Spring 1978

Focal Spot, Spring 1978

FOCAL SPOT

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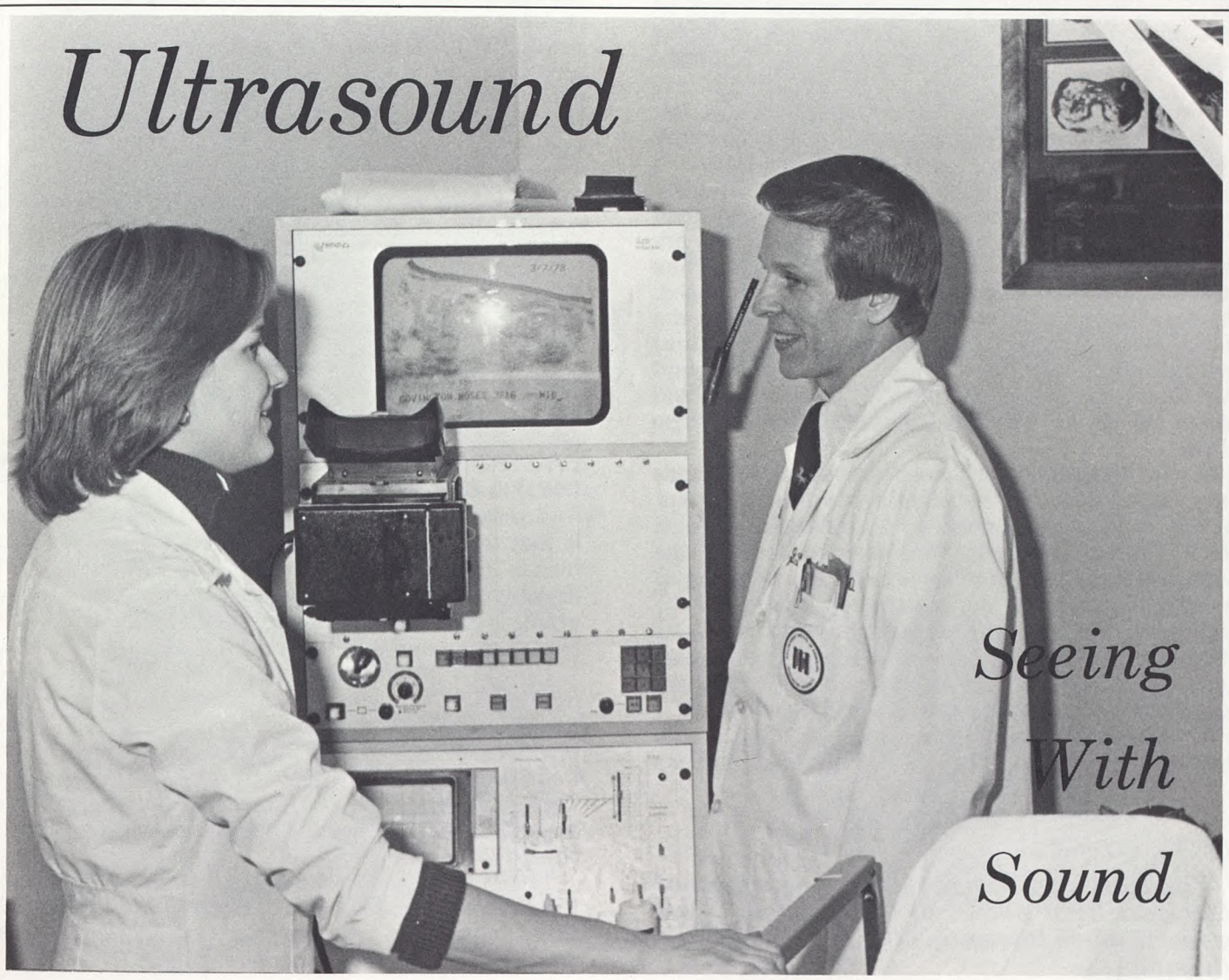


Seeing with Sound at Mallinckrodt

Diagnostic ultrasound is a way of imaging organs within the body without exposing the patient to radiation. Its beginnings were from sonar, the method developed during World War I to enable ships to detect submarines or other objects beneath them. Although the first experimental medical applications of diagnostic ultrasound occurred in the late 1940's, the technique has achieved wide usage only in the past six years.

