From 2D scans to 3D model . . .

New Dimensions: Craniofacial Imaging
Life-Size Model of Skull Available from CT Scans

When a dentist plans a prosthesis or complex restoration, he makes an impression of the teeth and casts a dental model. The same process can be used for the planning of corrective surgery for persons with craniofacial deformities, provided that an accurate life-size replica of the skull can be produced. In the past, the only means of obtaining a skull was from cadaveric sources. Now, Dr. Michael W. Vannier, radiologist at Mallinckrodt Institute, has developed methods to produce a life-size model of the skull of a living person by using contours derived from ordinary CT scans.

Starting with a set of high resolution CT scans of the face, three-dimensional images of the skull can be produced. These three-dimensional images are easier to understand than the original CT scans and have been applied to the surgical planning and evaluation of more than 150 patients with craniofacial deformities caused by cancer, trauma, or birth defects. The computer programs for conversion of CT scans to a fully three-dimensional form were developed at Mallinckrodt Institute by Dr. Vannier in collaboration with Dr. Jeffrey Marsh, a plastic surgeon at Children’s and Barnes Hospitals.

On the Cover

Skull surface of a young boy in an image that was produced by computer reconstruction of 48 original CT scans. This type of image has not been previously available in a human being. (The absence of cheekbones is characteristic of the Treacher Collins Syndrome.)
Washington University Medical Center. No other center in the world has such a large experience with the clinical application of three-dimensional images.

While the production of three-dimensional images alone has changed the way surgery is planned, even more phenomenal advancements have been accomplished through collaboration with scientists in the aerospace industry. Advanced computer-aided design technology developed by the McDonnell-Douglas Corporation and used for military aviation applications has been adapted for use in craniofacial surgery planning and permits the surgeon to actually simulate surgical procedures on a three-dimensional replica of the patient's face and head. This computerized production of "blueprints" for the correction of complex skull abnormalities, coupled with the construction of solid models, are the two most significant applications of the 3-D imaging processes first developed at Mallinckrodt by Drs. Vannier and Marsh.

Dr. Michael Vannier, assistant professor of radiology and former NASA engineer, uses a dry skull to illustrate the kind of detail previously available only in autopsy. He is seated at the CAT scan console where reconstructions of scans are performed to provide such details of the skulls of living persons.
Jim Warren, Unit Chief-Design, MCAIR, uses a light pen and function keyboard to construct the 3-dimensional body tissue on the screen.

The CT scanner can reconstruct oblique views of the patient's face. These soft tissue views show the small malformed ears (microtia), small jawbone, and anti-mongoloid slant of the eyes.
Jean Barbier, Mallinckrodt research engineer working with Dr. Vannier, has machined plastic skull models based on contour tracings derived from CT scans. Preparations are underway at MIR to offer this capability as a routine clinical tool.

Space-filling three-dimensional model of the skull of a three-month-old child with unilateral coronal synostosis. The interface between the bone plates on one side of the skull has closed prematurely (in utero) causing asymmetric development of the remainder of the cranial cavity and facial bones. Forty-three 2mm scan slices (cut with a scroll saw from lucite sheets) were combined to form the three-dimensional model.

These developments: three-dimensional surface images from CT scans, computer-aided design of surgical procedures, and production of life-size models of the skulls of living patients have been pioneered at MIR and promise to significantly change the approach for diagnosis and treatment of complex craniofacial abnormalities.

Diana Davis, medical reporter, KTVI Channel 2, has been awarded a 1982 Radiology News Award for the excellence of her report entitled, “Facecraft,” which dealt with the adaption of high resolution CT scans (converted to a three-dimensional form) and advanced military aircraft computer-aided design technology to the analyses of a 13-year-old patient’s craniofacial deformities before and during corrective surgery. The week-long series was filmed at Mallinckrodt Institute, Barnes Hospital, St. Louis Children’s Hospital, and McDonnell Douglas Corporation.

The news awards program is sponsored by the American College of Radiology, the Radiological Society of North America, Roentgen Ray Society, and the American Radium Society.
Virginia Hamby, film librarian, uses a portable bar code decoder to identify misfiled films in the film library.

The movement of x-ray films is monitored through the use of bar codes attached to the film jacket.

By a sweep of the bar code label on Dr. Barbara Monsee's I.D. badge, film librarian Patricia Northern completes the sign-out process for the physician.
of MIR’s Efficient Film Traffic

Good organization is important in any well-run business, but it is particularly important in the medical field where patients’ lives can depend on good management. Mallinckrodt Institute has developed the largest radiology computer facility in the world to assist in the organization and monitoring of patient care. The system supports over 125 computer terminals throughout the Institute in addition to over 40 hand-held wands which are used to gather data on patient related events.

Computers now play a critical role in the control of films in the Institute where every day thousands of patient x-ray film jackets are processed. In May 1982, the cooperative team of Dr. Gilbert Jost, Rex Hill, Armand Diaz, and other members of the Computer Division, technology, and film library staffs put into operation a comprehensive film tracking and checking system. Through the combined efforts of this group, MIR personnel now have the tools to provide continuous accurate information on the location of films, accumulate data that answers questions about problem areas in the total operation, make more accessible a film in transit, and isolate the probable location of a missing film.

All the films for an individual patient are kept in one or more 18" x 15" cardboard jackets. At MIR, film folders are labeled with bar codes that resemble labels on supermarket goods. These codes identify the jackets and link them to the proper patients.

Upon a patient’s arrival in the department, the tracking procedure begins. Bar code labels are prepared automatically for the temporary jacket which will hold the examination to be performed. If the computer determines the patient is new, labels are prepared for a permanent x-ray jacket as well. Every time the film jacket is moved to a new location, a sweep of the hand-held optical wand across the bar code indicates where the jacket is being sent. One sweep of the wand indicates the film jacket’s location; a second sweep of the wand indicates the destination to another department.

Physicians are now able to sign out a film simply by sweeping the wand across the resin-coated label on their hospital I.D. badges, then across the film jacket label. This offers better control of the film sign-out process since the physician’s name, phone number, and date of sign-out are available throughout the department, and when necessary, overdue notices can be sent.

