

Fall 1986

Focal Spot, Fall/Winter 1986

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FALL/WINTER 1986

VOLUME 17, NUMBER 4

FOCAL SPOT

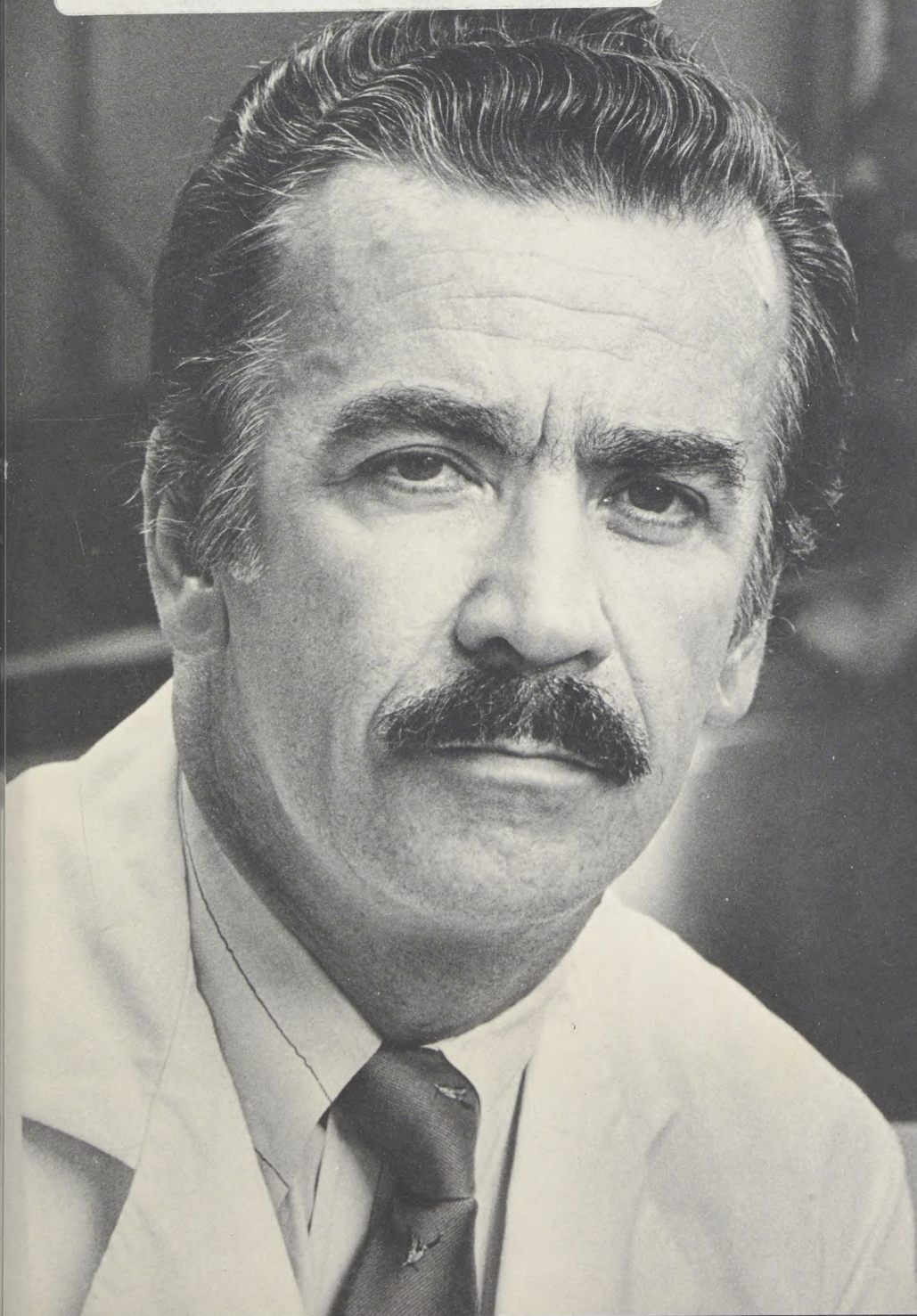
MALLINCKRODT INSTITUTE OF RADIOLOGY

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HYPERTHERMIA
Comes of Age



Mike DeFilippo

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MALLINCKRODT INSTITUTE OF RADIOLOGY

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ON THE COVER:

Carlos A. Perez, M.D., director of the Division of Radiation Oncology, began hyperthermia research at Mallinckrodt. Now he heads a cooperative effort to develop and improve the use of hyperthermia in cancer treatment. Photography by Mike DeFilippo.

SPOT NEWS

No Smoking Policy Announced

Something's in the air at the Mallinckrodt Institute of Radiology. More properly, something's not in the air—those drifting clouds of cigarette smoke that shadow the workday. In November, MIR joined the growing number of institutions in the health care field implementing a no smoking policy for both employees and patients.

The policy changes the official position of the institute on employee, patient and visitor smoking from one of "smoking allowed in designated areas" to one of "no smoking except in designated areas." That may seem to be a slight and purely semantic change, but according to Ronald G. Evens, M.D., director of Mallinckrodt, it's an important one.

"The institute and its staff are going on record that we are against smoking and believe it is bad for health," states Evens. "We have an obligation to our patients, visitors and staff to protect and encourage their good health. I predict the institute will be completely free of smoking in the future."

The widely documented dangers of tobacco use have led a quickly growing number of health care institutions to limit the amount of smoking allowed by their employees and patients. Because of the overwhelming risks associated with cigarettes—to the smoker and nonsmoker alike—many at Mallinckrodt believe the institute has been compromising its position as a serious promoter of health by maintaining a policy that tolerates or encourages smoking.



Stuart S. Sagel, M.D., chief of the Chest Section, strongly believes that it is inconsistent to foster smoking in a health care environment. His interest in the issue led to Sagel's appointment as chairman of a committee of physicians, scientists, technologists and secretaries, who were asked to formulate a policy for the institute. "They all realized smoking offends some people," he says. "Opinions ranged from adamant 'no smoking at all' to 'limited areas of smoking,' but we came up with a policy that everyone could agree on and support."

Based on his studies of other hospitals and businesses with no smoking policies, Sagel expects little trouble with the policy at Mallinckrodt. He claims that even people who feel their rights are being infringed on come to appreciate the change. There may be some initial antagonism toward the policy, Sagel explains, but in the long run there has



been overwhelming acceptance at other institutions. He expects similar results at Mallinckrodt.

"Most people want to cooperate," Sagel says. "In fact, a number of people found that making smoking inconvenient was enough to get them to quit. It was the straw that broke the camel's back."

Purdy Receives NCI Contract

James A. Purdy, Ph.D., professor and chief of the Physics Section in the Division of Radiation Oncology, was awarded a \$360,000 research contract from the National Cancer Institute. The contract is part of a multi-institutional collaborative effort to develop criteria, guidelines and methodology for the performance and evaluation of radiation treatment planning for electron beam therapy.

With researchers from the

University of Michigan and the M.D. Anderson Hospital and Tumor Institute, Purdy's research group will provide a focused evaluation of the capability of improving electron beam dose distributions with presently available beam delivery and computerized treatment planning systems. Parameters of this 3-year project were defined at the first joint meeting held August 19 in Washington, D.C.

Purdy and his coinvestigators at Mallinckrodt—William Harms, Russell Gerber, John Wong, Ph.D., Robert Dryzmala, Ph.D., and Bahman Emami, M.D.—along with John Matthews, D.Sc., of the Institute for Biomedical Computing at Washington University, and computer scientists Ken Krippner and P.K. Ramchandrar, of Computerized Medical Systems, Inc., a St. Louis-based computer treatment planning company, have developed a computerized treatment planning system that can perform dose calculations for individual patients based

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on a three-dimensional view of the body.

The system utilizes anatomical detail and tissue density information provided by computed tomography (CT) and makes use of high-speed numerical processing and real-time display systems to evaluate the delivery of radiation from every possible orientation.

Purdy's group is also participating in a similar research contract evaluating three-dimensional photon beam treatment planning. That work is entering its final stages and the results will be published at the end of 1987.

MIR and St. Luke's Sponsor Oncology Update

"Current Controversies in Management of Carcinoma of the Breast" was the subject of the Oncology Update presented by the Mallinckrodt Institute of Radiology and St. Luke's Hospital on October 30. Sponsored by the American Cancer Society, the event featured the latest information on the detection and treatment of breast cancer from experts around the world.

The day-long seminar at St. Luke's Hospital was the fifth in an annual program established by Carlos A. Perez, M.D., director of the Division of Radiation Oncology, to provide physicians and other health care professionals with the most recent advances in the diagnosis and treatment of cancer.

Washington University faculty participating were Perez, chairman of the

seminar and moderator of the afternoon panel discussion; Delia Garcia, M.D., clinical chief of Radiation Oncology at St. Luke's Hospital, moderator of the morning discussion; Andrew E. Galakatos, M.D., associate professor of clinical obstetrics and gynecology, lecturer on "Diagnostic Workup of Patient with Breast Symptoms"; and V. Leroy Young, M.D., associate professor of plastic and reconstructive surgery, lecturer on "The Role of Reconstructive Surgery in Breast Cancer."

Participating St. Luke's faculty included Dave Krakovich, M.D., chief of the Vascular Division, Department of Surgery; George L. Tucker, M.D., chief of the Department of Surgery; and John B. Shapleigh, M.D., codirector of the Oncology Section, Department of Surgery.

Guest faculty were Edwin R. Fisher, M.D., director of laboratories, Shadyside Hospital, Pittsburgh; Jay Harris, M.D., director, Joint Center For Radiation Therapy, Harvard Medical School, Boston; Daniel F. Hayes, M.D., instructor in medicine, Harvard Medical School; Alfred S. Ketcham, M.D., chief, Division of Oncology, University of Miami School of Medicine, Miami; Edward Sickles, M.D., associate professor of radiology, University of California School of Medicine, San Francisco; and Barbara Thomas, M.D., clinical coordinator, Guildford Breast Screening Project, Jarvis Screening Centre, Guildford, England.

Sickles also spoke on "The Indeterminate Mammogram" and "Xerox Versus Film-Screen Mammography" on October 29 at St. Luke's.

Roti Roti Awarded NCI Grants

Joseph L. Roti Roti, Ph.D., associate professor and chief of the Cancer Biology Section in the Division of Radiation Oncology, has been awarded \$1,035,980 for two research grants for a 5-year period from the National Cancer Institute to study the effects of heat on cell structure.

The first grant, entitled "Radiation Induced Alterations of Chromosomal Proteins," will allow Roti Roti and coresearchers Ryuji Higashikubo, Ph.D., instructor in cancer biology in radiology, Andrei Laszlo, Ph.D., assistant professor of radiology, and William D. Wright, scientific coordinator in the Division of Radiation Oncology, to study the effects of ionizing radiation and hy-

perthermia on nuclear organization, structure and function.

The purpose of the study is to determine how the heat- and x ray-induced changes in cell nuclei inhibit nuclear function. The study will determine if heat-induced excess nuclear proteins alter enzymatic access to DNA and the DNA available for supercoiling changes.

With the second grant, entitled "Nuclear Protein Content and Heat-Induced Cell Killing," Roti Roti and coresearchers Higashikubo and Carlos A. Perez, M.D., professor of radiology and director of the Division of Radiation Oncology, will study the correlation between heat-induced changes in nuclear protein content and tumor growth delay or tumor cell survival.

The researchers will measure the nuclear protein content of tumors treated with hyperthermia to obtain an early estimate of the outcome of the treatment.

Joseph L. Roti Roti, Ph.D.



SPOT NEWS

Gilula Chairs ACR Course

Louis A. Gilula, M.D., codirector of the Musculoskeletal Section, served as chairman of the Categorical Course on Diagnostic Techniques for the Musculoskeletal System, held September 13-14 at the Omni International Hotel in Baltimore.

The course was the preliminary program to the 63rd Annual Meeting of the American College of Radiology and provided radiologists with an update on imaging techniques of the musculoskeletal system.

Gilula is a member of the ACR Categorical Course Committee, which coordinates courses for major radiological society meetings. "Each year the committee sponsors three Categorical Courses," he explains, "one at the Radiological Society of North America meeting, one at the American Roentgen Ray Society meeting and one at the American College of Radiology meeting. As one of the committee members involved in musculoskeletal work, I was chosen to chair this course."

Gilula was responsible for faculty selection and course organization. He made two presentations during the course, one on knee and the other on wrist arthrography. Other Mallinckrodt participants included William R. Reinus, M.D., assistant professor of radiology, who presented a paper on ankle tenography; William G. Totty, M.D., associate professor of radiology, who presented a paper on MRI of ischemic necrosis; Judy M. Destouet, M.D., associate professor of radiology, who presented an article on bone biopsy; and David C. Hardy, M.D., who presented a paper on temporomandibular joint arthrography.

New Linear Accelerator Inaugurated

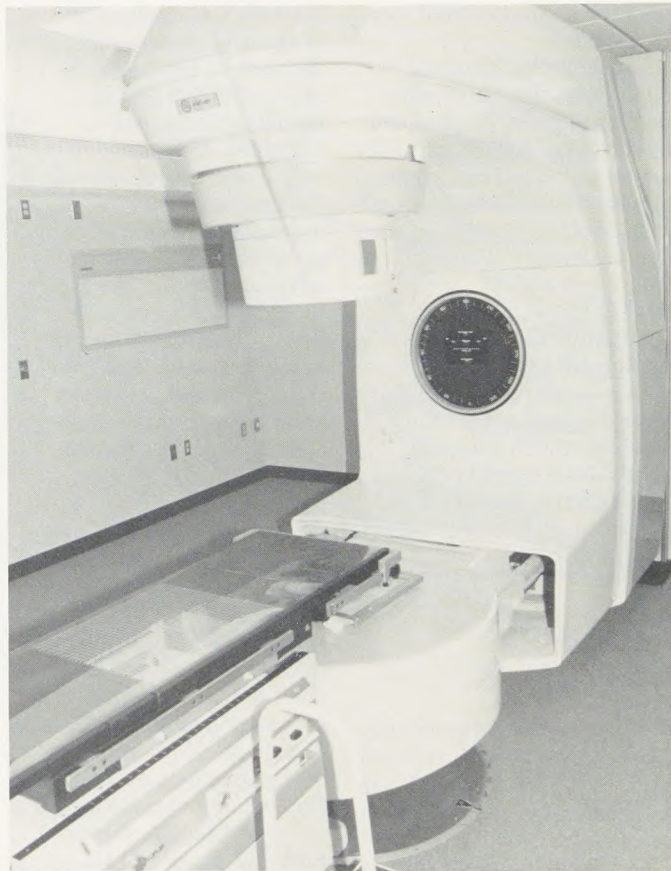
The Division of Radiation Oncology inaugurated the new Clinac 1800 Linear Accelerator in a ceremony held in Scarpellino Auditorium September 18. The accelerator provides Mallinckrodt with the most accurate and effective method of therapeutic radiation available in the treatment of cancer.

One of only a few in the nation, the new accelerator is capable of issuing two different energy beams from the same unit. The dual beam accelerator treats tumors at various depths, thereby reducing the number of machines used in treatment, the number of times a patient must be moved and the total time spent in the treatment facility.

The purchase of the Clinac 1800 was made possible in part by the contribution of \$100,000 from Mr. and Mrs. John Arnold of Panama City, Florida. Mr. Arnold underwent successful hyperthermia treatment for cancer at Mallinckrodt after hearing of the success of the program in a Florida newsletter.

Inauguration guest lecturer Luther Brady, M.D., Hylda Cohn and American Cancer Society professor of clinical oncology and chairman of the Department of Radiation Oncology at Hahnemann University in Philadelphia, spoke on "Recent Advances and Future Directions of Radiation Oncology in Cancer Management."