Literally meaning "beyond sound", ultrasound uses physical wave frequencies above the upper range of human hearing (about 18,000 cycles per second). In most modern units the frequency is between 2.25 and 5 million cycles per second. Several types of ultrasound units have been designed for different purposes. The most widely used type is the "B mode" scanner.

How does it work? The heart of an ultrasound unit is the transducer, which converts electrical energy into mechanical energy, and vice versa. When a piezo-electric crystal in the transducer is electrically stimulated, a very short pulse (less than 1/1,000,000th of a second) of ultrasonic waves are transmitted into the body. As the pulses strike interfaces between structures, echoes are produced. Some of the reflected waves are bounced back to the transducer which converts the mechanical energy into electrical impulses. The typical modern ultrasound unit produces echoes about 0.1% of the time, and spends 99.9% of the time "listening" for returning echoes.

As the transducer is moved across the patient's body, sensing devices constantly monitor the transducer's position. By knowing how fast sound travels within the body and the time elapsed between the production of ultrasound waves and the receiving of the returning echoes, the electronic circuitry of the machine determines the depth at which the echo originates. Combining these two factors, the scanner literally "paints" a cross-sectional picture or "B-mode sonogram" of the portion of the body examined.

The earliest B-mode scanners differentiated only whether the returning echoes were above or below a given strength, producing a black and white or "bistable" image which consisted primarily of outlines of structures but contained relatively little information regarding the internal texture of most organs. About three years ago a major advance occurred with the development of "gray scale" imaging. In this modality the relative strengths of the returning echoes are depicted by several shades of gray, providing much more information about the internal structure of tissues.

In April, 1973 Mallinckrodt Institute acquired its first ultrasound equipment, a bistable unit, which was initially shared with cardiologists in a laboratory on the eighth floor of the Institute. The equipment was updated to gray-scale capabilities in May, 1975. In April, 1976, the laboratory was relocated in the new west wing of the third floor and a more advanced gray scale unit installed in June, 1977. The ultrasound case load grew steadily from the inception of the service to 102 cases in October, 1975.

With growing enthusiasm for CT, many problems which would have been evaluated by ultrasound in other centers were studied by CT and the caseload fell to 50-80 a month. Now in the midst of a veritable ultrasonic boom the volume of studies has progressively increased since April, 1977 to a record 138 patients a month in January, 1978.

Dr. G. Leland Melson, Chief of Diagnostic Ultrasound said, "Even for ailments of the abdomen where CT scanning is predominant, ultrasound has some advantages". One of these advantages is money. A CAT scanner costs $500,000-$700,000 compared to $50,000-$70,000 for an ultrasound unit."

Another advantage of ultrasound over CT scanning is that it is possible to examine the patient in several planes. Dr. Melson explained, "You can position the patient and move the transducer so as to produce oblique, sagittal, or coronal sections, as well as the transverse section, to which CT is currently limited."

Ultrasound is completely "non-invasive". It does not require the use of iodinated contrast agents, which carry a small but definite risk of severe reactions. In the pulse-echo mode used for diagnosis there are no known adverse bio-effects of ultrasound. Thus, it can be used in pregnant women, children, and adults of child bearing age without fear of genetic consequences.