The addition of portable, battery charged bar code decoders enable film librarians, with a portable unit, to periodically sweep each of the film folders in the library. When this data is transferred into the computer, a list is automatically produced of film jackets which have been misfiled. In addition, film library supervisors can use a portable bar code decoder to spot check the location of films throughout the department.

By monitoring the moment activities of film jackets, this comprehensive film tracking system not only offers new controls but also provides data for long-range improvements in the operation of the film library. The system has been highly successful in Mallinckrodt Institute’s large operation.

Mallinckrodt’s Role in Radiology Information System Consortium (RISC)

For the past one and a half years, Mallinckrodt Institute of Radiology, represented by Gilbert Jost, M.D., has joined with eleven other US major medical centers and hospitals to develop and provide an interactive, state-of-the-art radiology information system for hospitals of all sizes. The first priority of this non-profit group, known as the Radiology Information System Consortium (RISC), was to develop detailed functional requirements for the system and distribute them to interested vendors with a request for proposals to provide integrated hardware, software, and system support services.

Responses were formally requested in the fall of 1981 and seven companies responded with detailed proposals. In December 1981, at the Mallinckrodt Institute, negotiations took place with the three most promising vendors. Shortly thereafter, Digital Equipment Corporation, the second largest computer company in the world, was selected to develop the new radiology information system known as DECRAD.

Designed with a modular architecture, the DECRAD system runs on VAX-11 hardware with standard MUMPS software. The initial version of the system has the ability to register patients; schedule examinations; keep track of x-ray film folders, create, edit, and process radiology diagnostic reports; maintain fee schedules for examinations; and issue management reports on system activities. Subsequent versions of the DECRAD system are expected to provide further radiology management capability.

The Mallinckrodt Institute of Radiology is one of five test sites which have been chosen to evaluate the preliminary versions of the software, and the members of the Diagnostic Radiology Computer Section have been conducting these evaluations. Dr. Jost communicates with Digital Equipment Corporation (DEC) in Boston regularly to provide input to DEC on Mallinckrodt Institute’s experience with the system modules. “Whether the RISC system will ultimately be a success is certainly not yet clear,” said Dr. Jost, “but we are optimistic.” In any case the Consortium represents a promising method for hospitals to work cooperatively with industry to shape the development of a high-quality medical product.
Dr. Evens Discusses NMR in New York Times Article

Excitement is high over the new important level of diagnosis offered by Nuclear Magnetic Resonance (NMR), but according to Mallinckrodt Institute Director, Dr. Ronald G. Evens, in a New York Times interview, “It is too soon to describe or predict the full potential of NMR.” This revolutionary imaging technique, developed as a medical tool by radiologists during the last decade, produces particularly distinct images that provide information unobtainable with any other technique about the chemical environment of the body. NMR scans show both structure and function and have the potential to enable radiologists to distinguish normal from abnormal tissue even when the abnormality does not change the size or shape of the affected organ. Currently in use in three hospitals in the United States and two in England, the device does not employ x-ray, radioactivity, or injected contrast solutions.

Though NMR equipment is large, expensive, and requires a location that is free of extraneous radio waves and magnetic iron, investigators are hopeful about the potential widespread use of the equipment and the new information it will provide about the chemical structure of the body. Focusing on the areas in which NMR is expected to have a particular advantage over other techniques, researchers are already producing more detailed brain studies; making distinctions between benign and malignant breast tumors; detecting abnormalities of the heart muscle and valves; diagnosing heart attacks, strokes, and tiny lesions of the kidneys; examining the spinal column and disks; and evaluating the response of cancerous tumors to therapy. In addition, they are studying examinations performed with techniques associated with risks that might be eliminated with NMR imaging.

Recent research has produced such significant improvements in NMR equipment that even though entrance into the commercial market has been delayed by further investigation, the wait will be justified by a much more practicable product that can be periodically enhanced with only minor hardware updates and software changes. Mallinckrodt Institute plans to begin using NMR in the summer of 1983.

CAT Scanner Earns Its Way — US Visitor

“The expensive CAT body scanner is worth its cost” was the report in the New Zealand Herald on the address by Dr. Ronald G. Evens (Director, MIR) at a radiology conference in Christchurch and Queensland, New Zealand. The conference, sponsored by the Royal Australasian College of Radiology and the University of Connecticut, was attended by more than 150 radiologists from Australia, England, Germany, Iraq, Saudi Arabia, South Africa, Sweden, the United States, and New Zealand.

Dr. Evens served as the keynote speaker and addressed the economic impact of CT scanning on modern medical care. He was selected, at the suggestion of many New Zealand and Australian radiologists, specifically to present data to the government of New Zealand and Mr. A.G. Malcolm, the Minister of Health, who attended the conference and spoke after Dr. Evens.

Dr. Evens reviewed several studies performed at the Mallinckrodt Institute (often with the collaboration of Dr. R. Gilbert Jost, Associate Professor of Radiology) emphasizing that, while CT is initially expensive, it pays for itself by reducing other examinations and improves patient care at the same time.

Dr. Evens and Mr. Malcolm were interviewed on New Zealand television, subsequently televised in Australia.
"This was the right book at the right time from the right people" commented radiologists from around the world as they enthusiastically examined the newly introduced *Computed Body Tomography* at the recently concluded Radiological Society of North America meeting, the world's largest radiology assembly. The textbook was described by many viewers as a "classic" and all 500 copies brought for inspection were sold in the first few days.

Thirty staff members of Mallinckrodt Institute of Radiology, Washington University School of Medicine, authored this first comprehensive computed tomography (CT) text to describe anatomy, scanning techniques, clinical applications, and pathologic findings of all major organ systems of the body. Edited by Drs. Joseph K.T. Lee, Stuart S. Sagel, and Robert J. Stanley, *Computed Body Tomography* is a definitive work that also includes separate chapters outlining the physical principles and instrumentation of CT and assesses the economic impact of this technique on patient care. Using over 1500 illustrations from a fourth-generation three-second scanner, the authors detail the techniques of CT and its practical applications to various disease processes, stressing examination, interpretation, and differential diagnoses. In addition, they compare the efficacy of CT to conventional radiography and present thorough discussions of pediatric applications and important clinical uses such as radiation therapy planning, CT-guided biopsies, and CT-guided abscess drainage.