Brady is the author of more than 400 articles and 22 books in the field of radiation oncology. He is coeditor with Carlos A.



Thomas Murry

***The Division of Radiation Oncology,
Mallinckrodt Institute of Radiology,
Acknowledges and Appreciates
The Generous Contribution of
Mr. & Mrs. John Arnold
Toward the Purchase of the Clinac 1800
1986***

Perez, M.D., professor of radiology and director of the Division of Radiation Oncology, of a new book entitled *Principles and Practice of Radiation Oncology*, to be published next spring.

A second guest lecturer, William C. Dewey, Ph.D., professor and director of the Radiation Oncology Research Laboratory at the University of California Medical School

in San Francisco, spoke on "Biological Concepts of Applying Hyperthermia in Cancer Therapy."

Dewey has contributed 165 publications to the literature in the field of radiation sciences. He recently received a grant from the National Institutes of Health for his research in "Molecular Basis of Radiosensitization by Hyperthermia."

SPOT NEWS

Villforth Delivers Scott Lecture

The 15th Annual Wendell G. Scott Memorial Lecture was delivered on September 8 in Scarpellino Auditorium by John C. Villforth, assistant surgeon general and director of the Center for Devices and Radiological Health, U.S. Food and Drug Administration.

An expert in the regulation of hazardous materials, Villforth has directed the center since 1982. The center develops and carries out a nationwide program to assure the safety and effectiveness of both medical devices and a wide variety of products that emit radiation. The program consists of both regulatory activities and educational initiatives directed at users of these products.

Villforth was born and educated in Pennsylvania, receiving bachelor's and master's degrees from Pennsylvania State University and a second master's degree from Vanderbilt University. With nearly a quarter of a century worth of experience in the Public Health Service from which to draw, Villforth addressed the topic of "Regulation and Education: Is There a Proper Balance for the Food and Drug Administration?"

He began by tracing the regulatory nature of the Food and Drug Administration and its relationship to the Food, Drug and Cosmetic Act of 1906. The act gives the organization authority without directly stating the purpose behind the powers it bestows. Villforth likened the act to a hammer, referring to a sign on his desk that says, "If the only tool you have is a hammer, you see every-



John C. Villforth (left), Mrs. Wendell G. Scott, and Ronald G. Evens, M.D., in front of Dr. Scott's portrait.

thing as a nail."

Villforth said that is the way the FDA long operated, using its regulatory tool to hammer people into compliance with the law. In the sixties, however, newly appointed FDA commissioners began to emphasize the potential of education to enforce regulation. Villforth quoted former commissioner Dr. Alexander McKay Schmidt, who told his staff, "You must understand that the Food and Drug Administration is an educational organization first and foremost. However, we do put slow learners in jail."

While these changes were occurring in the FDA, the Center for Radiological Health was working with

have hammers, we have screwdrivers and we have monkeywrenches. And the law said, use all of these tools to protect the public from unnecessary radiation from these products."

In 1970, the Center for Radiological Health was moved into the Food and Drug Administration and has benefited that organization by providing it with broader means to accomplish the task of protecting the public health. Since that time, said Villforth, the center has been able to convince the FDA that there is much to be gained from an educational approach.

"I'd like to think that in a small way, our activities might have encouraged the idea of education as a tool for the FDA," Villforth said.

The Wendell G. Scott Memorial Lecture was established in 1972 by friends and colleagues as a living tribute to excellence in teaching and leadership in the field of radiology. An accomplished scientist, physician and educator, Scott was associated with the Mallinckrodt Institute of Radiology and the Washington University School of Medicine throughout his 40-year professional career.

x-ray programs and radiation exposure from nuclear fallout in the fifties and sixties. In 1966, the organization was then called on to address the issue of unnecessary radiation emitted from television sets, leading to the development of The Radiation Control for Health and Safety Act, passed in 1968. Unlike the Food, Drug and Cosmetic Act of 1906, this piece of legislation has a clear purpose. Villforth explained that the act states "the public health and safety must be protected from the dangers of electronic product radiation. It defines what electronic product radiation is and provides a variety of tools to solve the problem."

Those tools are performance standards, research, training and consulting. "Amazing thing!" Villforth exclaimed. "We

Thomas Murry

MEDIA FOCUS



Gary Brink, R.T., B.S., FASRT (foreground center), and Ronald G. Evens, M.D., are interviewed by KTVI-TV's Lisa Allen at the Mammography Mobile inauguration. In the background, Al Wiman of KMOV-TV talks with Missouri Attorney General William Webster.

Post-Dispatch, St. Louis Globe-Democrat, West County Publications newspapers and all of the Suburban Newspapers, Inc. journals.

That initial flurry of media attention, coordinated by the Department of Public Relations, generated a somewhat overwhelming public interest. "The response has been fantastic from both the female population at large and the corporations," says **Judy M. Destouet, M.D.**, associate professor of radiology and head of mammography at MIR. "We never anticipated the response would be as great as it has been."

Public awareness of the van and its convenient, low-cost, state-of-the-art service was so high that a crowd of 35 to 40 women had already gathered when the Mammography Mobile arrived at 8:30 a.m. for its first public date at a South County **Schnuck's**. According to **Gary Brink, R.T., B.S., FASRT**, chief technologist and coordinator of MIR's Mammography Outreach program, another 70 or more women showed up throughout the day.

Quick action was taken to meet this unexpected, but welcome, demand. Within days, an appointment scheduling mechanism was in place and the van's operating hours were extended. Although now

The Mallinckrodt Mammography Mobile has been showing off its sleek lines—and lifesaving service—on both television and tabloid since the van's August 11 press conference unveiling.

A large contingent of the St. Louis press corps attended the kick-off event

hosted by Boatmen's Bancshares, Inc. chairman of the board and chief executive officer **Donald N. Brandin**. The inauguration received extensive coverage by the electronic media, including **KMOV-TV, KSDK-TV, KTVI-TV** and **KMOX-AM**, and was featured in the **St. Louis**

Norman Hente

MEDIA FOCUS



Norman Hente

Judy M. Destouet, M.D. (left), Ronald G. Evens, M.D., Geri Rothman and Donald L. Brandin cut the ribbon at kick-off ceremonies for the van.

able to avoid that first-day crunch, the Mammography Mobile stays busy, seeing 50 to 54 patients each public day.

Media interest in the van also continues unabated. On September 2, Destouet appeared with **Geri Rothman**, a former breast cancer patient, in a "Health Team" report by **Harvey Liebhaver, M.D.**, on KSDK-TV. Destouet was then interviewed on September 3 by **Al Wiman** of KMOV-TV in a follow-up piece on the public's enthusiastic response to the van.

These frequent television and newspaper appearances and her radio guest spot with **Armand Brodeur, M.D.**, on KMOX-AM's "Doctor-to-Doctor" have made Destouet a reluctant celebrity. "It certainly hasn't changed my life," Destouet says, "but I was in the doctor's lounge for coffee today and one of the radiologists asked, 'Do you have your own talk show yet?'"

The van, MIR's other rising star, has spent a similar amount of time in action before the lights and cameras. Currently appearing with reporter **Tom O'Neal** in a KSDK-TV "Show Me St. Louis" pub-

lic service announcement, the Mammography Mobile premiered in a "Good News for St. Louis" public service announcement on KMOV-TV in October. The van will also be featured as an example of health care innovation in the "State of St. Louis" nationwide marketing campaign conducted by **Fleishman Hillard, Inc.** for the Regional Commerce and Growth Association.

As with the mammograms taken and developed on the van, proper exposure of the Mallinckrodt Mammography Mobile is yielding good results.

Mallinckrodt's international reputation continues to broaden through worldwide coverage of the institute's activities and accomplishments. Recently, the Italian journal **Corriere Della Sera**, a daily physician newspaper published in Milan, featured a piece by **Mauro Bonomi** describing the innovative use of CT scanning by **Michael W. Vannier, M.D.**, associate professor of radiology, to aid facial reconstruction. **Peter Coy** of the **Associated Press** similarly highlighted Vannier's research in a wire service report distributed in May. Vannier's ongoing collaboration in NMR with NASA also merited the cover of the June-July issue of **NASA Activities**.

A **Roger Signor** article in the September 12 **St. Louis Post-Dispatch** detailed the Division of Radiation Oncology's success with hyperthermia in the treatment of cancer (see related story on page 8). **Carlos A. Perez, M.D.**, director of the division, was interviewed for the feature in connection with the division-sponsored Second Annual Hyperthermia Symposium and Workshop, co-chaired by **Bahman Emami, M.D.**, associate professor of radiology and clinical director of the Hyperthermia Program, and **Gilbert H. Nussbaum, Ph.D.**, associate professor of radiation physics in radiology. Perez noted that more work still needs to be done, particularly in the treatment of cancer disseminated throughout the body, but he expressed hope "that this trial will improve the survival of these patients by perhaps many years."

The FDA's recent approval of the use of radiation to kill insects and bacteria in fresh fruit and pork prompted an inquiry from **Al Naipo** of **KSDK-TV** regarding potential radiation hazards from the practice. **Joseph L. Roti Roti, Ph.D.**, associate professor of cancer biology in radiology, explained in the August 6 news report that the Cobalt 60 radiation used in the process would produce "no residual radiation in the food." Roti Roti illustrated his point with a glass beaker that had been exposed over time to massive amounts of radiation. Although the beaker's color had altered because of chemical changes, a person could handle and even drink from the glass with no fear of contamination. Similarly, the irradiated food—though exposed to 1 kilogray, the equivalent of 10,000,000 chest x rays—remains free of radiation.

KMOV-TV trained its "Eye on St. Louis" on the treatment of recurrent breast cancer with radiation and hyperthermia during its July 27 show. Host and producer **Charlotte Ottley** interviewed **Robert R. Kuske, M.D.**, associate radiation oncologist, and **Debra Von Gerichten, R.N., B.S.N.**, assistant nursing supervisor in radiation oncology, about their lifesaving work in breast cancer treatment. Former patient **Eddie Mae Robinson** then described her winning battle against the disease. Kuske was also extensively quoted in an August 4 **St. Louis Globe-Democrat** article by **Susan Sherman Fadem** on the increased use of lumpectomy and radiation as "a perfectly acceptable alternative" to mastectomy in the treatment of certain breast cancers.



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PHICAL SH

HYPERTHERMIA

An Ancient Cancer Therapy Comes of Age

by Linda Sage

Carroll Rench, a retired insurance agent from Greenville, Illinois, came to Mallinckrodt Institute of Radiology in 1985 with a tumor the size of a baseball. This was 53-year-old Rench's second bout with cancer, having had surgery and radiation treatment for lung cancer in 1980. Although the surgery removed his right lung and the radiation destroyed most of the remaining malignant tissue, a few cancer cells remained to produce a new growth on the right side of his back, directly behind where his diseased lung had been. As a last resort, Rench agreed to have more irradiation plus an experimental heat treatment called hyperthermia.

Research on the 4,000-year-old cancer treatment had begun in earnest at Mallinckrodt in 1979, initiated by Carlos A. Perez, M.D., director of the Division of Radiation Oncology. But 6 years later, though research results were promising, hyperthermia was still officially considered a last-chance therapy for patients whose disease would not go away. Carroll Rench's persistent cancer made him an ideal candidate for hyperthermia.

By August 1, 1985, after undergoing 5 weeks of heat treatments along with irradiation, Rench's tumor had completely disappeared. Now, over a year later, Carroll Rench appears to be cancer free.

Good medical research weaves together slowly, one experimental thread at a time. Periodically, however, when statisticians feed the data into their computerized looms, a bit of cloth emerges. Such is the case with hyperthermia research at Mallinckrodt.

According to Perez, since 1979, Mallinckrodt's radiation oncologists have treated more than 250 cancer victims with heat plus irradiation. When they recently compared these patients with those

Oncologists hope to demonstrate what they have suspected for some time—that hyperthermia should no longer be used only as a last-resort therapy.

they had irradiated without hyperthermia, the figures showed that adding heat clearly had long-term benefits. For example, 44 percent of recurrent head and neck tumors treated at Mallinckrodt with the combined therapies regressed for the remainder of a patient's life. Only 15 percent of the cancers were controlled when treated with radiation alone.

In a recent publication, Perez reported that 48 recurrent lesions from carcinoma of the breast in the chest wall treated with irradiation and hyperthermia (after mastectomy) exhibited local tumor control in 60 to 80 percent of the patients, depending on the size of the tumor. These results were significantly better than those observed with irradiation alone (40 to 60 percent tumor control). All of these patients

lived for 3 months to 5 years after therapy, and those who responded well but then died succumbed to other effects of their advanced and often widespread disease.

These results—and statistics showing that heat increases the immediate effectiveness of any dose of radiation for any type of cancer—are sufficiently encouraging to warrant a nationwide study with patients in earlier stages of their disease, says Bahman Emami, M.D., director of the clinical service of Mallinckrodt's Hyperthermia Treatment and Research Center.

So encouraging have Mallinckrodt's results been that Emami is writing a protocol, or blueprint, on behalf of a national consortium of radiation oncologists to study patients with *first-time* advanced head or neck cancers. Emami proposes to study patients who would first routinely undergo surgery. Half would then be treated with radiation alone, and half would receive both radiation and hyperthermia. Emami initiated a pilot study last summer at MIR using a similar protocol.

With this study, oncologists hope to demonstrate what they have suspected for some time now—that hyperthermia should no longer be used only as a last-resort therapy. "We often see patients with large neck growths without evidence of disseminated disease," says Emami, "and we

Bahman Emami, M.D., director of the clinical service of Mallinckrodt's Hyperthermia Treatment and Research Center.

HYPERTHERMIA

know that a high percentage of those tumors will recur in the same spot. So our goal is to use hyperthermia as part of the initial management when we give radiation." If all goes well, this study will advance prospects considerably for therapeutic use of hyperthermia in earlier stages of disease. "We are getting ready," says Perez, "to move out of the investigative phase."

Thus far, radiation oncologists studying the benefits of hyperthermia have experienced notable success in heat-treating superficial tumors. Treatment of tumors deep within the body, however, has not been as successful. Consequently, about 90 percent of the institute's experience with hyperthermia has involved superficial tumors, those situated on the surface of the body or in places such as the bladder or cervix, which can be reached through natural openings.

There are two types of superficial tumors, those 4 cm deep or less and those bulkier than 4 cm. When a superficial tumor is greater than 4 cm deep, as was Carroll Rensch's tumor, a technique called interstitial hyperthermia is applied. The technique heats the tumor internally with microwave or radio frequency antennae slipped into catheters that are inserted into the tumor. Interstitial hyperthermia is suitable for accessible tumors that are large enough to hold several catheters and too large to be heated externally. "This is probably the most reliable method of heating," says Emami, who is chairman of a national collaborative protocol to study the effectiveness of interstitial heating. Preliminary results from Mallinckrodt show that about half the head or neck tumors of 25 patients regressed permanently after interstitial heating. These patients then survived for an average of 2 more years.

If a superficial tumor is less than 4 cm deep—about the thickness of a bar of soap—it can be heated externally with microwaves at 43°C (109°F). The heat is applied with a box-shaped device that simply sits over the tumor for 60 minutes while the patient lies on a special bed and chats with the therapist, reads or listens to music. Patients with shallow superficial tumors undergo hyperthermia 2 times per week for 4 to 5 weeks while receiving twice-weekly irradiation.

Sometimes shallow superficial tumors are too extensive to fit

*"This is a unique
opportunity to
combine a commitment
to understanding
fundamental
biological processes
with improving the
welfare of mankind."*

under commercial applicators. In these instances, in order to overcome the problem, clinicians and physicists on the hyperthermia team collaborate to custom-design equipment and treatment.