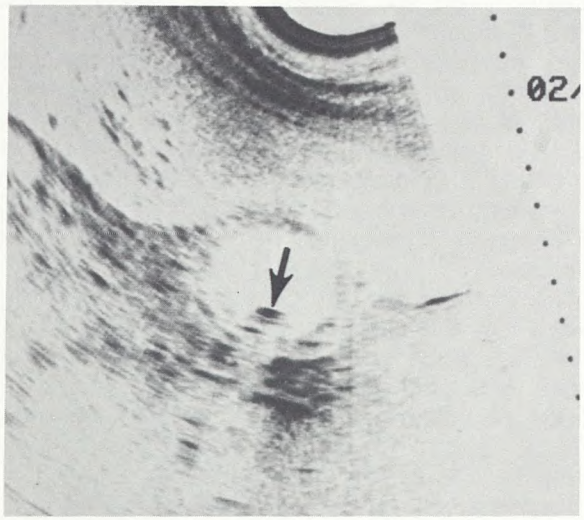
In patients who are unable to suspend respiration for the length of time necessary to complete a CT scan, or in those who are very thin, ultrasound may provide more satisfactory studies than CT.

ON THE COVER

A patient has his abdomen scanned by ultrasound technologist Carol Wilcox. At right is Dr. G. Leland Melson, Chief of Diagnostic Ultrasound at Mallinckrodt Institute.

A relative disadvantage of ultrasound is that it is highly "operator dependent", that is, dependent on the technical skills of the person performing the scan to produce high quality diagnostic images. The transducer must be moved in an optimum fashion, several machine settings optimized and the patient properly positioned to minimize artefacts and provide maximal scan information. Interpretation of scans also requires considerable experience.

The applications of diagnostic ultrasound are wide and varied. In this medical center, three major areas, echocarciography, opthalmology and obstetrics, are carried out in other departments. Those studies conducted at MIR deal most frequently with the abdomen and thyroid gland. Occassionally other parts of the body are examined.

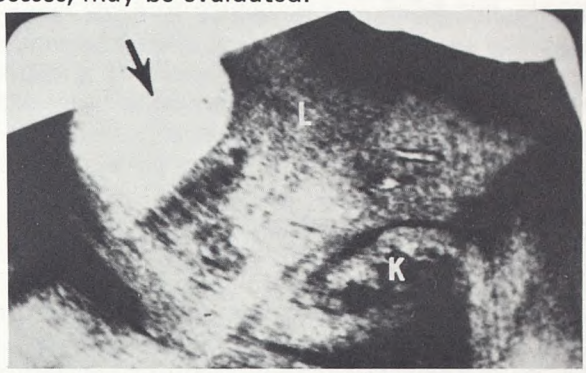


Gallbladder sonogram demonstrating a gallstone (arrow) and thickening of the wall giving a "halo" appearance in a patient with acute cholecystitis.

Among the most frequent indications for an ultrasound exam at MIR are examining the gallbladder to diagnose gallstones when the gallbladder has failed to visualize on oral cholecystography, when the patient is admitted with abdominal pain suggestive of acute cholecystitis or with jaundice. In the past 4-5 years, ultrasound has almost totally replaced arteriography as the primary modality for diagnosing and characterizing abdominal aortic aneurysms.

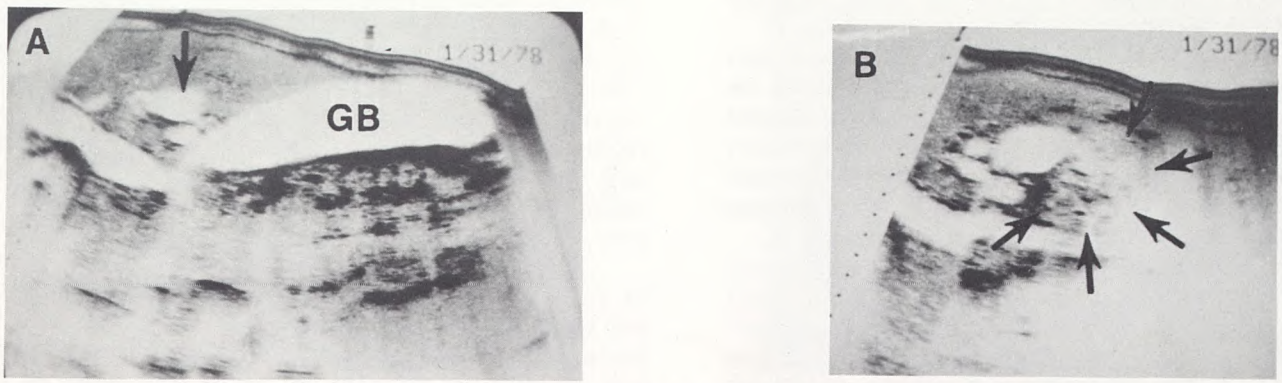
Ultrasonography can determine whether a thyroid nodule which is "cold" on a radionuclide scan is a solid tumor or a cyst. If the nodule is cystic, surgery may be avoided.