The computed tomography scanner system was introduced in 1973. Declared a "revolutionary" new radiological technique, this significant scientific contribution led to a Nobel Prize in less than ten years for Godfrey Hounsfield, an inventive scientist for the EMI Corporation of the United Kingdom, who proved that computers and mathematics could be used to reconstruct an image from sets of accurate x-ray measurements through the body from multiple angles.

As early as 1973, the importance of CT was recognized at the Mallinckrodt Institute and, under the guidance of Institute Director Dr. Ronald G. Evens, the first CT head unit was installed in 1974. Mallinckrodt was also the first institution to have two CT scanners.

Computed tomography technology expanded to produce the first useful whole body images in the summer of 1975, when EMI announced a CT unit that provided scans of the chest and abdomen. Mallinckrodt Institute and Mayo Clinic received the first of these units in the United States.

After obtaining the most advanced scanners available, the Mallinckrodt Institute diagnostic radiology staff began conducting extensive clinical evaluations. The further testing of new generation scanners, in conjunction with countless consultations, conferences, and on-going dialogue has resulted in the most up-to-date review on the diagnostic uses of CT.

Since their beginning efforts in 1973, Mallinckrodt Institute staff members have published over two hundred scientific papers documenting their personal witness of computed body tomography's development. Recognizing their obligation to share new medical information with radiologists worldwide, Drs. Evens, Sagel, and Stanley (formerly of MIR) helped to found the Computed Body Tomography Society. Dr. Sagel is the current president.

*Computed Body Tomography*, published by Raven Press of New York, represents the Mallinckrodt Institute's landmark publication and its most up-to-date authoritative coverage of CT applications.
John Harris, M.D., Professor and Chairman, Department of Radiology, University of Texas Health Science Center at Houston and President of the American College of Radiology, presented the City-Wide Radiology Conference November 8, 1982. Dr. Harris's topic, "Radiological Management of the Multiply Traumatized Patient," focused on the organization and activity of the emergency department at Hermann Hospital (where he is chief of emergency radiology) and a discussion of radiological management of injuries to the cervical spine, chest, and pelvis.

The emergency department and Hermann Hospital in general are geared to the rapid, efficient management of severe trauma. Its three "Life Flight" helicopters bring severely traumatized patients from Houston's surrounding counties directly to a heliport at Hermann Hospital. Providing 24-hour-a-day emergency medical transportation, this service accounts for a large percentage of all hospital admissions.

A full-time radiologist or a resident in training actively directs all respects of the radiologic evaluation in the emergency department. The goal of the department and of its radiological contingent is to preserve life and stabilize the extent of trauma. Once physiological functions are stabilized, the patient is immediately transferred into another area of the hospital for more sophisticated diagnostic testing or for more definitive treatment. The radiologic protocol to perform radiological diagnosis simply and expeditiously is generally accomplished with a survey in antero-posterior and lateral projections. Additional films may be added as needed.

Dr. Harris explained his approach to the radiological management of injuries to the cervical spine, chest, and pelvis. For cervical spine injuries, he recommended a complete evaluation of the region including the use of traction for evaluating the lower cervical and upper thoracic vertebra, as well as proper film placement and tube angulation to obtain supine oblique radiographs. Regarding chest trauma, it was his opinion that it is unnecessary to perform arteriography of the aorta and brachiocephalic vessels every time a first or second rib fracture is identified. Rather, he stressed that the soft tissue findings indicating mediastinal hemorrhage as seen on a chest radiograph are the appropriate indicators for aortography. Likewise, soft tissue findings in the abdomen and pelvis are useful for documentation of intra and extra peritoneal hemorrhage.

Finally, he indicated that there are many instances where trauma to several regions occur in predictable combinations. Thus, radiological evidence of trauma to a particular area might suggest other areas that should be evaluated. Examples of these included fractures of the spine associated with other spinal fractures or with fractures of the calcanea.
Eleventh Annual
Wendell G. Scott Lecture

Henry S. Kaplan, M.D., Professor of Radiology and Director of the Cancer Biology Research Laboratory at Stanford University Medical Center, delivered the eleventh annual Wendell G. Scott Lecture in Scarpellino Auditorium at Mallinckrodt Institute of Radiology on October 12. His lecture was entitled, "Radiology’s Contributions in Hodgkin’s Disease."

An internationally renowned authority on cancer, Dr. Kaplan is best known for his pioneering efforts in the use of linear accelerators and radiotherapy techniques in the treatment of Hodgkin’s Disease and other malignant lymphomas. His important discovery that leukemias and lymphomas in mice exposed to x-rays and certain chemicals are induced by a latent virus has led to a search for similar viruses in tissue cultures of human lymphomas.

Dr. Kaplan graduated from Rush Medical College in Chicago and trained at Michael Reese Hospital and the University of Minnesota. He was the Department Chairman and Professor of Radiology at Stanford University from 1948–1972.

The first radiologist to be elected to the National Academy of Sciences, Dr. Kaplan has received numerous honors including the highest awards of the Leukemia Society of North America and the North American Cancer Society, the First Kettering Award from the General Motors Center Research Foundation, the Legion d’Honneur of the Republic of France, and the Order of Merit of the Republic of Italy. He is a Gold Medalist of the American College of Radiology, the Association of University Radiologists, and the American Society of Therapeutic Radiologists.

The Wendell G. Scott Memorial Lecture was established by friends and colleagues of the late Dr. Scott as a living memorial to his excellence and leadership at Washington University and in radiology and medicine.

From left, Henry S. Kaplan, M.D., Mrs. Wendell Scott, and Ronald G. Evens, M.D.
68th Annual RSNA
The Radiologic Society of North America held its 68th Scientific Assembly and Annual Meeting in Chicago, November 28-December 3, 1982. Over 18,000 attended the six-day program, which included sessions in joint sponsorship with the American Association of Physicians in Medicine and offered more than 160 refresher courses, 500 scientific papers, and 200 scientific exhibits representing new research of ultimate benefit to patient diagnosis or treatment.