Such was the case last year when a woman presented herself to Emami with a tumor that stretched over both sides of her forehead. Because that was the only site of her disease, hyperthermia seemed very worthwhile. But the usual box-shaped applicator was not big enough to conform to the curved surface and was unable to heat the tumor uniformly.

For help, Emami turned to Leonid Leybovich, M.S., a Mallin-

Carlos A. Perez, M.D., consults with Debra Von Gerichten, R.N., B.S.N., whose experience and tender, loving care ease the way for Mallinckrodt's hyperthermia patients.

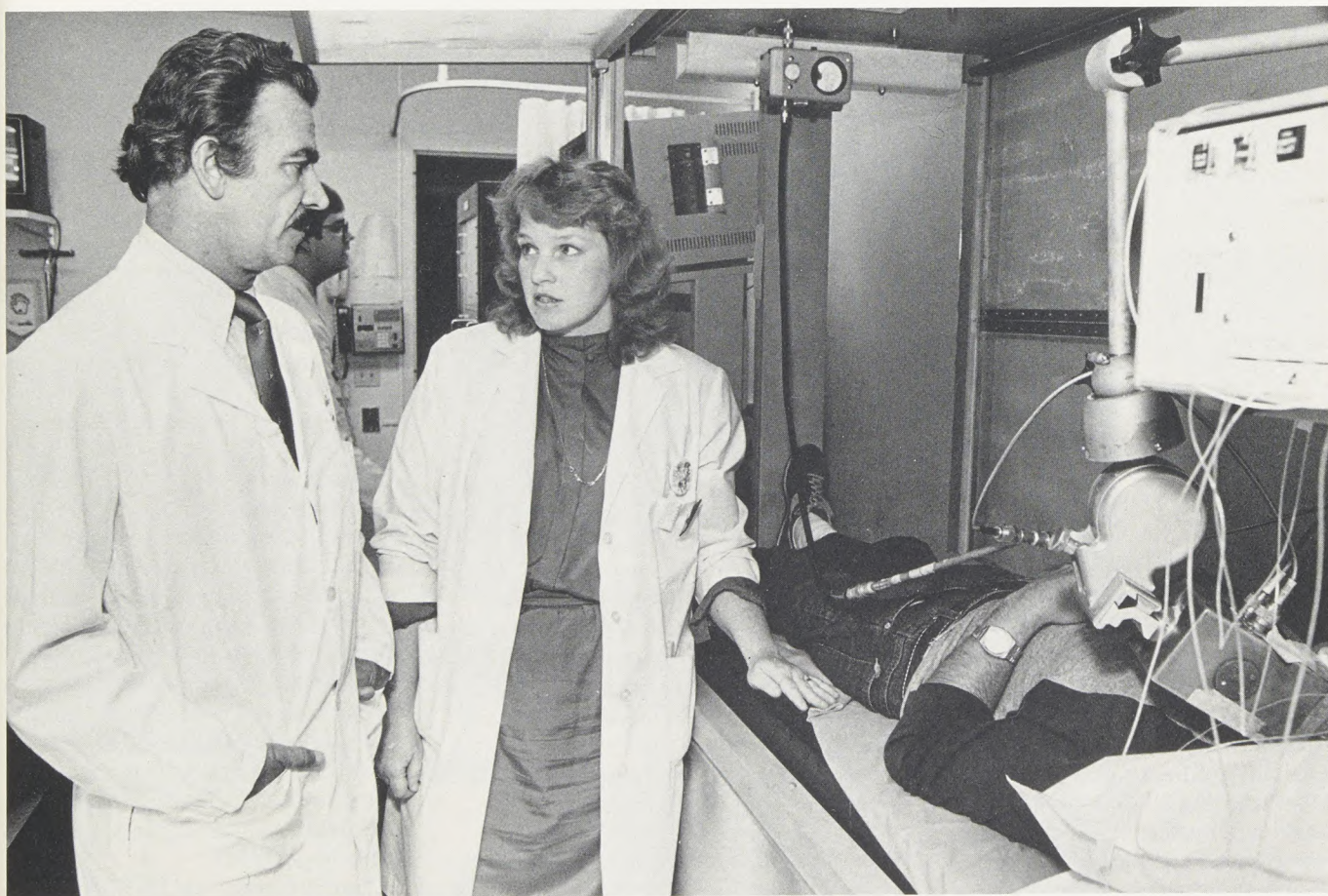
krodt physicist who emigrated from the Soviet Union 5 years ago. "He developed a device without which the patient would not have been cured," says Emami.

Leybovich built a specially curved applicator that followed the contour of the tumor. He is now improving the device, which introduces a new concept into hyperthermia. "The applicator has four antennae that produce a curved, integral pattern of microwave irradiation from their four separate patterns," explains Leybovich. "This means that not only do you have more homogeneous heating, but you can also change the shape of the electromagnetic field by changing the power from one antenna to another." By changing the shape of the field, physicists can deliver more heat to one part of a tumor than another, an advantage when a tumor fails to heat uniformly, as is often the case. Probes of wire or optical fiber relay the temperatures in various parts of the tumor and surrounding tissue throughout each treatment. Leybovich is currently writing a paper describing the concept of the applicator he developed.

Although the hyperthermia team is enthusiastic about progress made with accessible tumors, treatment of deep-seated cancers continues to frustrate them. For instance, the technology to effectively heat-treat the lung cancer that Carroll Rensch suffered back in 1980 continues to elude researchers. "We are still struggling with actually heating such tumors," says Emami.

One way to reach deep-seated

Continued on page 12



Mike DeFilippo

Although tumors have been treated with heat for over 4,000 years, in 1866, a German physician named W. Busch was the first to document the beneficial effects of hyperthermia on cancer. He described a patient whose facial tumor disappeared completely after a couple of feverish bouts of erysipelas, an acute streptococcal infection.

Other reports followed, including an account in *The Lancet* in 1880 of a British farmhand who was struck by lightning while plowing a field. His two horses were killed instantly, but he survived. Then, within a few weeks, the tumor on his lower lip disappeared. Though he eventually

died of cancer, the tumor was absent for 10 years.

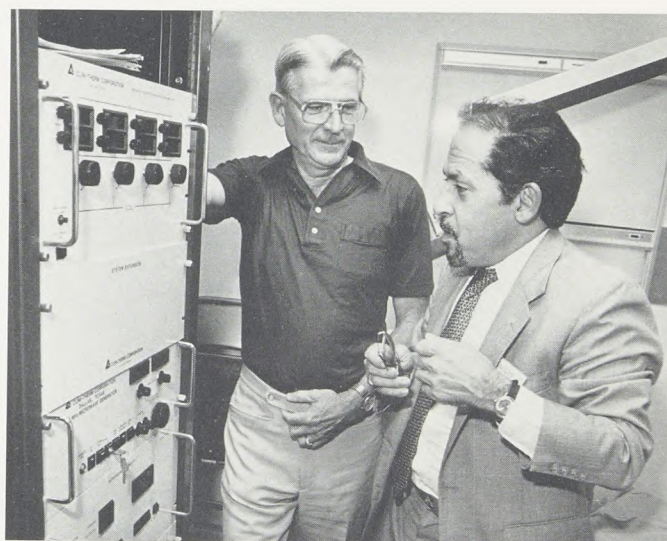
In 1891, an American physician named William Coley described his injection of fever-causing bacterial toxins directly into tumors. Although he had considerable success, other physicians were unable to duplicate his results, and his work fell into disrepute.

With the discovery of x rays in 1895, physicians had a new way to treat cancers, but studies of the palliative effects of hyperthermia continued sporadically. Reports showed physicians raising the temperature of the whole body and heating superficial tumors locally with hot baths or small

heaters. Hyperthermia and irradiation were also combined, beginning in 1909.

By 1940, however, interest in radiation treatment completely overshadowed heat therapy, and it was not until the mid-1970s that the practice of hyperthermia revived. By this time, sophisticated methods for irradiating tumors were widely available, but oncologists were frequently frustrated by the results. Ten years later, thanks to research at MIR and other institutions, there is evidence that heat, while ineffective by itself, can greatly enhance the effectiveness of irradiation and probably chemotherapy as well. □

HYPERTHERMIA



Courtesy Rick Stankoven/St. Louis Globe-Democrat

Carroll Rensch (left) travels from Greenville, Illinois, every 6 months for a checkup with his radiation oncologist, Bahman Emami, M.D. Since his last treatment over 13 months ago, Rensch remains cancer free.

tumors would be to heat the whole body. As part of another national collaborative hyperthermia study, which Emami chairs, Mallinckrodt is currently testing a large, cylindrical machine called the Annular Phased Array to determine the feasibility of heating deep tumors. After treating 30 patients in 300 sessions, physicists continue to experience problems with heating. In reviewing results from the 230 patients treated worldwide with this machine, says Emami, "The side effects are clear. Pain is the most prevalent, but there are also cardiovascular effects and patient intolerance."

A machine that could heat only the buried tumor rather than an entire region of the body would obviously be preferable, and senior physicist Gilbert H. Nussbaum, Ph.D., associate professor of radiation physics, is testing a prototype called Helios, which produces a beam of focused ultrasound. Helios has four concentric rings of ultrasound elements, which can be moved by computer-controlled motors to alter the heating pattern. Since it also generates an image, the operator can see where to place the ultrasound elements.

Perez emphasizes that the

encouraging preliminary results reported so far with clinical hyperthermia will be markedly improved when substantial technological advances occur in design of hyperthermia equipment and more practical methods for three-dimensional measurement of the temperatures in the patient are developed.

As research in clinical applications progresses, cancer biologists continue to investigate the effects of hyperthermia at the cellular level. The Mallinckrodt cancer biology team is currently studying how cells respond to heat and how those responses can be modified to increase damage to cancer cells or spare normal cells. Joseph L. Roti Roti, Ph.D., head of the Cancer Biology Section, and Andrei Laszlo, Ph.D., assistant professor of cancer biology, are looking at the biochemical and structural changes that occur when cells are heated. They also are studying cells that are unusually resistant or sensitive to heat.

"Our overall goal," says Roti Roti, "is to explain the biological mechanism of therapeutic modalities. We want to understand the interactions of cancer cells with radiation and hyperthermia." Roti

Roti recently received a grant from the National Cancer Institute for his research describing how hyperthermia and x-irradiation disrupt cellular function.

Heat-induced changes in chromosome structure are of major interest because heat is most destructive to cells whose chromatin is being replicated. Proteins called heat shock proteins, which are present in all cells and become more abundant as the temperature rises, also intrigue cell biologists. "Our working hypothesis is that the intrinsic response of a cell to heat may be in some way correlated with the amount of a heat shock protein called HSP-70," says Laszlo, who also received a grant from the National Cancer Institute to investigate certain aspects of this hypothesis.

Laszlo is assaying HSP-70 in cells that vary in heat resistance, and he hopes to measure it in tumor cells from Mallinckrodt's hyperthermia patients. "We would like to see if the level of HSP-70 correlates with the success or failure of heat treatment," he explains. "Then perhaps we could develop some type of clinical assay to predict the response of a tissue to heat."

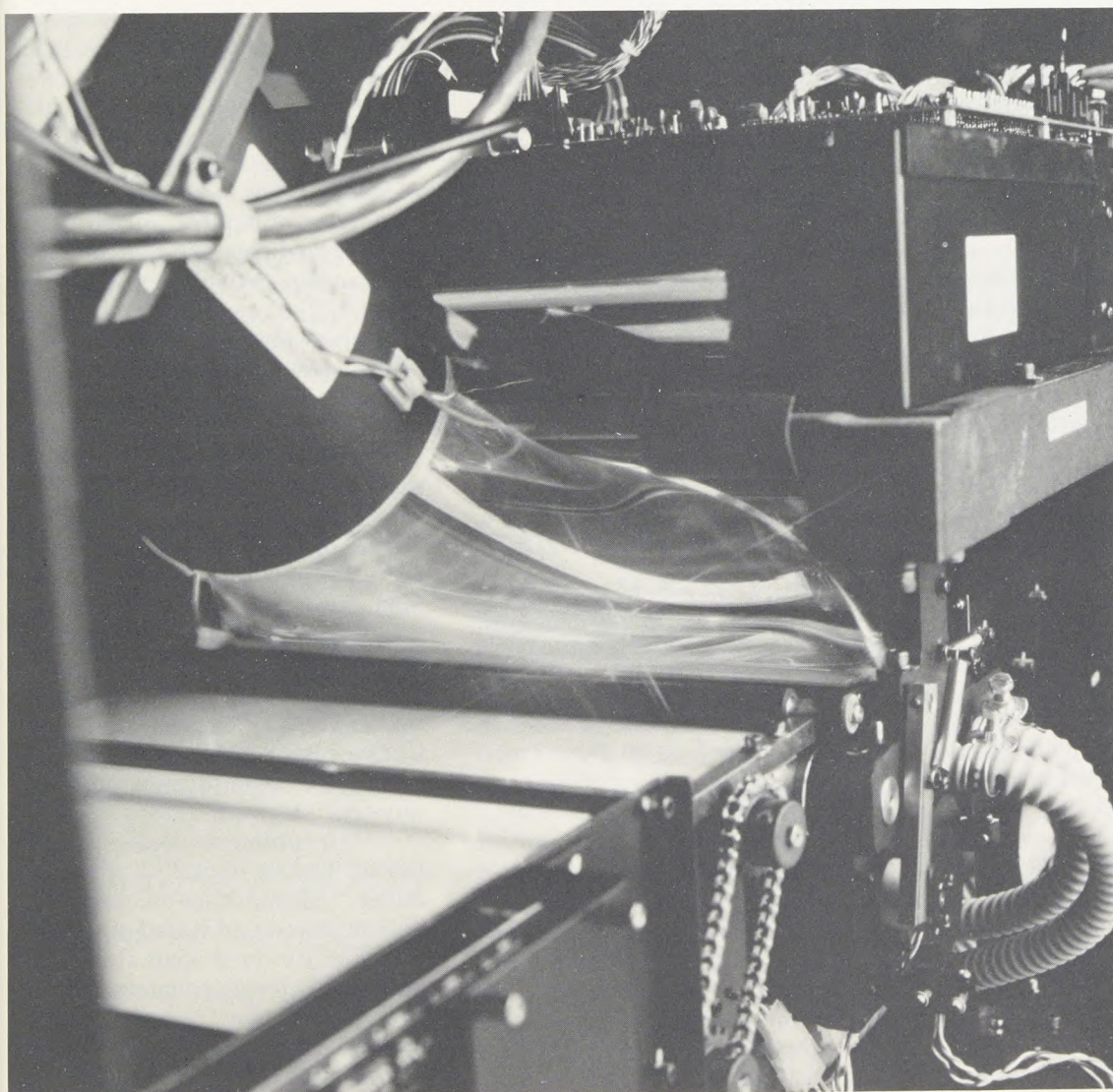
Such studies of cellular function build the bridge between basic research and the clinical applications that mean so much to patients like Carroll Rensch. "It's a unique opportunity," says Laszlo, "to combine a commitment to understanding fundamental biological processes with improving the welfare of mankind." □

Linda Sage, Ph.D. (biochemistry), is a free-lance writer and contributes regularly to Focal Spot.

THE ALL-DIGITAL DREAM

PCR Moves Mallinckrodt Closer to the Electronic Future

by Cliff Froehlich



Courtesy Philips Medical Systems, Inc.

Using a helium-neon laser scanner, PCR's image reader acquires information from the photo-stimulable phosphor plate.

P

icture this:

In the Barnes intensive care unit, a nurse performs a routine check on

the status of an auto accident victim recovering from a long session in the OR. Abnormal readings indicate a surgically placed intravenous tube has shifted, and the doctor on call orders an urgent portable chest exam.