In the pancreas, ultrasound can define if the gland is normal in size and shape or enlarged due to pancreatitis or a tumor. The development of complications of pancreatitis, such as pseudocysts and abscesses, may be evaluated.



Longitudinal scan through the liver (L) and right kidney (K) showing a large hepatic abscess (arrow).

Ultrasound studies of the liver can characterize space occupying lesions demonstrated by radionuclide scans as being primary or secondary neoplasms, abcesses or cysts. Jaundice may be differen-



Longitudinal sonogram (A) showing a markedly dilated gallbladder (GB) and a dilated bile duct (arrow). An oblique scan (B) shows the cause of the obstruction to be a large solid mass in the head of the pancreas (arrows).

Continued

tiated into obstructive or non-obstructive causes and the cause of obstruction frequently defined.

"We can define renal size and exclude obstruction in patients with renal failure," said Dr. Melson. "Masses in the kidneys can be differentiated into cystic or solid, and abscesses in or around the kidneys demonstrated. Renal transplants are evaluated to define kidney size, to exclude obstruction, and to show lymphoceles or other abnormal fluid collections. Retroperitoneal tumors, abscesses, or enlarged lymph nodes can also be shown."

In many respects ultrasound and computed body tomography are competitive modalities. Studies done at various centers around the country suggest that the diagnostic accuracy of the two modalities in evaluating many problems are essentially the same. "Various factors such as the rapidly developing technology of both CT and ultrasound, the fact that few centers have equally developed expertise in both areas, and that in few studies have both modalities been applied to the same patient population in a prospective fashion, make gathering of accurate comparative statistics very difficult," emphasized Dr. Melson.

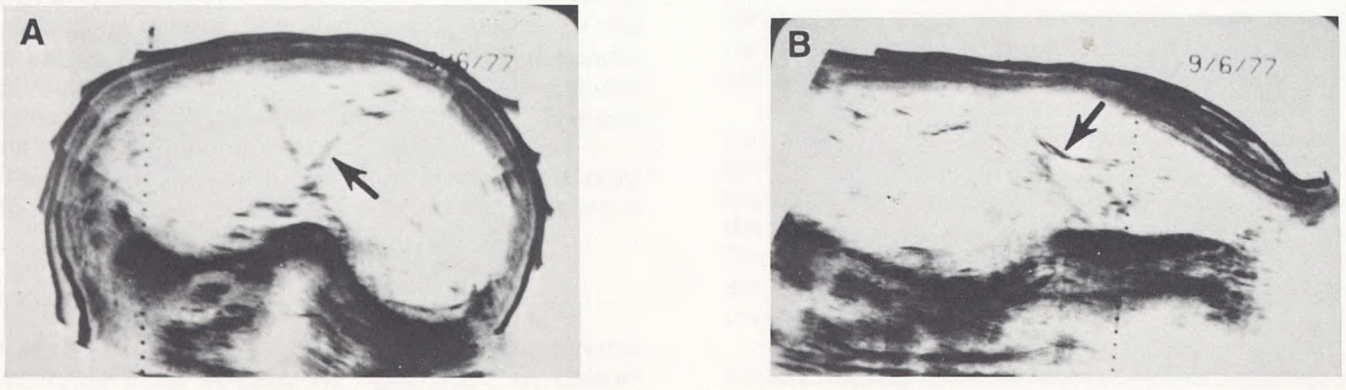
However, each method is based upon characterizing different properties of tissues – CT on the attenuation of X-rays and ultrasound on the accoustic impedance – and thus one might expect that the two modalities would frequently be complementary. For instance, at MIR ultrasound has clearly demonstrated fine septations within a huge abdominal cystic mass which are virtually pathognomonic of certain types of ovarian tumors, while CT was unable to show this characteristic feature becasue the soft tissue and fluid components were so similar in X-ray attenuation.