DIAGNOSTIC IMAGING FILM INTERPRETATION SESSION
Stuart S. Sagel, M.D., panel member.

REFRESHER COURSES
Refresher Course Committee
Stuart S. Sagel, M.D.

Courses
"Evaluation of Renal Structure and Function by Radionuclide Imaging," Barry A. Siegel, M.D., and Daniel R. Biello, M.D.

"Computed Tomography of the Thorax: Anatomy and Pathology of the Mediastinum and Lung," Stuart S. Sagel, M.D.

SCIENTIFIC SESSIONS
Program Committee
Nuclear Medicine, Barry A. Siegel, M.D.

Therapeutic Radiology and Radiobiology, John M. Bedwinek, M.D.

Presiding Officers
Neuroradiology, Diagnosis, Mokhtar H. Gado, M.D.

Therapeutic Radiology, Radiobiology, Carlos A. Perez, M.D.

Nuclear Medicine, Diagnosis, Barry A. Siegel, M.D.

Papers
"CT of the Gastrohepatic Ligament," Matthew A. Mauro, M.D.

"Computed Tomography in the Staging of Esophageal Carcinoma," Mokhtar H. Gado, M.D., Warren Danziger, Ph.D., David Chi, M.S.


"Body Weight in Relation to Parotid Irradiation," D. Venkata Rao, M.D., James E. Marks, M.D.

"Digital Fluoroscopic Conventional Tomography Using a Digital Vascular Imaging System," Michael W. Vannier, M.D., Jean Barbier, Robert L. Butterfield, B.S., R. Gilbert Jost, M.D., Bruce L. McClennan, M.D., Patrick L. Von Behren, Ph.D.

"Irradiation of Adenoid Cystic Salivary Gland Carcinoma," Joseph R. Simpson, M.D., Stanley E. Thawley, M.D.

"Clinical Comparison and Histologic Effects on the Rat Bladder of Cystoconray II, Diluted Cystoconray II, and Hypaque-Cysto 10%," William H. McAlister, M.D., Gary D. Shackleford, M.D., Marilyn J. Siegel, M.D.

"External Irradiation of Carcinoma of the Prostate Localized to the Pelvis," Carlos A. Perez, M.D., Milijenko Pilepich, M.D., Bruce J. Walz, M.D., Frederick R. Zivnuska, M.D.

"Analysis of Complex Musculoskeletal Anatomy Using Three-Dimensional Surface Reconstruction," William G. Totty, M.D., Michael Vannier, M.D.

"Low Dose Intraarterial Digital Vascular Imaging for Evaluation of Renal Transplant Donors," Philip J. Weyman, M.D.

"Pathologic Fracture After Radiation Therapy for Primary Non-Hodgkin’s Malignant Lymphoma of Bone," Steven H. Stokes, M.D., Bruce J. Walz, M.D.

SCIENTIFIC EXHIBITS
Scientific Exhibits Committee
James E. Marks, M.D.

"Practical Considerations in Digital Coronary Angiography," James Patton Neeley III, M.D., Michael W. Vannier, M.D., Fernando R. Gutierrez, M.D., Patrick L. Von Behren, M.D.

"Three Dimensional Surface Reconstruction for Craniofacial Surgery," Michael W. Vannier, M.D., Jeffrey L. Marsh, M.D.

"Monoclonal Antibodies for Imaging," Richard L. Wahl, M.D., Charles W. Parker, M.D., Gordon W. Philpott, M.D.

"The Renal Halo Sign in Pancreatitis," Noah Susman, M.D., Albert M. Hammerman, M.D., Edward Cohen, M.D.

PRESS CONFERENCE:
Dr. Michael W. Vannier addressed a press conference of reporters, television correspondents, and medical writers from the U.S. and Canada. The purpose was to discuss a collaborative project spearheaded by Dr. Vannier and plastic surgeon, Dr. Jeffrey Marsh, to aid craniofacial surgery through advanced CT technology underway at Mallinckrodt Institute of Radiology and at the Computer-Aided Design/Computer-Aided Mechanics (CAD/CAM) facilities of the MCAUTO division of McDonnell-Douglas Corporation in St. Louis.
RSNA
Washington University Medical Center Alumni Reception
Guest Faculty/Visiting Professors

Gilbert H. Nussbaum, Ph.D., presented "Techniques of Clinical Hyperthermia" as guest lecturer at the University of Kansas School of Medicine in Kansas City, Sept. 30.

G. Leland Melson, M.D., presented three lectures as a member of the faculty of the Third Annual St. Louis University Ultrasound Symposium held on Sept. 16-18: "Ultrasonography in Renal Failure," "The Role of Ultrasonography in Abdominal Aortic Aneurysms," and "Ultrasonography in Renal Mass Lesions: Uncommon Presentations of Common Tumors.

Joseph K.T. Lee, M.D., was visiting professor at the Medical College of Wisconsin in Milwaukee, Sept. 24-25, and was guest lecturer at the Mississippi Radiological Society Seminar, Oct. 23-24.

Ralph L. Smathers, M.D., presented "Utility of Computed Tomography of the Head and Body — 1982" as guest lecturer for the Ottumwa Medical Society in Ottumwa, Iowa.

William A. Murphy, M.D., presented "The Temporomandibular Joint," as guest lecturer for the Orthodontic Alumni Association of Washington University School of Dental Medicine, Oct. 15, 1982.

Louis A. Gilula, M.D., presented three lectures, "PA Approach to Wrist," "Ligamentous Instabilities of the Wrist," and "Overview of Musculoskeletal CT," for the Nashville Radiologic Society meeting at Vanderbilt University in October.

Bruce L. McClennan, M.D., served as Visiting Professor at George Washington University in Washington, D.C., Oct. 21-22, and at Columbia-Presbyterian Medical Center, Radiology Department, Dec. 22.


Carlos A. Perez, M.D., spoke on "Radiation Therapy in Prostate and Bladder Cancer" for the Urological Oncology Seminar in Miami, Dec. 10.