Minutes after the exam, at an array of high-resolution video monitors in a Mallinckrodt reading room, a radiologist places hands to

keyboard and accesses the digital radiograph of the patient's chest. The image, traveling rapidly over its cable path, appears short seconds later for review.

Across the city, in a private office, the surgeon recalls the same image at a CRT connected to the institute's computer network. At another terminal, the ICU physician similarly taps into the Mallinckrodt databank.

By three-way telephone hook-up, the doctors confer while simultaneously viewing the patient's radiograph. As the radi-

ologist enhances the image by computer, the tube becomes clearly visible. The problem located, the ICU staff prepares the patient for corrective surgery.

With eyblink speed and improved accuracy, an x-ray image has been called up and discussed by three physicians in different locations at the same time.

Such smoothly efficient transfers and subsequent manipulations of radiographic data remain conceits of science fiction for the present, but as new developments continue apace, realization of this electronic

THE ALL-DIGITAL DREAM

dream appears likely in the foreseeable future. At the Mallinckrodt Institute of Radiology, the next step toward the all-digital goal takes place early next year when the Philips Computed Radiography (PCR) system arrives for installation.

The Philips system, although new to Mallinckrodt, has been mapping the digital path for some time. In place at test institutions since 1982 in its prototype form, PCR appears to provide one of the first viable means of capturing and displaying conventional radiographic images digitally without significantly altering existing procedures and equipment. Initial experiments have validated PCR's potential, but important questions remain. Mallinckrodt will attempt to supply the answers when work begins next year with the recently completed production model of the PCR system.

The first—and key—link in the PCR chain is its imaging material, a photo-stimulable phosphor plate developed by Fuji Photo Film Co. and licensed by Philips in the early eighties. Simple in principle but complex in result, the reusable phosphor plate replaces the traditional film-screen combination in the standard x-ray cassette. According to Henry Soch, computed radiography product manager for Philips Medical Systems, Inc., the photo-stimulable phosphor allows an image to be captured and then stored on computer without using film in the process.

"We capture the information using conventional x-ray exposures on this imaging plate," says Soch, "which is then presented to a reading device that has a helium-neon laser in it. The laser scans the imaging plate and digitizes the information stored on the plate. That

enables us to then either print that information on a piece of film or take the information in its digital form, transmit it and view it on a CRT display."

PCR's ability to display, transmit and store conventional radiographic images in digital rather than analog film form serves as the investigative focus of Mallinckrodt's work with the system. R. Gilbert "Gil" Jost, M.D., chief of Diagnostic Radiology, notes that until now PCR has essentially functioned as an elaborate film processor.

"I'm very encouraged about the PCR system because it changes the way we do radiology the least."

"The early versions of this technology have not emphasized looking at the image on a computer screen," says Jost. "Other institutions using the system have had the high-resolution digital image stored in a computer, but they have then gone to a laser printer and generated a film.

"We have made an agreement with Philips to investigate in a detailed way the electronic viewing issue. We anticipate jumping in with both feet to evaluate just how electronic radiology can be worked out in a clinical environment."

Although PCR represents a major leap, Mallinckrodt has been moving in the direction of digital imaging for years. Newer imaging technologies, for example, many of

them intimately tied to the computer, already produce digitally derived images.

Stuart S. Sagel, M.D., chief of the Chest Section, confirms digital imaging's increasing importance at Mallinckrodt. "All of magnetic resonance, computed tomography, nuclear medicine and ultrasound are basically in digital form," says Sagel. "If you really stop and think about how much of those procedures we do in this institute, it's probably 50 percent."

The totally digital Division of Nuclear Medicine, in particular, has served as a valuable pilot program for the institute. According to Tom R. Miller, M.D., Ph.D., associate professor of radiology, "Nuclear Medicine is a very nice testing ground for digital radiology because of the smaller data requirements. We don't generate as many megabytes of data per day as CT, MRI, Chest or Bone and Joint, so we don't have the burden on our physical hardware.

"Our cardiac studies are interpreted directly digitally," states Miller. "All our other images are also collected and stored digitally. The ability to view some studies, such as GI bleeding examinations, in cine, or 'movie,' form adds valuable diagnostic information. In other cases, repeat imaging is unnecessary when the film is not exposed properly—we simply make a copy of the digital image on a new piece of film."

Once its images are electronically captured, the division then forwards the data to Mallinckrodt's central computer system, which allows for remote viewing of the studies in select areas.

Mallinckrodt's continuing work with the Raytel film digitization system has also given helpful instruction in electronic data transmission. Used to speed transfer of images to the Cardiac Care Unit, the Raytel system actually begins

with a film image. "It's like working a Xerox machine," says Jost. "The film is put down in a box, a button is pressed, the light comes on and the machine scans and digitizes the image. That digitized image is then stored away and distributed."

By starting with film and then digitizing, some loss of information unfortunately results. With images requiring less resolution, the Raytel system works well, but in other cases, according to Sagel, "that little loss of detail is critical."

Despite this difficulty, the Raytel project has yielded useful data. "Many of the things that we learned from the Raytel experiment had to do with networks and displays," Jost explains. "It's definitely been a step along the path to achieving our goal of distributing electronic images."

In addition to its day-to-day digital experience, Mallinckrodt serves as an ideal research facility

"It provides extremely consistent images and therefore totally eliminates retakes due to overexposure or underexposure."

for electronic radiology because of its ongoing work in the development of a picture archive and communication system (PACS) both within and beyond the institute.

"In this department," says Jost, "we want to develop, over an extended period of time, the kind of technology that will support distribution, display and storage of electronic, digitized images. What interests us for the long haul is that

the PCR images can be moved around from place to place easily and displayed in various locations."

Mallinckrodt's PACS workbench—a small-scale prototype system first developed in 1982—and the Computer Section's extensive involvement with the design of Washington University's campus-wide picture network provide a ready-made environment and substantial hands-on experience for testing PCR's data transmission potential. "Those are the areas of interest to us," says Jost, "and it's why we particularly want to explore that kind of technology here at Mallinckrodt."



Setting aside for the moment the all-digital possibilities Mallinckrodt intends to investigate, the system's proven capabilities remain impressive. Research sites in both the United States and Europe have delivered promising results in several vital areas.

Ironically, the most immediately apparent advantage of PCR is its *limited* effect on current hardware and technique. "I'm very encouraged about the Philips system," says Sagel, "because it changes the way we do radiology the least. We still deal with the same x-ray equipment, but instead of going directly to film, the x rays go to a phosphor plate that's computer activated and read. The change is minimal."

Unlike most current digitized images—CT scans, for example—the images PCR produces also closely approximate the quality of film. "We're digitizing in PCR to an image matrix of 2000 x 2000 nominally," says Soch, "which provides the type of resolution that physicians are going to need for small detail work."

Jost agrees. "PCR images

use over 2000 picture elements in each dimension," he explains, "so there's very high spatial resolution—spatial resolution that *almost* approaches that of standard film. The density resolution, that is, the black-white scale, is even more sensitive than that of film."

PCR, in fact, has proven superior to film in some applications.

"This experiment is a microcosm with very wide implications for the field of radiology."

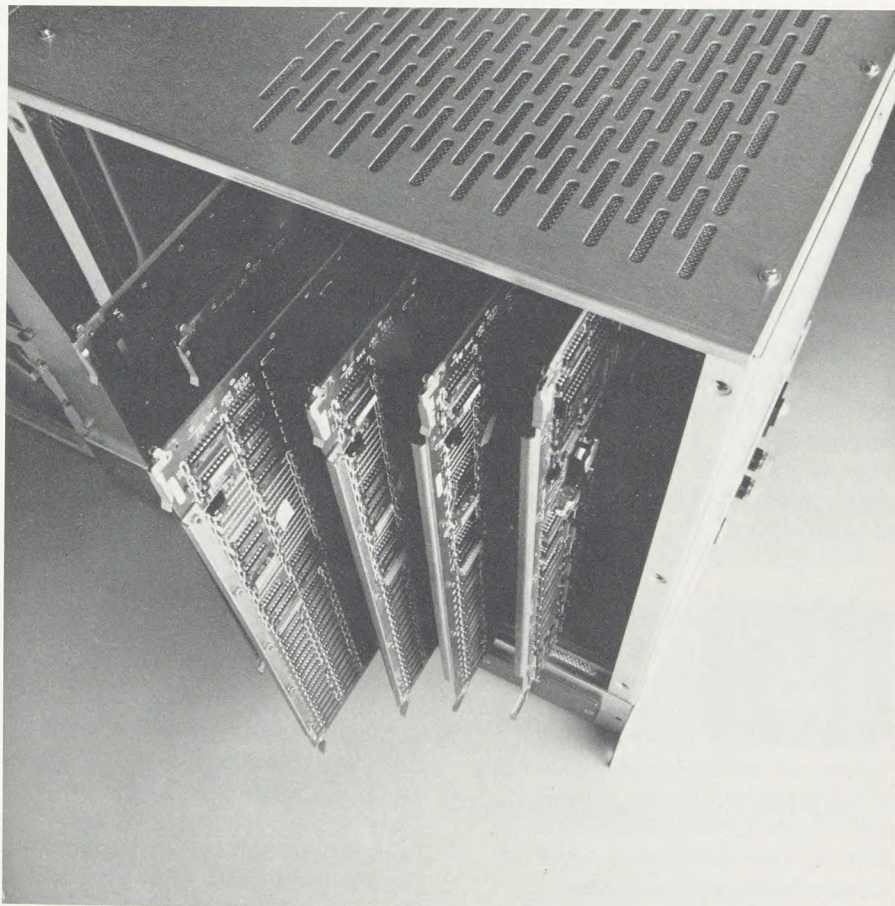
One immediately beneficial aspect of the plate technology is the virtual elimination of image over- or underexposure. Christopher Merritt, M.D., chairman of the Department of Radiology at the Ochsner Clinic and Foundation Hospital in New Orleans, has worked extensively with the PCR prototype and notes "the extreme latitude of the system to exposure."

PCR's images are so predictably good that Soch promises near-perfection. "If the person doing the examination can position the patient correctly on the imaging plate," says Soch, "we know that 99 times out of 100 they're going to get a superb image."

"It provides extremely consistent images," echoes Merritt, "and therefore has *totally* eliminated repeat examinations due to overexposure or underexposure. That's a strong statement, but it's true."

Because of this unique attribute, PCR's first use at Mallinckrodt will be in intensive care portable radiography. Currently, the variable battery levels of the portable equip-

THE ALL-DIGITAL DREAM



Courtesy Philips Medical Systems, Inc.

ment and the delicate condition of the ICU patients make obtaining a usable first-time image as difficult as it is important. With the phosphor plate, time-consuming, patient-disturbing retakes will become increasingly rare.

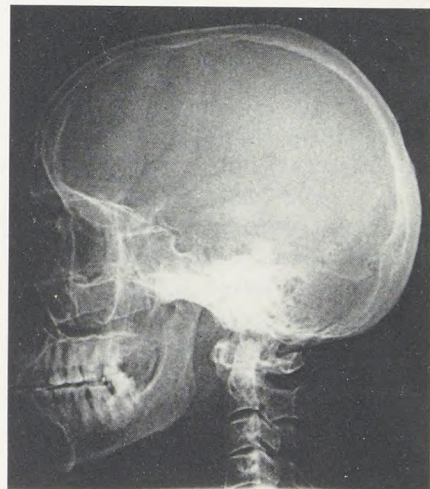
Another important benefit of PCR is its dose reduction capabilities. According to Soch, "Probably one of the first things people realized with this system is that we can reduce the radiation dose to the patient dramatically over what's done today in conventional film-screen work. By dramatic reduction, I'm not talking 20 to 30 percent; I'm talking in the area of 75 to 80 percent."

Merritt also cites dose reduction as a critical advantage. "With the phosphor plate," says Merritt,

PCR's process control system allows the simultaneous acquisition, processing, storage, transmission and viewing of different images.

"we can tailor the amount of dose—the radiation that we use—to the amount of information we want. The translation of that into clinical practice is that we are doing certain selected examinations at *extremely* low doses.

"The most important of those exams are probably our scoliosis studies in children, which we are doing at doses of 4 to 6 mAs—anywhere from one tenth to one twentieth of the dose commonly used. We are also using reduced dosage techniques for other pediatric procedures where we think that control is important. Dose



Courtesy Christopher Merritt, M.D./Ochsner Clinic

These radiographs illustrate PCR's ability to reduce dose without sacrificing detail.

Top: Conventional film-screen image taken at 1 mAs.

Bottom: PCR image obtained at 1 mAs.

reductions of anywhere from 25 to 75 percent are being used here in daily clinical work."

PCR's combination of high resolution and low radiation opens intriguing avenues in other areas as well. Recent work at UCLA, for example, indicates the system might significantly advance mammography by both reducing dose and increasing diagnostic accuracy. As production units are installed in other institutions, PCR's applications no doubt will continue to broaden.

Perhaps the most exciting aspect of that expansion is the system's still-unproven electronic networking potential—the central hypothesis Mallinckrodt plans to test.

"We see this as an important experiment," says Jost, "because if it works, it proves the whole notion of being able to take, distribute and display x-ray images electronically. It is also the first step toward eliminating film and saving film costs. This experiment is a microcosm with very wide implications for the field of radiology."

Because PCR's phosphor plates, if handled correctly, are infinitely reusable—a plate is "cleansed" and used again after laser-scanning for the captured image—the savings in film cost is possibly great. According to Jost, "If we were able to do away with film, we would save up to \$4.00 for each sheet of film and begin to cost-justify this expensive kind of equipment."

Freed from film, Mallinckrodt could then also expect to ease current space problems by eliminating the film warehouse and to reduce the manpower associated with storing, tracking and physically transporting film around the institute.

In addition, such computer-archived images could be retrieved both instantaneously and simultaneously, from inside and outside the Washington University medical complex. States Sagel, "I think that electronic storage would in the long term solve a great problem in many of the larger medical centers where multiple people need to be looking at and examining studies."

A final benefit deriving from a digitally based department is the ability to manipulate the radiographic image by enlarging areas of interest, adjusting brightness and contrast and subtracting unwanted information. In Merritt's view, "We

are only beginning to explore what we may be able to do to make more conspicuous details that we otherwise might have overlooked. We're just scratching the surface of what image processing may be able to do for us."

Promising as PCR appears, however, many of these applications are still largely speculative. "I don't want to mislead," cautions Jost. "People often say, 'Well, it's just around the corner and any moment we'll have this.' But these kinds of technological developments often stretch out in time."

Sheer volume of data poses the first major problem. "The number of x-ray images in a place like Mallinckrodt that have to be stored is of course very large," says Jost. "We do about 300,000 examinations a year, and there are 3 or 4 films, on average, for each exam. So you can imagine the millions of images that need to be stored for a period of 5 years or more."

"The images in the PCR system are particularly demanding because they're so large. They require a great deal of electronic storage. With current technology, it's virtually impossible to do that at reasonable cost."

Further impeding progress are difficulties of transmission and display. In its ideal form, electronic radiology requires immediate data access, high-quality, multimodality viewing stations and extraordinarily limited computer downtime. The technology to meet these demands is developing—laser optical disk jukeboxes, data compression techniques, cable networks, sophisticated CRTs—but assigning a time frame for a fully operational all-digital department is currently impossible.

