a person. He was kind and always sensitive to others' feelings, and he had a gentle, human quality that endeared him to all. He also had an exceptional and somewhat impish sense of humor that delighted those who knew him well.

Sampath was a special person. He developed a unique computer system that greatly benefits patients, he made important contributions in research, and he was a true friend to all who knew him. He will be sorely missed even as his legacy lives on at MIR.

RADIOLOGY

Diagnosis • Treatment • Research



PRACTICAL ISSUES IN LEADING-EDGE RADIOLOGY III

Friday, October 23, 1998 through
Sunday, October 25, 1998



*The Radisson Hotel
7750 Carondelet
Clayton, Missouri*

A Symposium Sponsored by
THE MALLINCKRODT INSTITUTE OF RADIOLOGY
and the Office of Continuing Medical Education
at Washington University School of Medicine

Approved for 25.5 Hours of Category 1 CME Credit

 **Washington**
WASHINGTON UNIVERSITY IN ST. LOUIS
School of Medicine

For more information, call 314/362-2916.

FOCAL SPOT

MALLINCKRODT INSTITUTE OF RADIOLOGY

Address Service Requested

Send distribution changes or
address corrections to

Focal Spot Editor
Mallinckrodt Institute
of Radiology
510 South Kingshighway Blvd.
Campus Box 8131
St. Louis, MO 63110
(314) 362-2866

Editor and Writer
Vicki Kunkler

Contributing Writers
Joanna B. Downer
Candace O'Connor

Photographers
Bob Boston
Thomas Murry
Tim Parker
Michelle Wynn

Design
Purviance & Company
Marketing Communications

Printing
Scholin Brothers
Printing Company

Focal Spot magazine is
distributed three times
annually. Magazine articles
may be reproduced if credit is
given to *Focal Spot* magazine
of the Mallinckrodt Institute
of Radiology at Washington
University.

© Mallinckrodt Institute of
Radiology, 1998

Non-Profit Organization
U.S. Postage
PAID
St. Louis, Missouri
Permit No. 3309

MIR
MALLINCKRODT
INSTITUTE OF RADIOLOGY
WASHINGTON UNIVERSITY
MEDICAL CENTER

ARCHIVES
SERIALS DEPT., MEDICAL LIBRARY
WASH. U. SCHOOL OF MEDICINE
CAMPUS BOX 8132