Panel Member

Bahman N. Emami, M.D., served as a panel member for the combined meeting of the American College of Chest Physicians and the International Congress on Diseases of the Chest in Toronto, Canada, Oct. 15.

Awards/Honors

Patrick R.M. Thomas, M.D., has been awarded a renewal of the consulting arrangement with the Gastrointestinal Tumor Study Group.

Elected Offices

G. Leland Melson, M.D., has been elected to serve until 1984 on the Barnes Hospital Society Council.

Bruce J. Walz, M.D., has been elected program secretary of the Radiation Oncology Section of the St. Louis Radiological Society.

Appointments

Louis A. Gilula, M.D., has been appointed co-director of the Categorical Course on Musculoskeletal Trauma for the Roentgen Ray Society Meeting in Atlanta, April 18-22, 1983, and to the Program Committee for the International Skeletal Society Meeting in Geneva, Switzerland, in October, 1983.

Patrick R.M. Thomas, M.D., has been reappointed chairman of the Pediatric Oncology Group Radiation Therapy Quality Assurance Subcommittee.

Glenn P. Glasgow, Ph.D., received an appointment to the Radiation Therapy Committee of the Southeastern Cancer Study Group.

New DSA Unit in West Pavilion

Cardiac Cath Lab

MIR has installed a third digital subtraction angiography unit in the West Pavilion. This unit, which is designed for evaluation of the heart and major vessels following a venous injection of iodinated contrast material, will be used clinically for ventricular wall motion studies, shunt determination, and aortic arch studies. Future use includes pulmonary angiography and the determination of coronary by-pass graft patency.

Gridiron '83: Funds for Cancer Research

The 49th Annual Gridiron of the Advertising Federation of St. Louis, Inc., to be held at the Chase-Park Plaza on April 15, 1983, has earmarked this year's proceeds for the completely new Hyperthermia Treatment and Research Center opening this spring on the third floor of Barnard Hospital.

ACR Symposium on Computed Body Tomography

At a Symposium on Computed Body Tomography, sponsored by the American College of Radiology in Chicago, Oct. 1-3, Drs. Stuart S. Sagel and Mokhtar H. Gado presented lectures on computed body tomography. Dr. Sagel spoke on the mediastinum, the neck, the biliary system, and the retroperitoneum; Dr. Gado spoke on the spine.
Symposiums — Meetings — Workshops

Carlos A. Perez, M.D., presented “Current Status of Hyperthermia” for the Inaugural Symposium at Rush Cancer Center in Chicago, Oct. 21 and 22, and spoke on “RT as a Local Primary Management of Breast Carcinoma” for Cancer Update 1982 in Merrillville, Indiana, on Nov. 20.

Mokhtar H. Gado, M.D., made the following presentations: “CAT Scan of the Lumbrosacral Spine” at the Conference on Low Back and Sciatic Pain for the Department of Continuing Medical Education, Washington University School of Medicine, Dec. 4; “High Resolution CT Scanning of the Spine” at the 32nd Annual Meeting of the Congress of Neurological Surgeons in Toronto, Oct. 4-8; and “Lumbar Disc Disease,” “CT Anatomy and Functional Anatomy,” “Lesions Around the Sella,” and “Intracranial Metrizamide CT Studies,” for the Harvard Postgraduate Course in Basic Neuroradiology and Head and Neck Radiology in Boston, Sept. 28–Oct. 2.


Glenn P. Glasgow, Ph.D., and John M. Bedwinek, M.D., presented “Radiotherapy of the Pregnant Breast Cancer Patient.” Dr. Glasgow also presented “Dose Calculations for the HP-41CV Calculator” to the Missouri River Valley Chapter of the American Association of Physicists in Medicine at the University of Iowa in Iowa City, Nov. 7, and “Quality Assurance of Cobalt Teletherapy Machines” for the Symposium on Quality Assurance of Radiotherapy Equipment in Kansas City, June 4-5.

William A. Murphy, M.D., presented “Percutaneous Musculoskeletal Biopsy,” “Temporomandibular Joint Dysfunction,” and “Knee Arthrography” at the University of Minnesota symposium, Radiology/82: Skeletal Radiology, Sept. 17.


Stuart S. Sagel, M.D., presented lectures on computed tomography at the 5th Annual International South African Radiological Society Meeting in Johannesburg, South Africa, Oct. 7-14. The lectures were as follows: “CT of the Bile Ducts,” “CT of the Lung and Pleura,” “Computed Tomography of the Mediastinum: Anatomy, Pathology,” “CT in the Staging of Renal Cell Carcinoma,” “CT of the Larynx,” and “CT in the Evaluation of the Pancreas.”

Ralph L. Smathers, M.D., presented a paper titled “Differential Sonographic Findings with Left Upper Quadrant Masses” at the American Institute of Ultrasound in Medicine 27th Annual Convention in Denver, Oct. 4-8.

Ronald G. Evens, M.D., presented a paper entitled “Economic Aspects of DSA” at the International Workshop on Contrast Media in Digital Radiography held in Berlin, West Germany, Jan. 20-22, 1983.

Todd H. Wasserman, M.D., was elected by the National Cancer Institute to represent the United States for a US/Japanese Cancer Cooperative Agreement meeting in October. One of nine physicians who traveled to Chiba and Kyoto, Japan for the meeting, Dr. Wasserman presented “Clinical Trials of Hypoxic Cell Radiation Sensitizing Agents” and “Clinical Application of Radiation Protecting Agents” for the US/Japan Cooperative Cancer Research Program in Kyoto on Oct. 5. On Oct. 8, Dr. Wasserman presented “Hypoxic Cell Radiosensitizers” to the Division of Radiation Oncology of the Osaka University Medical School in Osaka, Japan.

Louis A. Gilula, M.D., made the following presentations: “Hand and Wrist Trauma” for the International Skeletal Society in San Francisco, Sept. 4, and “Radiographic Approach and Classification of Bone Tumors” for a meeting of the National Association of Orthopaedic Nurses held at the Breckenridge Hotel in St. Louis, Nov. 9.