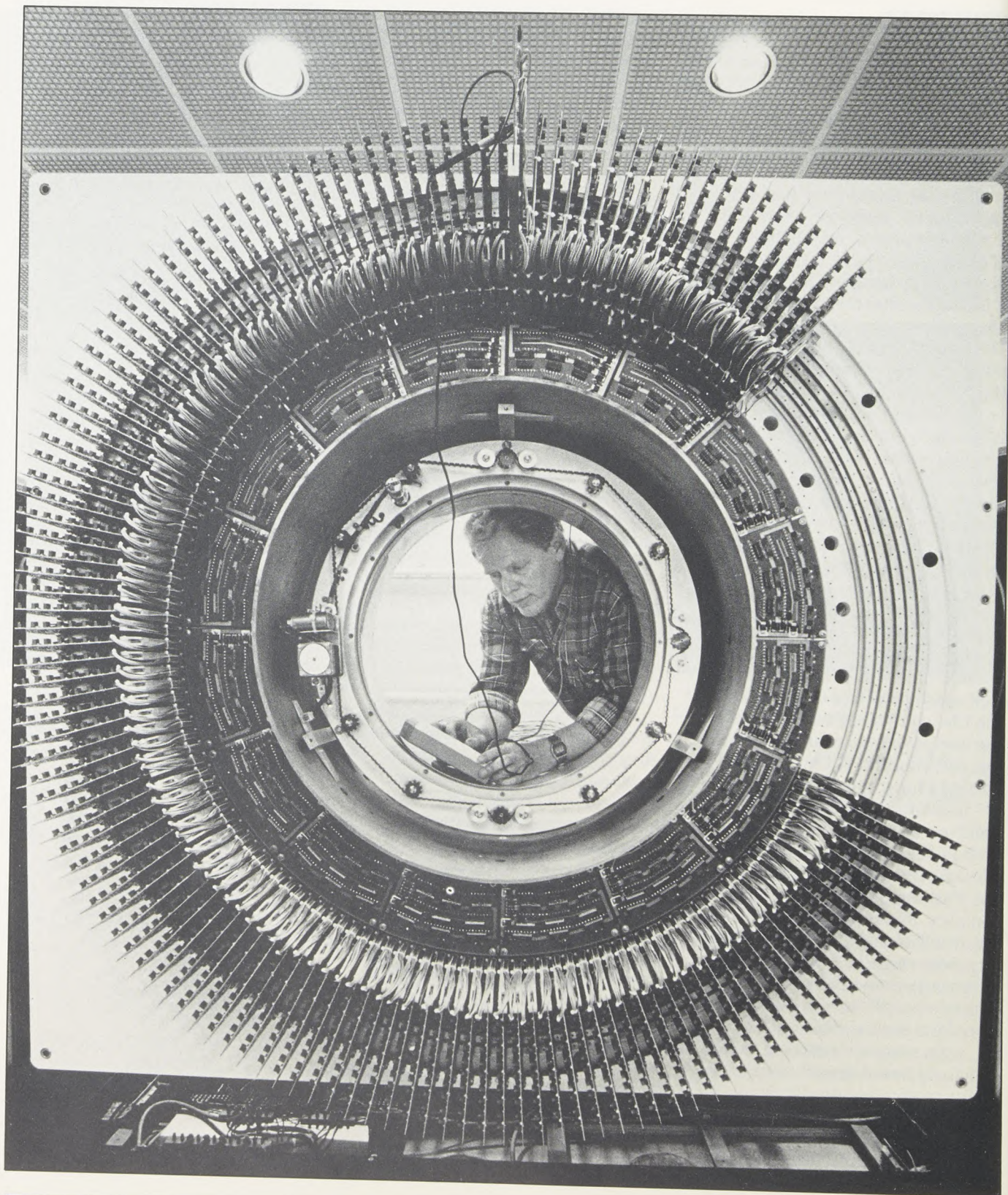
Although admittedly in need of considerable fine tuning, the picture for electronic radiology—and PCR—remains bright. "We feel that PCR is going to be the cornerstone for achieving an all-digital x-ray department," says Soch.

"That really is the key concept to this whole development," Merritt affirms. "A lot of people believe that we will eventually become digital imaging departments in toto, but that may be 10 or 20 years away. I think this system really is the first practical approach to bridge the gap between now and then."

Jost emphasizes that results, not hopes, will serve as the true measure of the plate and the system's value. "We don't have enough information yet," says Jost, "and we view this as an experimental phase to intensively examine whether or not this technology can deliver what it promises."

"There are some unanswered questions," Jost concludes, "but assuming the answers are positive, I think this photo-stimulable phosphor could be a revolutionary development in our field." □

*“It used to be a matter of a small room
with an x-ray machine.”*



MALLINCKRODT ON THE MOVE

An Update on the Institute's Ongoing Renovation

Story by Candace O'Connor □ Photography by Mike DeFilippo

When the Musculoskeletal Section moved into its new office space on Mallinckrodt's 10th floor, a

few things were missing.

The conference room furniture hadn't all arrived, for example, and for a while, invitations to staff meetings read "BYOC" (bring your own chair). Also absent, because of a company strike, were installed telephones. When the lone working phone in the office of William A. Murphy, Jr., M.D., section codirector, did ring, the three secretaries out front took turns running for it. "Sometimes," says Sharon Keathley, "I forgot and went to answer my nonexistent phone—and picked up my stapler."

Looking back, they all laugh about such hitches. Their new office suite is spacious enough to house all of the section's seven physicians, previously dispersed among the East Building, the West Pavilion and their smaller 4th floor office. Its contemporary colors and new equipment make it attractive and convenient. "We would do the whole move again to get to come up here," says Keathley. "It's so nice."

With recent renovation at Mallinckrodt, several floors' worth of people and equipment are on the move. Major remodeling has just concluded on 10 (which also houses Radiation Safety and the departmental library), on 9 (which will be home to the staff of the Abdominal and Chest Sections), on 7 (home of the new Nuclear Medicine Clinical PET Center) and on 5 (site of the MRI scanner and two new CT scanners). On other floors, entranceways have been

Glen Brickmore, assistant electronic supervisor, readies the SUPER PETT II B for action on the 7th floor.

"It's always nice to find a pleasant atmosphere and know that you're going to be examined with the newest technology available."

remodeled and more renovation is now being planned.

"Comments that we've gotten from the staff have all been very positive," says Michael Albertina, R.T., B.S., chief technologist in charge of technical operations. "They know that we're keeping up with the latest technology in the installation of new equipment, and the new decor is pleasing to staff and patients alike."

Work on several floors started some 15 months ago. Still earlier, Ronald G. Evens, M.D., director of MIR, began the planning process by canvassing radiologists who worked in the affected areas to ask for their ideas. A team of people, including R. Gilbert Jost, M.D., chief of Diagnostic Radiology and cochief of the Computer Section, and Armand Diaz, R.T., R.N., FASRT, technical administrator, then sat down with architects to decide specific changes.

Years ago, that kind of planning was much simpler. "It used to be a matter of a small room with an x-ray machine. Now we have highly sophisticated diagnostic equipment, driven by computers, which require special air conditioning systems wherever they are placed," says Albertina.

Choosing colors, furniture and office equipment is also more sophisticated than ever before. In

an effort to make the atmosphere most pleasing to patients, MIR is moving away from the traditional "hospital colors" of green and brown to handsome contemporary shades of mauve, gray and beige. There is a new emphasis on light, cheerful examination rooms and bright patient waiting areas.

All of this has required months of work by construction crews and an exceptional commitment by technical department staff. "It's not unknown for Armand Diaz to be here 14 hours a day," says Tim McNabb, R.T., technical supervisor. "He's always on the go."

It's easy to see the results on the finished floors. On 5, former home of the Pediatric Section, patients coming in for CT scans on the up-to-date equipment will also be greeted by mauve wall colors, newly carpeted and tiled floors and sunny windows. "It's always nice to find a pleasant atmosphere and know that you're going to be examined with the newest technology available," says McNabb. "With Mallinckrodt's size and reputation, I think patients expect that kind of consideration from us."

Moving itself can be a chore, however. In the Musculoskeletal Section office, Sharon Keathley took many hours off from her ordinary work just to do the packing. She and fellow secretaries Julie Imo and Linda Macker were especially concerned about the thousands of cases in the teaching file that they had laboriously organized. To ensure their safety, Sharon accompanied them to their new quarters, several hundred at a time, on flatbed carts.

Certain parts of their move took place in record time, Keathley recalls. Since Louis A. Gilula, M.D., codirector of the section, was leaving town for a month, they moved him first—in a hectic day which began at 6:30 a.m. and ended at 10:00 p.m. A few weeks later, they

MALLINCKRODT ON THE MOVE

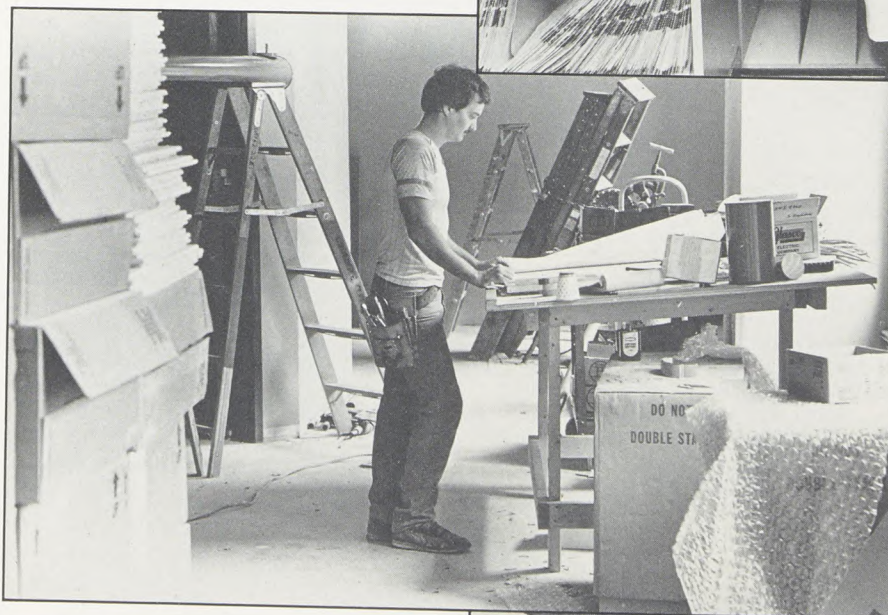
inaugurated their new conference room with a going-away party for Barbara Reichert, secretary to Business Administrator Donald Stone.

Now they claim their new office suite lacks only one thing. At their former 4th floor offices, they were enveloped by a magnetic field, created by 5th floor MRI equipment. Any day, they could find loose staples sticking to their scissors, and at Christmas-time, they could suspend ornaments directly from metal ceiling strips. "This year, I guess we'll have to go to an ordinary tree," jokes Keathley.



Sharon Keathley, secretary in the Musculoskeletal Section would do it all again, despite the hitches.

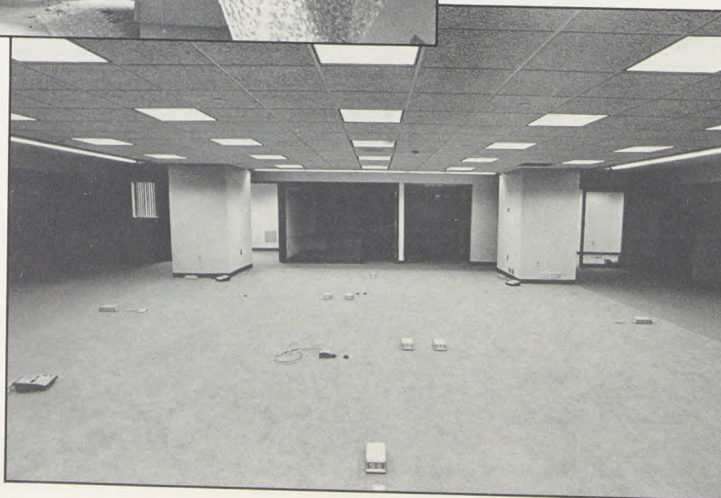
Formerly the Pediatric Section, the 5th floor east will house two new CT scanners.



The spacious 9th floor will soon be ready for the Abdominal and Chest Sections.

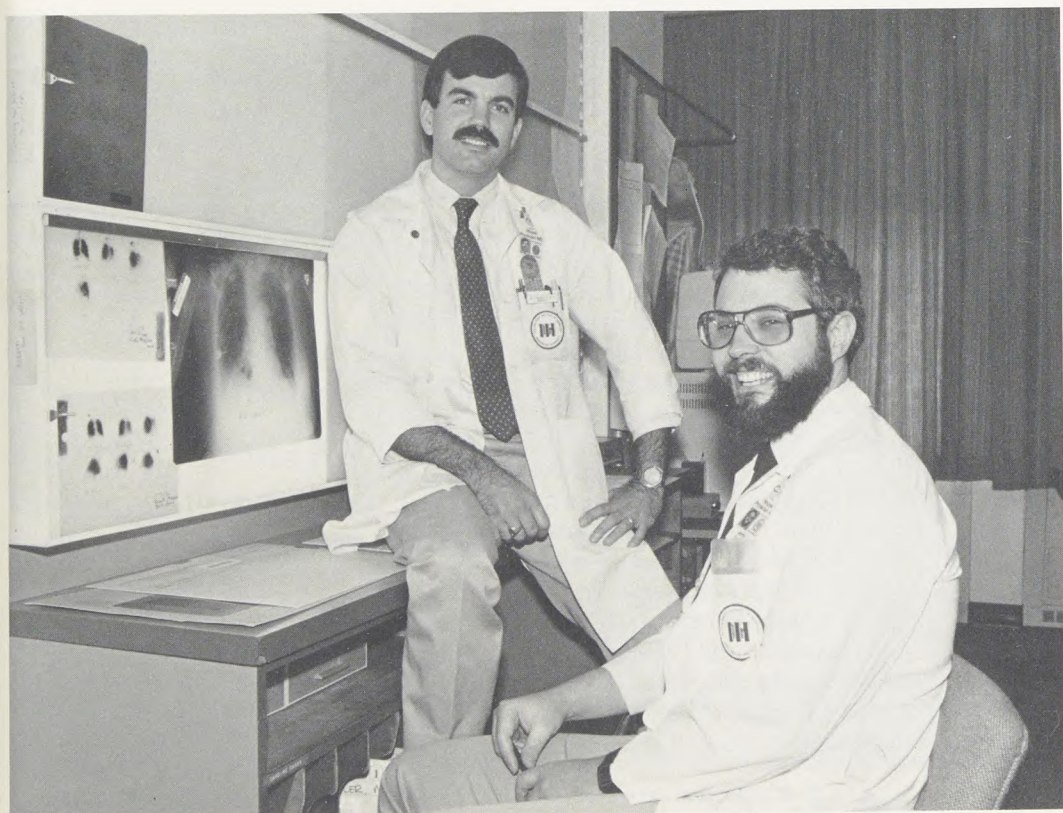
Despite the work, they are delighted with their new surroundings. Others around the institute are also looking forward to relocation. "Everyone has a real positive attitude," says McNabb. "By putting up with a little inconvenience now, we will all have a much nicer and more up-to-date workplace." □

Candace O'Connor is a St. Louis free-lance writer who contributes regularly to Focal Spot.



SPOTLIGHT

PROFILES OF THE CHIEFS



Thomas Murry

Thomas A. Getz, M.D., chief resident in Diagnostic Radiology (left), and Jerry Tobler, M.D., Ph.D., cochief resident.

“There’s something a little magical,” says Thomas A. Getz, M.D., chief resident in Diagnostic Radiology, “about looking into someone’s body, seeing what others can’t, without cutting the person open.”

That magic worked its spell on Getz, attracting him initially to emergency care and ultimately to radiology, with medical school—and much else—between. The enchantment, however, was as slow as it was strong, and during his undergraduate years, Getz pursued scientific but nonmedical studies, earning a B.A. in geology from Williams College in Williamstown, Massachusetts, and serving as a teaching assistant in the college computer center.