"Ultrasound has a definite future at Mallinckrodt Institute" . . . "We are optimistic about the advantages of using CT and ultrasound as a complementary set of methods."

G. Leland Melson, M.D.

Also, occasionally ultrasound will be able to clearly distinguish an abscess or a neoplasm when the CT number is compatable with other possibilities.

"Ultrasound has a definite future at Mallinckrodt Institute," said Dr. Melson." We have purchased a second B-scanner having digital scan conversion which utilizes computers and promises to reduce operator dependence and provide greater reproducibility of studies. We are also developing a training program for dedicated ultrasound technologists". The Institute now offers a preceptorship in abdominal ultrasound to practicing radiologists through its Visiting Fellowship program. Featuring the latest state of the art techniques in this imaging modality, the course involves 8 hours per day Category 1 credit. "We look forward to the development of units to perform studies of 'small parts' such as thyroid or carotid arteries, real time scanners, and units allowing simultaneous visualization of blood vessels and measurement of blood flow," Dr. Melson said. "We are optimistic about the advantages of using CT and ultrasound as a complementary set of methods."



Transverse (A) and longitudinal (B) sonograms in a young patient with a huge ovarian mucinous cystadenoma showing septations (arrows) within the cystic mass.

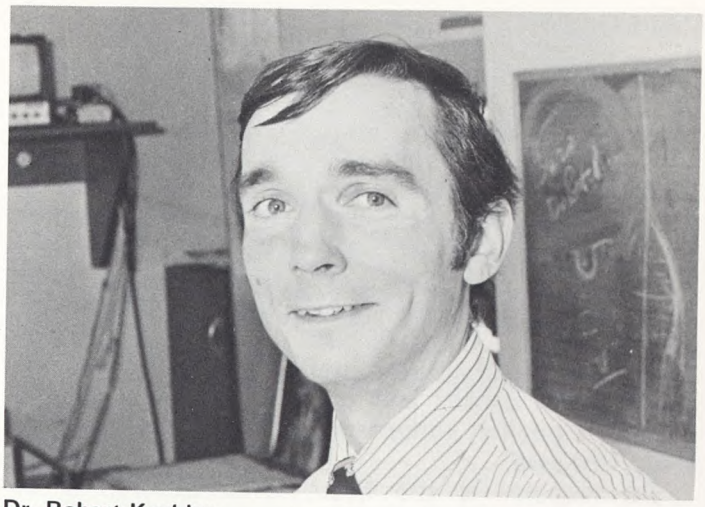
Mallinckrodt's Fifth Picker Scholar

Dr. Robert Koehler, Assistant Professor of Radiology in the Section of Abdominal Radiology, has been selected as a 1978 Scholar by the James Picker Foundation, an award representing a major achievement in his radiological career. The James Picker Foundation was established in 1947 when Mr. Picker set aside a large endowment to fund young academic radiologists with unusual potential at an early stage in their career to help provide for their research and other academic activities. The Foundation will set aside $40,000 to be used by Washington University Medical School over a four year period to provide enhanced opportunities for Dr. Koehler in research, teaching, and advancement as a member of the faculty. This gives the Scholar a chance to establish a track record of productivity so that at the end of the four years he is in a position to compete for funding money on the basis of his past accomplishments.