Louis A. Gilula, M.D., and Judy M. Destouet, M.D., presented “Lumbar Facet Arthrography and Steroid Injection: Follow-up Results” and Dr. Gilula presented “Radiographic Exam of Lumbar Spine” for the Spine Symposium at Barnes Hospital, St. Louis, Dec. 3 and 4.

24th Annual
ASTR

Gilbert H. Nussbaum, Ph.D., and Glenn P. Glasgow, Ph.D., attended the 24th Annual Meeting of the American Society of Therapeutic Radiologists, the largest society of radiation oncologists in the world, was held in Orlando, Florida, October 25-29, 1982. MIR Radiation Oncology staff members representing both the Clinical Oncology Section and the Physics Section shared clinical research data and made presentations as follows:

PRESIDENTIAL ADDRESS
"Carcinoma of the Prostate, A Vexing Biological and Clinical Enigma,"
Carlos A. Perez, M.D.

REFRESHER COURSES
"The Technique of Tumor Excision and Irradiation for Early Breast Cancer,"
John M. Bedwinek, M.D.
"Carcinoma of the Hypopharynx,"
James E. Marks, M.D.
"Introduction to Clinical Hyperthermia,"
Carlos A. Perez, M.D.
"Radiation Therapy Planning,"
James A. Purdy, Ph.D.

PANEL MODERATORS
Introduction to and moderator of panel on "An Update on Transglottic Carcinomas,"
James E. Marks, M.D.
Co-moderator of panel on "Genitourinary Carcinoma,"
Miljenko V. Pilepich, M.D.
Moderator of panel on "Physics,"
James A. Purdy, Ph.D.

PANEL PRESENTATIONS
Scientific Session on "Cancer of the Breast — The Management of Locally Advanced Disease,"
John M. Bedwinek, M.D.
Scientific Session on "Potential Clinical Applications of Hyperthermia,"
Gilbert H. Nussbaum, Ph.D.

SCIENTIFIC PRESENTATIONS
"Concurrent Chemotherapy and Radiotherapy for Non-Metastatic, Stage IV Breast Cancer Study Group,"
John M. Bedwinek, M.D.
"Palliative Radiation Treatment of Cutaneous Mycosis Fungoides — A Dose Response,"
Gregory W. Cotter, M.D.
"Preliminary Factors in Irradiation of Unresectable Non-Oat Cell Carcinoma of the Lung — Observations in Two Randomized Studies by the Radiation Therapy Oncology Group,"
Bahman N. Emami, M.D.
"The Value of CT Scan in Pre-Treatment Evaluation of Bladder Tumors,"
Bahman N. Emami, M.D.
"The Value of Radiation Therapy in Addition to Surgery for Low Grade Astrocytomas of the Adult Cerebrum,"
Delia Garcia, M.D.
"Effects of Dose Fractionation on Mouse Pulmonary Alveolar Macrophage Colony-forming Cells,"
Hsiu-San Lin, M.D., Ph.D.
"Interstitial Hyperthermia with Multiplanar Electrodes,"
Gilbert H. Nussbaum, Ph.D.
"Modalities and Equipment Characteristics," (Hyperthermia)
Gilbert H. Nussbaum, Ph.D.
"Thermal Characteristics of Regional Heating in vivo," (Hyperthermia)
Carlos A. Perez, M.D.
"Treatment Related Morbidity in Phase III RTOG Studies of Extended Field Irradiation in Carcinoma of the Prostate,"
Miljenko V. Pilepich, M.D.
"Lymphomas and Pseudo-lymphomas of the Orbit,"
D. Venkata Rao, M.D.
"Adjuvant Therapy Following Apparently Complete Excision of Adenocarcinoma of Rectum — Results of a Multinstitutional Trial,"
Patrick R.M. Thomas, M.D.
"Phase I Trial of Desmethyl-misonidazole (DMM) — An Hypoxic Cell Sensitizer,"
Todd H. Wasserman, M.D.
"Neuropathy of Desmethyl-misonidazole (DMM): Clinical and Pathological Description,"
Todd H. Wasserman, M.D.
Commemoration of New Facility and Inauguration of Clinac 6 Linear Accelerator

On April 21-22, Dr. Carlos A. Perez and the Division of Radiation Oncology will inaugurate a new clinac 6 linear accelerator and commemorate both the renovation of the ground floor clinical facility and the opening of the new Hyperthermia Research and Treatment Center on the third floor of Barnard Hospital. The scientific program for this observance will include a Cancer Workshop on Thursday, April 21, dealing with recent advances in the management of early breast cancer and lectures on the management of colorectal cancer and gynecological tumors on Friday afternoon, April 22. The Friday evening agenda will include a brief inauguration ceremony by Dr. Ronald G. Evens and Dr. Perez, a scientific presentation and reception, and a tour of the facilities. Invited speakers include Dr. Gilbert Fletcher, M.D. Anderson Hospital and Tumor Institute, Dr. Jean Papillon from Lyon, France, Dr. Leonard Gunderson, Mayo Clinic, and several members of the Washington University faculty. All staff members of Mallinckrodt Institute, Washington University faculty, and alumni are cordially invited to attend.

Oncology Update Seminar

“Oncology Update,” a clinically-oriented seminar sponsored by the Division of Radiation Oncology, Mallinckrodt Institute of Radiology, and the Office of Continuing Medical Education, Washington University School of Medicine, in conjunction with St. Luke’s Hospitals, was held at St. Luke’s West on September 10. MIR staff members who served as faculty and planners for the seminar were Carlos A. Perez, M.D., Director of the Division of Radiation Oncology and Professor of Radiology; Bruce J. Walz, M.D., Associate Professor of Radiology; John M. Bedwinek, M.D., Assistant Professor of Radiology; and Sumner Holtz, M.D., Associate Professor of Clinical Radiology at MIR and Chief of Radiology at St. Luke’s Hospital. The seminar, attended by approximately 150 people, addressed current concepts in the management of patients with malignant lymphomas, carcinoma of the breast, carcinoma of the colon, and gynecological tumors.