It was after graduation, while helping administer the family businesses in Moline, Illinois, that Getz first felt medicine’s pull. Volunteering as an instructor for

the American Red Cross, Getz became increasingly interested in trauma and emergency care and eventually began working nights as an emergency medical technician at Moline Public Hospital.

Having “decided I liked medicine more than business,” Getz returned to college, fulfilling his premedical requirements in “an action-packed year” at the University of Iowa. Getz then began marriage and medical school simultaneously in 1979, a self-described “major adjustment” in life-style. Coping nicely, he excelled at the University of Iowa College of Medicine and was honored with the Radcliffe Infirmary Clerkship at Oxford University in England.

Selecting radiology as his specialty on graduation was a natural extension of Getz’ outside interests and personality. “I’ve always been very visually, graphically oriented,”

he says. “My hobbies are things like stained glass and photography. I also enjoy working with my hands. Given those two traits, the natural choice was radiology.”

Although still undecided about what he will do and where his family—wife Margaret and daughter Meghan—will locate after residency, his 4 years at Mallinckrodt have Getz looking forward to practicing some modern-day wizardry of his own.

Jerry Tobler, M.D., Ph.D., cochief resident in Diagnostic Radiology, has traced a circuitous route to the proper intersection of career and family. As committed to wife and children as to medicine, Tobler believes he’s found a path that merges both here in St. Louis.

Born in Elgin, Illinois, Tobler began his journeys at age 18 when he headed east to Cornell

SPOTLIGHT

PROFILES OF THE CHIEFS

University in Ithaca, New York. Even while earning his B.S. in engineering, Tobler started his wandering ways, taking courses in biochemistry with the goal of pursuing graduate work.

Reversing direction—and changing fields—Tobler went west in 1973, completing a Ph.D. in chemistry at the California Institute of Technology in Pasadena. He settled down briefly after graduation, working at “a real job” as a research biochemist at Proctor and Gamble in Cincinnati, before the road pulled him east yet again in 1979.

“I thought I might be more effective in research if I got an M.D.,” says Tobler. “At the time, I was really looking toward tumor research.” With that aim in mind, he began medical school at Yale.

While at Yale, Tobler once more changed directions. “I did some research that was cancer-related during my first years there,” explains Tobler, “but I

*“There’s something
a little magical
about looking
into someone’s
body, seeing what
others can’t.”*

became interested in radiology because I feel that one can have a greater impact on cancer prognosis through early detection. In addition, I enjoy the puzzle-solving approach.”

Because of his research background, Tobler initially thought he would pursue academic radiology,

but he didn’t want to foreclose his clinical options. Residency at Mallinckrodt allowed him to keep both roads open. That decision has proven important, for he has made another turn in his career path by accepting a position at Missouri Baptist Hospital after residency.

Tobler’s private practice commitment reflects his growing concern with balancing a satisfying medical practice with a stable family life. “My wife, Maura, has really put down roots here,” says Tobler, “and St. Louis is a great town for people with families. I really wanted to raise my kids—Jason, Nina and Rachael—in the sort of friendly Midwestern environment I grew up in.”

Having found “the right job in the right place,” Tobler appears to have finally arrived at his destination.

An adopted son of the Midwest by way of the Far East, William J. Pao, M.D., chief resident in the Division of Radiation Oncology, has traveled far and fast in pursuit of his medical education.

Born and reared in Hong Kong, Pao visited the United States frequently in his youth, moving here permanently in 1976. Most of his family now lives in the States, and Pao himself acknowledges his thorough Americanization, from his provincial biases to his unaccented speech.

“I’m a Midwesterner, even though I’m from another country originally,” Pao asserts. “I grew up in a very crowded city—lots of people, very cosmopolitan—and I now enjoy living where life isn’t as hectic.”

Although his new home is admittedly less fast paced than his native city, Pao’s own life has hardly slowed since his arrival in the United States. Because of dif-

ferences between the Hong Kong and U.S. educational systems, Pao began college at Marquette University in Milwaukee at the young age of 17 without officially earning a high school degree. He then continued his accelerated progress a few years later, enter-

*“In radiation
oncology, you can
often effect a direct,
positive change.”*

ing the Medical College of Wisconsin before graduation from Marquette.

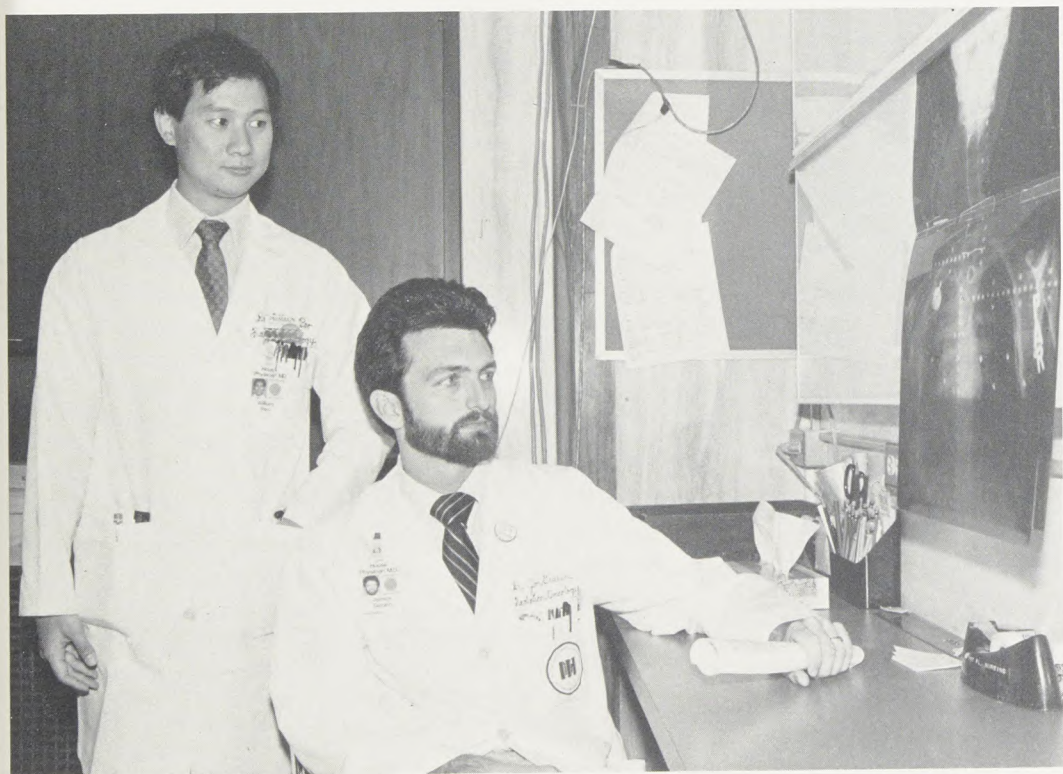
Pao is obviously proud of his accomplishments, but he admits to a certain ruefulness about his education’s rapid rate. “Unlike most people,” he says, “I’ve never been a senior in high school or a senior in college. I’ve never really goofed off, and there may be something to be said for stopping and smelling the roses.”

Attractive as leisure may be, Pao has no intentions of relaxing at present. After his residency, he hopes to establish a practice that keeps him busy and in close contact with patients. “I enjoy medicine because I enjoy interacting with people,” says Pao. “I like to see people do well, and in radiation oncology you can often effect a direct, positive change to help them.”

Other than a desire to remain in a clinical setting—and in the Midwest, if possible—the exact shape of the future for Pao, wife Lily and son Lionel remains unclear. Whatever his ultimate choice, Pao has clearly demonstrated an ability not only to adapt but to excel.

SPOTLIGHT

PROFILES OF THE CHIEFS



Thomas Murry

William J. Pao, M.D., chief resident in the Division of Radiation Oncology (left), and James R. Geurin, M.D., assistant chief resident.

Much traveled but well rooted in the South, James R. Geurin, M.D., assistant chief resident in the Division of Radiation Oncology, exhibits a distinct nostalgia for the region he calls home.

Although he has lived in the respectively cold and watery climes of Anchorage, Alaska, and Seattle, Washington, Geurin prefers the Southern heat. Born in Hot Springs, Arkansas, he has spent his days from high school until residency in Memphis, Tennessee.

Youthful travels have left no trace of a drawl, but Geurin knows the proper use of "good Southern colloquialisms" and identifies his relatives as "Arkansas hillbillies." "I have uncles who may not still *make* moonshine," claims Geurin, "but they certainly still know how."

However colorful his origins, the articulate, soft-spoken Geurin

could scarcely be mistaken for someone just down from the hills, given his broad education and experience. Trained in teaching (B.S.Ed.) and physics (M.S.) at Memphis State University, Geurin worked as both college instructor and energy engineer before entering medical school in 1980 at the University of Tennessee.

Initially unsure which direction his medical career would take, Geurin carefully weighed his options before choosing radiation oncology. "I wanted a technical field because of my interests and my physics background," says Geurin, "but I still wanted patient contact. Radiation oncology gives me both."

With his residency just past its halfway mark, Geurin has only recently begun considering future choices. The needs of his wife—Washington University psychiatry resident Julia Warnock, M.D., Ph.D.—and their daughter Nicole

will obviously help make that decision, but the South holds a predictable allure.

"A lot of areas in the South are relatively underserved in terms of radiation therapy," says Geurin, "and right now I know that I'd like to go back." Geurin enjoys St. Louis and the attractions its larger size offers, but recalling the relatives and friends left behind in Tennessee, he concludes, "I'll certainly be looking in Memphis." □

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THE DIRECTOR'S OFFICE REPORT

RECENT PROMOTIONS

Joseph K. T. Lee, M.D., to the rank of professor of radiology

Dennis M. Balfe, M.D., to the rank of associate professor of radiology

Judy M. Destouet, M.D., to the rank of associate professor of radiology

William G. Totty, M.D., to the rank of associate professor of radiology

Edward Cohen, M.D., to the rank of assistant professor of clinical radiology

Gene L. Davis, M.D., to the rank of assistant professor of clinical radiology

Daniel J. Leary, Jr., M.D., to the rank of assistant professor of clinical radiology

Daniel D. Picus, M.D., to the rank of assistant professor of radiology

Naris Rujanavech, M.D., to the rank of assistant professor of clinical radiology

Kondapuram S. Sampathkumaran, M.S., to the rank of research assistant professor of radiology

Karen L. Beetham, Ph.D., to the rank of instructor in cancer biology in radiology

James W. Brodack, Ph.D., to the rank of research instructor in radiology

NEW STAFF

Gale C.S. Anderson, M.D., instructor in radiology, Division of Radiation Oncology

James P. Crane, M.D., professor of radiology (primary appointment in the Department of Obstetrics and Gynecology)

Robert E. Drzymala, Ph.D., assistant professor of radiation physics in

radiology, Division of Radiation Oncology

Joseph N. Fields, III, M.D., assistant professor of radiology, Division of Radiation Oncology (completed 4-year residency in Radiation Oncology at MIR)

Perry W. Grigsby, M.D., assistant professor of radiology, Division of Radiation Oncology (completed 4-year residency in Radiation Oncology at MIR)

Kathryn A. Hackman, B.S., research assistant in radiology, Division of Radiation Sciences

Carla Mathias, B.A., research assistant in radiology, Division of Radiation Sciences

Stephen M. Moerlein, Ph.D., assistant professor of radiation chemistry in radiology, Divisions of Nuclear Medicine and Radiation Sciences

Yuzuru Nakamura, Ph.D., visiting research associate in radiation physics in radiology, Division of Radiation Oncology

Janice W. Semenkovich, M.D., instructor in radiology, Diagnostic Radiology (completed 4-year residency in Diagnostic Radiology and 1 year of training in Nuclear Medicine)

Larry D. Simpson, Ph.D., associate professor of radiation physics in radiology, Division of Radiation Oncology

Yvonne Taylor, Ph.D., assistant professor of cancer biology in radiology, Division of Radiation Oncology

Jerold W. Wallis, M.D., instructor in radiology, Division of Nuclear Medicine

OFF STAFF

Frederick G. Abrath, Ph.D., assistant professor of radiation physics in radiology, Division of Radiation Oncology, has joined the staff of the Division of Radiation Medicine, St. Anthony's Hospital, St. Louis.

W. Thomas Dixon, Ph.D., assistant professor of radiation sciences in radiology, has joined the staff at Emory University Medical School, Atlanta.

Paul A. Jerabek, Ph.D., research instructor in radiology, Division of Radiation Sciences, has accepted a position at the University of California, Irvine.

David McNaney, M.D., instructor in radiology, Division of Radiation Oncology, has entered radiation oncology private practice at Miller Dwan Medical Center, Duluth, Minnesota.

David G. Politte, M.S., research assistant in radiology, Division of Radiation Sciences, will be pursuing tomography research at the Institute for Biomedical Computing, St. Louis.

John G. Rehder, M.D., instructor in radiology, has accepted the position of assistant professor of medicine at the University of Pittsburgh.

Akemi C. Chang, M.D., completed a 4-year residency in Diagnostic Radiology, including 1 year of training in Nuclear Medicine, and has begun a fellowship in CT, ultrasound and MRI at Cedars-Sinai Medical Center, Los Angeles.

Alan B. Fein, M.D., instructor in radiology, completed a 1-year fellowship in Abdominal Radiology and has entered private practice in diagnostic radiology with Wake Radiology Consultants

and is a clinical associate at Duke University Medical Center, Raleigh, North Carolina.

Carl A. Geyer, M.D., instructor in radiology, completed a 2-year fellowship in Neuroradiology and is now a member of the Neuroradiology Section at Walter Reed Army Medical Center and an assistant professor at the Armed Forces Medical School.

Stanley J. Grossman, M.D., completed 2 years of training in Nuclear Medicine and has accepted the position of Director of Nuclear Medicine at the Western Pennsylvania Hospital, Pittsburgh.

Susan D. James, M.D., completed a 3-year residency in Diagnostic Radiology and has entered private practice in general radiology at Sparks Radiology Group, Ltd. and will teach medical students at the University of Nevada, Reno.

Michael E. Katz, M.D., completed a 4-year residency in Diagnostic Radiology and has entered private practice at the Department of Diagnostic Radiology, Henry Ford Hospital, Detroit.

C. Keith Keyser, M.D., instructor in radiology, completed a 1-year fellowship in Musculoskeletal Radiology and has entered private practice with Seattle Radiologists, Seattle.

John H. Niemeyer, M.D., chief resident in radiology 1985-86, completed a 4-year residency in Diagnostic Radiology and has entered private practice at Missouri Baptist and Incarnate Word Hospitals, St. Louis.

Chris L. Palaskas, M.D., completed a 4-year residency in Diagnostic Radiology and has entered private

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practice with Suburban Radiologic Consultants, Ltd., Minneapolis.

Gary A. Press, M.D., instructor in radiology, completed a 3-year residency in Diagnostic Radiology and a 2-year fellowship in Neuroradiology and has accepted a position in the Department of Radiology at the University of California-San Diego Medical Center.

Kenneth S. Rhol, M.D., cochief resident in radiology 1985-86, completed a 4-year residency in Diagnostic Radiology and has accepted a 1-year fellowship in interventional radiology at Alexandria Hospital, Alexandria, Virginia.

David A. Trenkner, M.D., completed a 4-year residency in Radiation Oncology and has entered private practice in radiation oncology in Ft. Wayne, Indiana.

Evan C. Unger, M.D., completed a 3-year residency in Diagnostic Radiology and has assumed the position of director of MRI at Fox Chase Cancer Center, Philadelphia.

Earlene H. Walls, M.D., completed a 3-year residency in Radiation Oncology and has entered private practice in Kansas City.

Michael P. Ward, M.D., instructor in radiology, completed a 3-year residency in Diagnostic Radiology and a 2-year fellowship in Neuroradiology and has entered private practice at St. Mary's Hospital, Reno, Nevada.