Dr. Koehler, who did not enter radiology until he was 30 years old, did his residency in diagnostic radiology at the University of California, San Francisco. One person who greatly influenced him in his decision to enter the field was Dr. Ronald Evens. In 1969-70, while a resident in internal medicine at Washington University, Dr. Koehler was among a group of residents who met weekly in radiology conferences with Dr. Evens, then Chief Resident in Radiology at Mallinckrodt Institute. "We brought our films and queries to him," said Dr. Koehler, "and he would tackle any problem we presented with enthusiasm and competence."

Another person Dr. Koehler found very influential in his choice of radiology as a career was Dr. John Armstrong who was a fellow on the chest radiology service at Mallinckrodt. "John was critical and dedicated in his approach to his work," recalls Dr. Koehler, "but most of all, he was excited and enthusiastic about what he did. I found his enthusiasm infectious and began to think more and more about entering radiology myself. You might say that Dr. Evens and Dr. Armstrong provided role models for me and showed me that radiology plays a very crucial role in providing patient care."

Although pre-programmed to fulfill two years of military service as a Medical Epidemiologist at the Center for Disease Control in Atlanta, Dr. Koehler had by now firmed up his interest in radiology and had made the decision to enter the field upon completion of his military service.



Dr. Robert Koehler

"One of my reasons for going to the University of California for radiology training was that I like doing things in medical centers in different areas of the country." Dr. Koehler graduated from Johns Hopkins University, Baltimore, in 1964, and in 1968 received his medical degree from Cornell University, New York. He served his medical internship and one-year residency training in the midwest at Washington University.

It was a serendipitous encounter that led Dr. Koehler back to Washington University and the Mallinckrodt Institute. While sitting next to Dr. Leland Melson at an RSNA lecture in 1975, in the course of their conversation, Dr. Melson asked Dr. Koehler what he planned to do the following summer. He answered that he was interested in finding an academic position in radiology, specifically in gastrointestinal radiology. "We might just have such an opening at Mallinckrodt," said Dr. Melson. In September, 1976, Dr. Koehler joined the Institute staff.

"I consider one of the primary goals of academic radiologists," emphasized Dr. Koehler, "is to create an environment that will influence some of our residents not only to become good radiologists but to realize the fun and excitement of working in a teaching institution and keeping up-to-date in a subspeciality of radiology.

Dr. Koehler has received other honors. While attending Cornell Medical School, he received the Good Physician Award and the Award for Academic Achievement. He is a member of Alpha Omega Alpha and was awarded an honorary scholarship for scholastic achievement at John Hopkins University, 1961-64.

As a Picker Scholar, Dr. Koehler plans to develop contrast agents for use in CT scanning. Computed

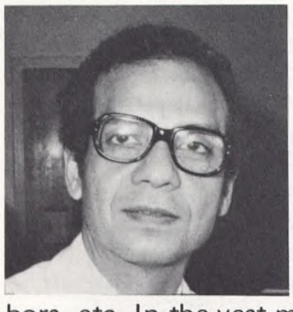
continued

tomography is highly sensitive to differences in tissue density and has created a role for new contrast agents. Much more information could be gained from CT scanners if organ-specific contrast agents were available such as are currently used in radiology of the gallbladder and kidneys. Other research areas on which he intends to concentrate in the next four years are studies to find the best ways of doing air-contrast examinations of the esophagus, stomach, and the colon. "These should enable us to visualize finer details and more abnormalities leading to the detection of cancer and other disorders in the GI tract at a smaller, earlier and hopefully, more curable stage," he said.

Dr. Koehler is the fifth Picker Scholar to be selected from Mallinckrodt Institute. The distinguished group includes; Dr. James Potchen, 1966; Dr. Ronald Evens, 1970; Dr. Gilbert Jost, 1975; Dr. Robert Levitt, 1977; and Dr. Robert Koehler, 1978. The number of persons reflects an environment at the Institute which has attracted people interested in teaching and research and in which, in the eyes of the Picker Foundation, the staff will have the time, facilities and other support needed to be productive academically.