Bruce J. Walz, M.D., faculty member and program planner for St. Luke’s West Oncology Seminar.
Dr. Miller and Mr. Sampathkumaran with the members of the Nuclear Medicine Department at Yu-Quan Lu Hospital. The department staff includes four attending physicians, one full-time and several part-time computer scientists, a radiopharmacist, two technologists, and clerical staff.

One of many busy sessions at the computer for Mr. Sampathkumaran, surrounded by a group of computer scientists from nuclear medicine and the Institute of Systems Sciences.

Dr. Liu Yen Tang, Director of Nuclear Medicine (on the right), with three other physicians in the imaging area in nuclear medicine. Behind them is the console for the modern British-made scintillation camera. Similar cameras are now manufactured in China.
Mallinckrodt Institute and the Medical World Community

MIR Staff
Members Visit China

During the summer of 1982, Tom R. Miller, M.D., Ph.D., and K.S. Sampathkumaran, M.S., spent two weeks at the Yu-Quan Lu Hospital in Peking, China, presenting a series of lectures on clinical nuclear medicine and computer applications in nuclear medicine and helping place in operation the nuclear medicine department's new computer. The following account by Dr. Miller describes their experience:

“We found the level of clinical practice in nuclear medicine and radiology in the best hospitals close to western standards. In Peking there are four CT scanners (three body and one head) and four scintillation cameras, some manufactured in China. The Chinese physicians and computer scientists we met were generally well-informed on basic nuclear medicine; however, with radiology so dependent on advanced technology, the best work is being done in those hospitals with modern equipment. Our assistance was needed in helping them select the most important new concepts from the great body of published information. We were able to perform a number of clinical studies on their new computer using programs written by us for our computer, which is identical to theirs.

“In the cities, all working people, which means essentially all adults, are closely identified with their employer, or ‘unit.’ Each unit contracts with a nearby hospital or clinic to provide medical care so that a hospitalized patient generally pays only for his meals. In addition, many units build nearby apartments where the employees can live. Thus, a short bicycle ride frequently enables the worker to eat lunch at home.

“There is an interesting conjunction of traditional Chinese and western medicine. While some medical schools and hospitals practice only Chinese medicine, many western-style hospitals have, in addition to the usual clinical divisions, a Department of Chinese Medicine. The Chinese are now using modern western scientific methods to assess the value of traditional Chinese therapies. For example, the nuclear medicine department at Yu-Quan Lu Hospital is employing scans of the heart to evaluate traditional cardiac medications.

“Part of the fun and excitement of foreign travel is encountering new and unexpected customs. Our first lecture was a well-organized 50-minute presentation by Mr. Sampathkumaran. At the end he said ‘Thank you’ and sat down. Immediately the Director of the hospital rushed to the front of the auditorium saying that in China lectures were always three hours long, and Mr. Sampathkumaran couldn’t stop yet! This length requirement was eased somewhat by the time used in translation. We would say three or four sentences and pause for the translation, while we sipped tea from continuously replenished cups.

“Mrs. Miller joined us for sightseeing, where we sensed China’s great historical heritage extending from the Great Wall to the Forbidden City and Tiantanmen Square. After two weeks in Peking, we spent a week visiting Shanghai and the resort city of Hangzhou, accompanied by a representative from the hospital and an interpreter.

“We established many close friendships with the Chinese with whom we worked. We came home with the strong and clear impression that the Chinese people want friendship with the American people.”

Indian Neuroradiologist at MIR

Dr. Chandrashekkar H. Thakkar, who has returned to his native India to practice neuroradiology at The Bombay Hospital after completing seven years of medical training in London, visited Mallinckrodt Institute in October to study every facet of the operation of computed tomography equipment here. His visit was preparatory to the installation of the first scanner in Bombay’s largest and most established hospital. According to Dr. Thakkar, this installation will set a precedent that will lead to the acquisition of perhaps a dozen more scanners in other hospitals over the next three years.

Grateful for the opportunity to practice medicine with the aid of computed tomography equipment, Dr. Thakkar and other doctors at the Bombay Hospital will work six days a week to help offset the expense of the new scanner. Such an attitude of accommodation is the rule among Indian physicians, who practice in the midst of poverty and overpopulation. Fees, very low relative to those in America, are based on the patient’s ability to pay. Medical care in India is approximately twenty years behind what is generally provided in the United States and is readily available to only a small percentage of the population.

Dr. Chandra Thakkar left Mallinckrodt after two weeks, eager to apply his advanced training and newly-gained knowledge of computed tomography to the medical needs of his people. His favorable impressions of the quality of medical care, the facilities, the research and training programs, and the ‘hard-working’ staff at Mallinckrodt have prompted his plans to return in a few years when his own CT operation can benefit from new observations.
Administrative Executive Speaks on “Impact of Technology on Deliverance of Health Care”

The future problems in health care management arising from rapid technological advances will be financial, ethical, and educational, according to Leonard Lopez, Vice-President for Administration at Memorial Sloan Kettering Cancer Center and the 10th Annual Diaz Lecturer at Mallinckrodt Institute.

Speaking to a capacity audience in Scarpellino Auditorium, November 18, 1982, Mr. Lopez first discussed major issues involved with increased technology. Among these are: a proliferation of personnel and rapid equipment obsolescence in the effort to maintain state-of-the-art technology; an increase in available data from each exam; and expanded training requirements for technologists to include specialization in new technologies as well as a thorough knowledge of old.

Mr. Lopez explained that with proliferation of equipment, a free enterprise market for both the equipment and the performance of procedures has developed that demands cost-effective hospital operations as well as a re-evaluation of the benefits to the patient and physician from the application of new technology.

In his opinion, re-evaluation of the health care market by third party payors, scrutiny in the allocation of scarce resources, and an interest in the economy of multi-disciplinary use of equipment invites questions of control, responsibility, and ethics of patient care that have not existed.

“The patient population has become more aware, more consumer conscious, is living longer and, because of new technology, receiving more services on an outpatient basis,” said Mr. Lopez. And, as the public questions more, it also demands improved technology with wider availability. The administrative question will be not what we are able to do with the new technologies, but how we will best manage them with regard to ethical, educational, and financial responsibility.