Paul N. Weiss, M.D., instructor in radiology, completed a 4-year residency in Diagnostic Radiology, including 1 year of training in Nuclear Medicine, and has entered private practice in radiology and nuclear medi-

cine at St. Mary's Hospital, Salt Lake City.

James D. Winthrop, M.D., instructor in radiology, completed a 4-year residency in Diagnostic Radiology and a 1-year fellowship in Neuroradiology and will be specializing in neuroradiology at Madigan Army Medical Center, Tacoma, Washington.

Janette L. Worthington, M.D., instructor in radiology, completed a 3-year residency in Diagnostic Radiology and a 1-year fellowship in Abdominal Radiology and will be working in general radiology at St. Mary's Hospital, Richmond, Virginia.

NEW FELLOWS

Catherine E. Beal, M.D., is a new fellow in neuroradiology. She received her premedical training in chemistry at St. Louis University. Beal completed her medical education at St. Louis University Medical School, where she went on to complete residency training in radiology.

Wanda I. Benitez, M.D., is a new neuroradiology fellow. Originally from Puerto Rico, she received a degree in biology at the University of Puerto Rico and completed her medical education there as well. Benitez completed an internship and residency training in diagnostic radiology at University Hospital in Puerto Rico. She has been certified by the American Board of Radiology and is a member of the AMA, ACR and RSNA.

William F. Conway, M.D., Ph.D., is a new fellow in musculoskeletal radiology. He attended Brown University in Providence, Rhode Island, graduating with a degree in biophysics. He received his medical education at the University of Chicago, where he also received a Ph.D. in genetics. Conway completed an internship in orthopedics at the University of Iowa Hospital and Clinics and a residency in diagnostic radiology at Mallinckrodt. He is a member of AOA and Sigma Xi.

Patricia Guithues Corder, M.D., is a new fellow in nuclear medicine. She received her premedical training at St. Louis University and her medical education at St. Louis University Medical School. She completed residency training in radiology at St. Louis University and is a member of Phi Beta Kappa, ACR and RSNA.

Mohamad Reza Dadsetan, M.D., is a new neuroradiology fellow. He received his medical education at the Medical School of Mashad in Mashad, Iran. Dadsetan completed residency training in neuroradiology in Lille, France, and later worked as a neuroradiologist attache in Paris. He recently completed another residency in radiology at St. Louis University Medical School. He is a member of RSNA, ACR and the Neurological Society of France.

Charles F. Garvin, M.D., is a new fellow in neuroradiology. Garvin received his premedical and medical education at the University of Missouri School of Medicine in Kansas City. He completed an internship in internal medicine and a residency in radiology

at The Jewish Hospital of St. Louis.

Kristie G. Jones, M.D., is a new fellow in radiation oncology. She attended the University of Louisville in Kentucky, graduating with a degree in nursing. She completed her medical education at the University of Louisville School of Medicine. Jones received internship training at Humana Hospital University and University of Louisville Affiliated Hospitals and completed residency training in radiation oncology at the University of Louisville Brown Cancer Center.

Randolph J. Knific, M.D., is a new abdominal fellow. He completed his premedical training in chemistry at Case Western Reserve University and his medical education at Case Western Reserve University School of Medicine. Knific completed both an internship and residency in radiology at the Cleveland Clinic in Cleveland, Ohio.

Kenneth W. Martin, M.D., is a new pediatric radiology fellow. He received his premedical training in biological science at the University of Southern California and completed his medical education at the University of California-San Diego School of Medicine. Martin completed residency training at Mallinckrodt in 1986.

Mary V. Marx, M.D., is a new fellow in abdominal radiology. She attended the College of Wooster in Wooster, Ohio, graduating with a degree in biology. She completed her medical education at Ohio State University School of Medicine, where she stayed to complete an internship and residency in radiology. Marx was chief resident her final year of

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NEW FELLOWS

residency. She is a member of Phi Beta Kappa and AOA.

Clement C. Wen, M.D., is a new neuroradiology fellow. Wen attended McGill University in Montreal, where he received a degree in bio-

chemistry. He completed his medical education at Albert Einstein College of Medicine in New York. Wen served an internship at University of Miami Hospital and Clinics and received residency training at St. Paul's Hospital in Vancouver and Sinai Hospital of Baltimore.

Taiwan. He completed his premedical training at Duke University, graduating with a degree in chemistry in 1981. He attended Emory University School of Medicine in Atlanta and stayed there to complete his internship. Liou is a member of AOA.

Richard D. Lovett, M.D., received a degree in radiologic technology from the University of Vermont in Burlington and later attended the University of Vermont School of Medicine. He completed an internship at Framingham Union Hospital and has done research in single-photon tomography at New England Deaconess Hospital in Boston.

Larry D. Schertz, M.D., received his premedical training at Northwestern University, graduating with a degree in chemistry. He attended Washington University School of Medicine and completed an internship at West Suburban Hospital in Oak Park, Illinois.

Schertz was the 1985 recipient of the Hugh M. Wilson Award in radiology and is a member of AOA.

David A. Thorne, M.D., completed his premedical studies in biology at the University of Utah in Salt Lake City. He graduated from the University of Utah School of Medicine in 1984 and then completed an internship in general surgery and a year of residency training in nuclear medicine at the university. Thorne is a member of AOA, Phi Beta Kappa and Phi Kappa Phi and has a number of publications in nuclear medicine to his credit.

James H. Wynstra, M.D., completed his premedical training at the University of Wisconsin-Parkside. He graduated from the Medical College of Wisconsin in Milwaukee in 1985 and completed an internship at University Hospital in Madison, Wisconsin.

FIRST YEAR RESIDENTS

Thomas F. Hirsh, M.D., received his premedical training in psychology at Brown University in Providence, Rhode Island, and at the University of Minnesota in Minneapolis. He completed his medical education at the University of Minnesota School of Medicine and his internship at Hennepin County Medical Center. Hirsh is a member of Phi Beta Kappa, Phi Kappa Phi and AOA.

Corbin Johnson, M.D., received his premedical training at Harvard University in Cambridge, Massachusetts. A 1985 Washington University School of Medicine graduate, Johnson completed an internship at Rush Presbyterian-St. Luke's Hospital in Chicago. He is a member of ARRO.

Johnson Liou, M.D., is originally from Taipei,

New 1986 Residents
Back Row (left to right):
Drs. Gary D. Shackelford
(director of resident
training), Johnson Liou,
Richard D. Lovett, Peter K.
Nelson, Thomas C. Winter,
III, David A. Thorne, Paul D.
Kountz, Jr., Dale M. Fletcher,
James H. Wynstra, R. Gilbert
Jost (chief of Diagnostic
Radiology). Front Row:
Drs.
Michael B. Evert, Corbin
Johnson, Thomas F. Hirsh,
Ronald G. Evens (director
of MIR), V. Marie Tartar,
Charles A. James,
Larry D. Schertz.



Thomas Murry

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FIRST YEAR POSTGRADUATES

Michael B. Evert, M.D., completed his premedical training at San Jose State University in San Jose, California, graduating with a degree in molecular biology. He attended medical school at Emory University in Atlanta, where he received the Robert W. Woodruff fellowship in medicine. Evert is a member of AOA.

Dale M. Fletcher, M.D., received his premedical training in chemistry at the University of Pittsburgh. He completed his medical education at the University of Pittsburgh School of Medicine. Fletcher is a member of AOA.

Charles A. James, M.D., graduated from the University of Arkansas with a degree in chemistry. He completed his medical education at the University of Tennessee School of Medicine in Memphis in 1986. James is a member of AOA.

Paul D. Kountz, Jr., M.D., Ph.D., graduated from Wofford College in Spartanburg, South Carolina, with degrees in chemistry and French. He received his M.D. and Ph.D. from

Vanderbilt University in 1986. Kountz has received several honors and is a member of both AOA and Phi Beta Kappa.

Peter K. Nelson, M.D., completed his medical education at Louisiana State University in New Orleans. He is a member of AOA and the Aesculapian Honor Society and is a recipient of the Adamo Neuroscience Award.

V. Marie Tartar, M.D., graduated from the University of Arizona with a degree in art history and an emphasis in chemistry. She also completed her medical education at the university, receiving the Outstanding Radiology Student Award and the Lange Book Award. She is a member of AOA, RSNA, Phi Beta Kappa and Phi Kappa Phi.

Thomas C. Winter, III, M.D., received degrees in physics and math from Duke University in Durham, South Carolina. He completed his medical training at Duke as well. Winter is a member of AOA and Phi Beta Kappa.

SYMPOSIA

Ronald G. Evens, M.D., professor of radiology and head of the Mallinckrodt Institute of Radiology, spoke on "Economic Considerations for the Clinician" and served on a panel discussion at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.

William A. Murphy, Jr., M.D., professor of radiology, served as course director, session moderator, panel discussion participant and lecturer on "Breast MRI" for the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20. He spoke on "Imaging the Temporomandibular Joint" for The Greater St. Louis Society of Radiologists, September 9, and "Radiologic Imaging of the TMJ" for the TMJ Support Group of Barnes Hospital, September 16. "Forensic Radiology" was his topic for the Medicolegal Death Investigator Training Course at St. Louis University School of Medicine, St. Louis, October 6. He presented "MRI of the Skeleton" at the 18th Annual Southeast Magnetic Resonance Conference, hosted by Vanderbilt University, October 9.

Bruce L. McClennan, M.D., professor of radiology, attended the American College of Radiology Meeting in Baltimore, September 13-17. As president of the Greater St. Louis Society of Radiologists, he cohosted the Carmen Lecture at the St. Louis Medical Society, October 14, with Dr. William Bradley speaking on "Flow Phenomena in MRI."

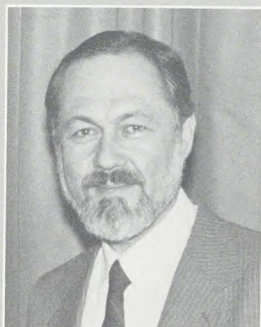
Jay P. Heiken, M.D., assistant professor of radiology, acted as consultant in magnetic resonance imaging and lectured on "Magnetic Resonance Imaging in Cancer Diagnosis and Management" and "Magnetic Resonance Imaging: Clinical Applications in Oncology" at the Royal Marsden Hospital, Sutton, England, June 19-28. He also lectured on "Magnetic Resonance Imaging of the Abdomen and Pelvis" at St. Bartholemew's Hospital, London, June 26. He spoke on "Liver MRI" and participated on a panel discussion at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.

Bahman Emami, M.D., associate professor of radiology, served as symposium chairman and session moderator and presented "Clinical Experience with Deep Hyperthermia" and "Hyperthermia in the Treatment of Melanomas" at the Second Annual Clinical Hyperthermia Symposium and Workshop, St. Louis, September 18-20. He attended the Three-Dimensional Treatment Planning Meetings in New York, June 9-11 and September 12, and in Philadelphia, September 22-24. Emami attended the Radiation Therapy Oncology Group Meeting in Philadelphia, June 16-17, and the Electron Beam Meeting, National Cancer Institute, Bethesda, Maryland, August 19.

Miljenko V. Pilepich, M.D., associate professor of radiology, presented "Interaction of Hyperthermia and Chemotherapy" at the Second Annual Clinical Hyperthermia Symposium and Workshop, St. Louis, September 18-20.

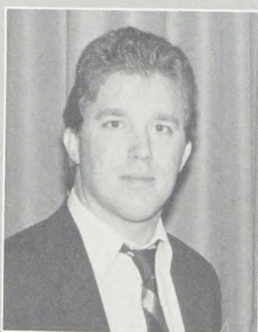
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SYMPOSIA



Gilbert H. Nussbaum, Ph.D.

Gilbert H. Nussbaum, Ph.D., associate professor of radiation physics in radiology, served as workshop chairman and session moderator and spoke on "Physics of Local Hyperthermia (Electromagnetic Methods)" and "Physics of Interstitial Hyperthermia" at the Second Annual Clinical Hyperthermia Symposium and Workshop, St. Louis, September 18-20.

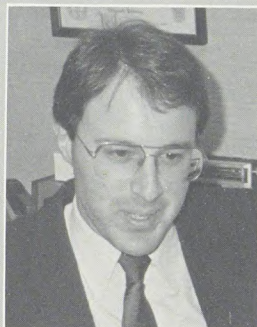


Robert R. Kuske, M.D.

Robert R. Kuske, M.D., associate radiation oncologist, spoke on "Hyperthermia in the Treatment of GYN Tumors" at the Second Annual Clinical Hyperthermia Symposium and Workshop, St. Louis, September 18-20. He attended the Fourth Selectron International Users Meeting: Brachytherapy, September 15-17.

Joseph L. Roti Roti, Ph.D., associate professor of cancer biology in radiology, presented "Biological Basis for Hyperthermia" at the Second Annual Clinical Hyperthermia Symposium and Workshop, St. Louis, September 18-20. He spoke on "Nuclear DNA Organization as a Function of the Cell-Cycle" at the 10th Annual Meeting of the Cell Kinetics Society, Santa Fe, New Mexico, March 18-21. Roti Roti presented "The Nuclear Matrix from Heat-Shocked HeLa Cells Contain a Double Stranded Nucleic Acid Resistant to RNase A Digestion" at the 34th Annual Meeting of Radiation Research, Las Vegas, April 12-17.

Todd H. Wasserman, M.D., associate professor of radiology, presented "Solitary Plasmacytomas: Response to Radiation and Progression to Multiple Myeloma," co-authored by David Trenkner, M.D., former MIR resident, at the Fletcher Society Meeting, Edinburgh, August 3-8; "Failure of Misonidazole to Improve Radiation in Advanced Head and Neck Cancers," coauthored by J.T. Fazekas, V. Marcial, C. Scott and L. Davis for the Radiation Therapy Oncology Group of Philadelphia, and "SR-2508: A New Promising Hypoxic Cell Sensitizer Ready for Phase III Clinical Trials," coauthored by C.N. Coleman, R. Urtasun, T. Pajak and T. Phillips for the Radiation Therapy Oncology Group of Philadelphia, at the European Society for Therapeutic Radiology and Oncology, Baden-Baden, West Germany, September 8-10. He attended the Conference on Interaction of Radiation Therapy and Chemotherapy, Williamsburg, Virginia, September 28-October 1. He is cochairman of the group's organizing committee.



William R. Reinus, M.D.

William R. Reinus, M.D., assistant professor of radiology, presented "Tenography of the Ankle" at the American College of Radiology Meeting, Baltimore, September 13-14. He spoke on "Orthopedic MRI" and served on a panel discussion at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.

Carlos A. Perez, M.D., professor of radiology and director of the Division of Radiation Oncology, presented the paper "Impact of Tumor Control on Survival in Carcinoma of the Lung Treated with Irradiation," coauthored by Madeline Bauer, Sharon Edelstein, Brenda Gillespie and Robert Birch, at the Third Rome International Symposium: The Challenge of Local Tumor Control and Its Impact on Survival, Rome, May 12-16. At the same conference, he presented "Tumor Control in Definitive Irradiation of Localized Carcinoma of the Prostate," coauthored by Miljenko V. Pilepich and Fred Zivnуска. Perez served as session moderator and presented "Hyperthermia in Treatment of Breast Cancer" and "Hyperthermia in the Treatment of Head and Neck Cancer" at the Second Annual Clinical Hyperthermia Symposium and Workshop, St. Louis, September 18-20.

Klaus Sartor, M.D., associate professor of radiology, presented "CT and MR in Children with Rare Movement Disorders," coauthored by C. Geyer, A. Pinsky, C.L. Abramson, F.J. Hodges and M. Gado, and "MR Imaging of Spinal Cord Arteriovenous Malformations and Hemangioblastomas," coauthored by G. Fahrenndorf and M. Gado, at the XIII Symposium Neuroradiologicum, Stockholm, June 22-28. He spoke on "Hematoma and Vascular Lesions," "Developmental Abnormalities and Hydrocephalus" and "Paranasal Sinuses and Orbits" and participated in a panel discussion at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.

Fred J. Hodges, III, M.D., professor of radiology, presented "Brain Tumors," "Inflammatory Lesions" and "Degenerative Disease and Atrophy" and served as session moderator and panel discussion participant at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.



Judy M. Destouet, M.D.

Judy M. Destouet, M.D., associate professor of radiology, spoke on "Bone Biopsy" for the preliminary program of the American College of Radiology Meeting, Baltimore, September 13-14.

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Dennis M. Balfe, M.D., assistant professor of radiology, presented "Pelvic MRI" and participated in a panel discussion at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.

Joseph K.T. Lee, M.D., professor of radiology, served as session moderator and panel discussion participant at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20. He spoke on "MRI of Kidneys and Adrenals" at the Kentucky Bluegrass Radiologic Society, Lexington, Kentucky, October 9-11. Lee served as a grant proposal consultant for the National Cancer Institute, June 4-5.

David Ling, M.D., assistant professor of radiology, presented "Retroperitoneum" and participated in a panel discussion at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.

Louis A. Gilula, M.D., professor of radiology, organized the Categorical Course on Diagnostic Musculoskeletal Techniques, served as chairman and moderator and spoke on "Knee Arthrography" and "Wrist Arthrography" at the American College of Radiology Meeting, Baltimore, September 13-14. He lectured on "Tenography of the Foot and Ankle" and served as codirector of the refresher course at the International Skeletal Society Meeting, Vancouver, September 6-12. "Approach to the Painful Wrist" was a refresher course he presented with Dr. Leroy Young at the meeting of the American Society of Plastic and Reconstructive Surgeons, Los Angeles, October 28.

W. Thomas Dixon, Ph.D., assistant professor of radiation sciences, spoke on "Simplified Physical Principles of MRI" at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.

Harvey S. Glazer, M.D., assistant professor of radiology, gave presentations on "Mediastinum and Lungs" and "Neck MRI" and served on two panel discussions at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.

Fernando R. Gutierrez, M.D., assistant professor of radiology, served as a session moderator and panel discussion participant at the Midwest Clinical Magnetic Resonance Imaging Conference, St. Louis, September 19-20.



Lois Howland, R.N.

Lois Howland, R.N., managing director of the Cancer Information Center, attended the Fourth International Conference on Cancer Nursing, sponsored by Memorial Sloan-Kettering Hospital, New York, September 7-12. She was 1 of 1,200 nurses, from 46 countries attending the conference.

AMERICAN ASSOCIATION OF PHYSICISTS IN MEDICINE

The following members of the Physics Section of the Division of Radiation Oncology presented papers at the 28th Annual Meeting of the American Association of Physicists in Medicine, Lexington, Kentucky, August 3-7.

James A. Purdy, Ph.D., professor of radiation physics in radiology, presented the paper "Three-Dimensional Radiation Treatment Planning System," coauthored by William B. Harms, John W. Wong, J.W. Matthews and Bahman E. Emami.

Eric D. Slessinger, M.S., instructor in radiation physics in radiology, presented

the paper "Clinical Application of a New Treatment Verification Approach," coauthored by John W. Wong, Michael Vannier, R. Hermes and T. Roy.

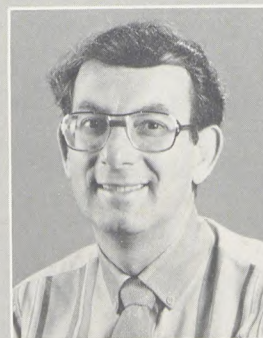
William B. Harms, B.S., instructor in radiation physics in radiology, presented the paper "Experimental Tests for Three-Dimensional Dose Calculations," coauthored by Eric D. Slessinger, John W. Wong and James A. Purdy.

John W. Wong, Ph.D., assistant professor of radiation physics in radiology, presented the papers "Plastic Scintillator Sheet as Areal Dosimeter in Radiotherapy," coauthored by W.R. Binns, J.W. Epstein, J. Karlmann and M.H. Israel, and "An Examination of Recent Methods of Photon Dose Calculations," coauthored by James A. Purdy.

VISITING PROFESSORS & GUEST LECTURERS

William A. Murphy, Jr., M.D., professor of radiology, presented "Rheumatoid Arthropathies: Pathophysiologic Concepts" and "Musculoskeletal Magnetic Resonance Imaging" as visiting professor at the University of Connecticut Radiology Grand Rounds, October 8.

Jay P. Heiken, M.D., assistant professor of radiology, presented a workshop on "Gastrointestinal Radiology and Barium Products: A Radiologist's Perspective" at Mallinckrodt, Inc., St. Louis, August 19.



Stuart S. Sagel, M.D.

Stuart S. Sagel, M.D., professor of radiology, spoke at the Eighth International University of Connecticut Radiological Symposium, Salzburg, Austria, September 8-14.

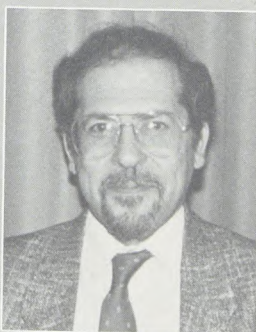
FYI

VISITING PROFESSORS & GUEST LECTURERS

Louis A. Gilula, M.D., professor of radiology, spoke as a visiting professor on "Analytic Approach to Carpal Injuries," "Ligamentous Instabilities of the Wrist," "CT of the Foot and Ankle," "Wrist Arthrography," "Peripheral Percutaneous Transluminal Angioplasty" and "Localized Intra-Arterial Streptokinase Treatment" at the University of British Columbia Health Sciences Center Hospital, Vancouver, September 2-5. He lectured on "Analytic Approach to Carpal Injuries" and "Ligamentous Instabilities of the Wrist" as visiting professor at the Mayo Clinic, Rochester, Minnesota, September 23-26. The lectures "3D-CT of the Wrist" and "Radiographic Approach to the Painful Wrist" were presented at the Wrist Meeting of the American Society for Surgery of the Hand, Mayo Clinic, Rochester, Minnesota, September 24-27.

Joseph K.T. Lee, M.D., professor of radiology, presented lectures on "CT of the Peritoneal Spaces and Ligaments," "MRI of the Male Pelvis," "MRI of the Adrenals," "MRI of the Liver" and "MRI of the Female Pelvis" at the Eighth Annual Diagnostic Imaging Seminar, sponsored by the University of Pennsylvania

at Martha's Vineyard, Massachusetts, July 7-11. "MR of the Scrotum" was the topic for the National Institutes of Health Symposium of Reproductive Biology, Bethesda, Maryland, in May. Lee lectured on CT/MRI of the retroperitoneum, the thorax and the male and female pelvis at the American College of Osteopathic Radiology, Kansas City, in May. As visiting professor, Lee presented "MRI of the Liver" and other interesting cases to residents at the University of Kentucky, Lexington, October 10-11.



Bahman Emami, M.D.

Bahman Emami, M.D., associate professor of radiology, was invited to speak on "Interstitial Thorioradiotherapy in Malignant Tumors" at Memorial Hospital, New York, September 26.

CALENDAR

**November 30-
December 5, 1986**
Radiological Society of
North America
Chicago

December 8, 1986
City-Wide Radiology
Conference
MRI Spectroscopy
Robert J. Herfkens, M.D.,
associate professor of
radiology, director of MRI,
Duke University, Durham,
North Carolina
Scarpellino Auditorium

January 11-15, 1987
ACR Symposium on
Neuroradiology
Miami, Florida

January 12, 1987
City-Wide Radiology
Conference
Speaker To Be Announced
St. Louis University

January 23, 1987
Freund Lecture
Speaker To Be Announced

February 9, 1987
City-Wide Radiology
Conference
Pediatric Nuclear Medicine
Salvador T. (Ted) Treves, M.D.,
director, Division
of Nuclear Medicine,
Children's Hospital,
Boston
Scarpellino Auditorium

February 19-27, 1987
Radiation Research Society
Atlanta, Georgia

March 9, 1987
City-Wide Radiology
Conference
Evaluation of the Spine:
Current Technology
Mokhtar H. Gado, M.D.,
professor of radiology,
Mallinckrodt Institute
of Radiology
Scarpellino Auditorium

April 13, 1987
City-Wide Radiology
Conference
Leroy Sante Lecture
Speaker to be Announced
St. Louis University

May 11, 1987
City-Wide Radiology
Conference
Urinary Tract Imaging:
The Impact of Current
Technology
Bruce L. McClennan, M.D.,
professor of radiology,
Mallinckrodt Institute
of Radiology
Scarpellino Auditorium

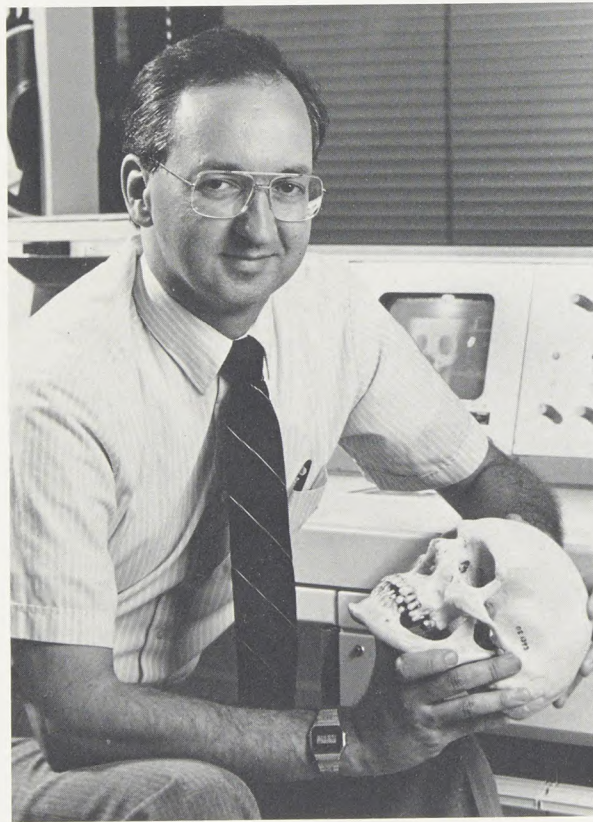
APPOINTMENTS

Joseph L. Roti Roti, Ph.D., associate professor of cancer biology in radiology, has been appointed associate editor for *Cancer Research*. He continues as associate editor for *Radiation Research* and on the editorial board of *Cell and*

Tissue Kinetics. He has also been appointed to the Radiation Study Section of the National Cancer Institute, the Ad Hoc Study Section of the Lawrence Livermore Laboratories and the Radiation Research Society Finance Committee.

REFLECTIONS

MICHAEL W. VANNIER, M.D.



3-D Imaging of South African Hominid Skulls

In July 1986, Glenn Conroy, Ph.D., professor of anatomy and anthropology, and I visited Johannesburg, South Africa, for research on fossil skulls of early man. We were guests of the Department of Anatomy at the University of the Witwatersrand, hosted by Professor Phillip V. Tobias. With his assistance, we arranged to examine several rare fossil skulls on a Siemens Somatom DR-3 computed tomography (CT) scanner at the Hillbrow Hospital. The scans were stored on floppy disks and placed in a suitcase for the trip back to St. Louis, where we have been working on their three-dimensional reconstructions.

In the past, there has been no satisfactory way for paleoanthropologists to nondestructively visualize intracranial morphology in fossil skulls in more than two dimensions. Images provided by conventional x rays, and even by normal CT scans, are abstract, flat, two-dimensional representations that often fail to reveal important three-dimensional relationships among cranial structures. These limitations are particularly severe in paleoanthropology, where most fossil skulls are too precious to be physically "invaded" by scientists wishing to examine intracranial morphology. An additional complication arises when fossil skulls are

REFLECTIONS

MICHAEL W. VANNIER, M.D.

filled with stone matrix (e.g., the South African australopithecines). In such cases, there is no way to accurately examine intracranial morphology or to directly measure intracranial volume and shape without first removing the matrix in some manner. For this reason, some of the australopithecines that are important to anthropological knowledge lie unprepared on museum shelves with the matrix obscuring important anatomical information.

Until now, this problem has seemed insurmountable. To circumvent these problems, we have developed a new research strategy utilizing recent advances in computer imaging technology that enables us to produce geometrically accurate, three-dimensional images of fossil skulls from their two-dimensional computerized tomographic data. These techniques can also make various portions of the fossil skull "transparent" on the computer screen to view previously hidden intracranial structures. In effect, this allows the investigator to electronically "dissect" a fossil skull in any plane desired in a totally safe, noninvasive way.

These techniques can be used in a unique way in the South African hominids. We can examine size and shape changes in the evolution of the human brain, particularly the evidence for cerebral symmetries and patterns of cerebral venous drainage in matrix-filled australopithecine skulls. Endocranial volume and shape and cranial venous sinus patterns are some of the most important parameters derived from fossil skulls, and the evolution of these parameters in humans is a particularly significant theme in contemporary paleoanthropology.

Anthropologists are just beginning to utilize advanced computer imaging techniques to study fossils

in ways that a few years ago would have seemed impossible. During the past 2 years, Dr. Conroy and I have been developing advanced three-dimensional computer imaging techniques to aid in paleoanthropological research. These techniques have now been used to examine both extant populations (e.g., over 700 patients with various craniofacial deformities and

"No one has ever had the opportunity of applying this new technology to the hominid fossil record."

trauma at Washington University hospitals) and fossil skulls filled with stone matrix (e.g., several 30-million-year-old fossil ungulates and 2-million-year-old *Theropithecus* skulls from Lake Turkana). However, no one has ever had the opportunity of applying this new technology to the hominid fossil record: Hence the *raison d'être* for our trip to South Africa.

We examined the original fossil hominids of South Africa for several reasons. South Africa has one of the largest repositories of original australopithecine fossils in the world, and Dr. Tobias had already given his permission for this work. In addition, much of this fossil australopithecine material is embedded in dense stone matrix and is thus ideal for the types of computer imaging experiments we wish to perform. Finally, and most importantly, the CT scanners in Johannesburg and St. Louis are compatible machines, so the CT scans can be taken in South Africa without

having to move the original fossils. The stored images can then be analyzed in St. Louis using our unique three-dimensional algorithms developed for this purpose. These priceless specimens—including the Taung skull and the posterior two thirds of an *A. africanus* skull (MLD 37/38)—are quite rightly considered national treasures and cannot be taken out of the country for study. Thus any CT study of the original fossils must be conducted in South Africa. (Kenya, the only other nation having excellent collections of australopithecine fossils, has no CT scanner available.)

The high-resolution CT methodology that we employ is able to distinguish between the density of stone matrix and mineralized bone in fossil skulls. This allows the computer to "remove" the stone matrix from the picture, leaving behind only the true extra- and intracranial osseous contours of the fossil. The procedure results in a sequence of nonoverlapping, 2-mm thick CT sections of the complete fossil skull with the stone matrix "removed." The computer then "stacks together" all these images to present the viewer with a three-dimensional, geometrically accurate image of the complete "matrix-free" skull.

Applying this technology to the matrix-filled skulls of australopithecine is an exciting project. Because of the rarity of fossil human skulls, it becomes imperative that anthropologists extract as much information as possible from each specimen that is discovered. These new, noninvasive, three-dimensional computer imaging techniques thus have important applications and advantages for anthropological research in the future. □

Michael W. Vannier, M.D., associate professor of radiology, is a pioneer in three-dimensional imaging.



Mike DeFilippo

FOCAL SPOT

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