Mr. Lopez, registered in both medical technology and nuclear medicine, holds a bachelor’s degree from Washington University and an M.H.A. degree in Health Care Administration from Washington University School of Medicine. He was Director of the Graduate Program in Nuclear Medicine Technology at Mallinckrodt Institute from 1969 through 1974 and has since held administrative positions at Johns Hopkins University, Baltimore, Maryland, and at Stanford University, Stanford, California.

Mr. Lopez has lectured extensively throughout the United States on topics such as nuclear instrumentation, radiopharmaceutical preparation, hospital financing and reimbursement, capital equipment acquisition, hospital computer systems, and marketing strategies. He has served in various offices and committees in numerous professional organizations, including the Society of Nuclear Medicine, American Society of Clinical Pathologists, American College of Hospital Administrators, American Society of Radiologic Technologists, and American Management Associations.

Armand Diaz, R.T., R.N., FASRT, is Technical Administrator at Mallinckrodt Institute of Radiology and Director of Education and Lecturer in Radiologic Technology at Washington University School of Medicine. The Diaz lectureship was established in 1973 in recognition of his contributions to the profession of radiologic technology and leadership in the advancement of education in the field. Educated at the University of Havana, Diaz is an author (published in Spanish, French, Italian, German, and English), lecturer, and innovator in the development of many specialized techniques and new x-ray equipment designs. He is a charter member of the American Hospital Radiology Administrators and a member of the Editorial Board of Applied Radiology. Diaz has been a strong advocate of peer review and continuing education and is often cited for his leadership in the efforts throughout the U.S. to upgrade the status of radiologic technologists.
Mallinckrodt Institute Observes National Radiologic Technology Week

National Radiologic Technology Week, November 7-13, 1982, coincided with the 87th Anniversary of Wilhelm Conrad Roentgen’s discovery of x-ray on November 8, 1895. Since its discovery, x-ray has developed into one of the most essential diagnostic procedures for patient evaluation and treatment.

Mallinckrodt Institute marked this national observance by focusing attention on the vital role of radiologic technologists as part of the health care team with a display of prizewinning technological exhibits demonstrating application of technical skills ranging from general diagnostic procedures to some of the latest advancements in technical practices. The Institute's didactic and clinical training programs in diagnostic radiology, nuclear medicine, and radiation therapy were highlighted in a television news story by Al Wiman, KMOX-TV medical-science reporter.

MIR accepts 20-25 students a year in diagnostic radiology; 7 postgraduate students in radiation oncology; and 6 postgraduate students in nuclear medicine. Many of the students join the technical staff of MIR after graduation. The largest institute of radiology in the country, Mallinckrodt performs an annual 350,000 diagnostic radiographic studies; 58,000 therapy treatments; 11,000 nuclear medicine scans; and 95,000 CT scans utilizing state-of-the-art equipment, all of which provide a broad technical training base for students from throughout the United States and foreign countries.

Pictured from left are Armand Diaz, R.T., R.N., FASRT; Diaz Lecturer, Leonard Lopez, B.S., M.H.A.; Maureen Hulsey, R.T., President of 4th District MSRT; and Michael D. Ward, R.T., B.S., President of MSRT.
Jane E. Woods recently shared in the presentation of the Howard B. Woods Tribute for Minority Entrepreneurs to St. Louis architect, Charles E. Fleming. The award ceremony was held during the St. Louis Metro Sentinel’s 9th Annual “Yes I Can” Dinner at Stouffer’s Riverfront Towers. Honoring her late husband, Howard B. Woods, who as Sentinel publisher initiated the dinners in 1974, the award recognizes minority achievers who inspire young blacks to achieve excellence.

Left to right, Charles E. Fleming, recipient of the Howard B. Woods Tribute for Minority Entrepreneurs, with Donald L. Schnuck, Jane E. Woods, and Bishop Frank Madison Reid, Jr.

### MIR Calendar of Events

**March 14**
- CITY WIDE RADIOLOGY CONFERENCE
  - Scarpellino Auditorium
  - Mallinckrodt Institute
  - 7:15 P.M.

**March 19**
- CRANIOFACIAL SYMPOSIUM
  - Wohl Auditorium
  - Washington University
  - Medical Center

**April 11**
- CITY WIDE RADIOLOGY CONFERENCE
  - St. Louis University
  - 7:15 P.M.

**April 17-22**
- AMERICAN ROENTGEN RAY SOCIETY
  - Atlanta, Georgia

**April 21 and 22**
- DEDICATION OF 6 MEV
  - Hyperthermia Research and Treatment Center
  - Radiation Oncology
  - Mallinckrodt Institute/
  - Barnard Hospital

**May 6-13**
- CURRENT CONCEPTS IN MUSCULOSKELETAL RADIOLOGY
  - Mexico

**May 9**
- CITY WIDE RADIOLOGY CONFERENCE
  - Scarpellino Auditorium
  - Mallinckrodt Institute
  - 7:15 P.M.
Angiographic Generator (custom built for MIR by Picker X-Ray Co.) used to evaluate the cerebral blood flow by rapid sequential filming of the blood vessels in the brain.

State-of-the-art angiographic suite by Siemens Corp. has additional capability of Digital Vascular Imaging (DVI) to rapidly process and display special images of the neuro blood supply in which the "unwanted" shadows of bony skull have been erased by special computer processing techniques.
MIR CHRISTMAS PARTY, 1982
THE FIFTH ANNUAL
CURRENT CONCEPTS IN
MUCULOSKELETAL RADIOLOGY AND ORTHOPEDICS

presented by
THE MUSCULOSKELETAL SECTION
of the
MALLINCKRODT INSTITUTE OF RADIOLOGY
in conjunction with
THE OFFICE OF CONTINUING MEDICAL EDUCATION
WASHINGTON UNIVERSITY SCHOOL OF MEDICINE
in
ACAPULCO/MEXICO CITY
MAY 6 — 13, 1983

The object of this symposium is to review current diagnostic and treatment concepts of various musculoskeletal problems. The course is designed to help bridge the knowledge of radiologists and orthopedic surgeons through illustration of normal and abnormal anatomy, and meets the criteria for 24 hours in Category 1 of the PRA of the AMA.

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