AGING OR ATROPHY?

By Mokhtar Gado, M.D.



It is estimated that 5-10% of individuals past the age of 65 are afflicted with deterioration of mental function. The deterioration may be slight in degree or may be severe enough to require institutional care or total dependence on other individuals such as family members, friends, neighbors, etc. In the vast majority of these cases, there are morphologic changes in the brain that can be detected at autopsy. Their brains appear smaller in size, shrunken, with enlargement of the cerebral ventricles and sulci. This large section of patients suffering from senile dementia are classified as cerebral atrophy. A smaller group however, exists in whom there are no such degenerative changes. In some of these, there are correctable endocrine and biochemical disturbances. In others, there is potentially correctable hydrocephalus.

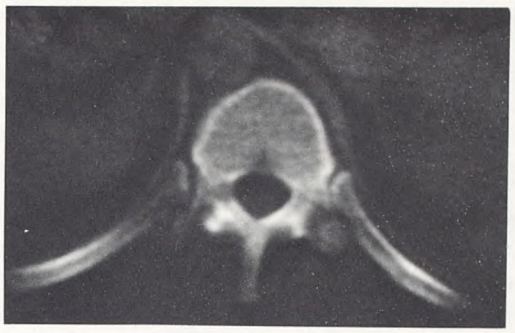
In the past, the only method for visualizing the ventricles of the brain and their cerebral sulci to make the diagnosis of cerebral atrophy, was by an invasive procedure entailing a lumbar puncture, removal of cerebrospinal fluid and injection of air. The invasiveness of the test limited its use to patients who had severe signs of neuropsychologic deterioration. The task of the radiologist in interpreting the radiographs was, therefore, relatively easy. The radiologist did not have to be concerned about the fact that there was a large number of individuals over the age of 65 who had perfect preservation of their neuropsychological functions and who yet, had structural morphological changes of the brain indistinguishable from the ones he was viewing. In most instances, the radiologist did not have to make a distinction between "aging" and "disease." In view of the fact that the mentally normal but aging patient was screened away by the invasiveness of the radiologic procedure of air injection, the radiologist was actually not put to the difficult test.

The moment came when computerized tomography was introduced as a noninvasive method of imaging the brain, the cerebral ventricles, and the cerebral sulci. The radiologist who has been conditioned in the past to associate shrinking of the brain with severe dementia was put to the test. The unwary failed the test! There are very few of us, if candid enough, who claim that this error was not common in the early days of the practice of CT. The term "atrophy" was misused in numerous occasions.

We moved fast to define the problem and alert our fellow radiologists. A prospective study was organized by Dr. Charles Hughes, neurologist, and myself in which individuals coming to have a brain CT for any complaint were subjected to a test for quantitating their performance. Accurate measurements of the ventricles and cerebral sulci on the CT image were made. The early results of this study indicated that the preserved individuals after the age of 65 showed signs of brain shrinking as a result of the aging process. The changes were indistinguishable, most of the time, from those due to atrophy as a result of degenerative disease. We took the opportunity of the International Symposium on Computerized Tomography in Miami in March 1978, to put these results in front of our fellow radiologists and to warn them against equating these morphologic changes that could be due to aging with the phenomenon of brain degeneration and its neuropsychological connotations. We suggested the use of the term "involution" of the brain.

Dr. Thomas P. Naidich, who joined the MIR staff in July, 1977, recently participated in the fourth Annual Symposium of the Barrow Neurological Institute, Phoenix, Arizona, where he presented the Mallinckrodt Institute experience with "CT Evaluation of Head Trauma," "Evaluation of Spinal Trauma by Plain Radiographs," and "Myelography, CT and Spinal Cord Angiography."

With Mr. Joseph Di Croce, RT, Dr. Naidich has formed a Spinal Trauma Team consisting of Ms. Janelle Sabo, RT; Ms. Rebecca Smith, RT; Mr. Joseph Di Croce and himself. During the last six months, the work of the team has clearly demonstrated that CT is



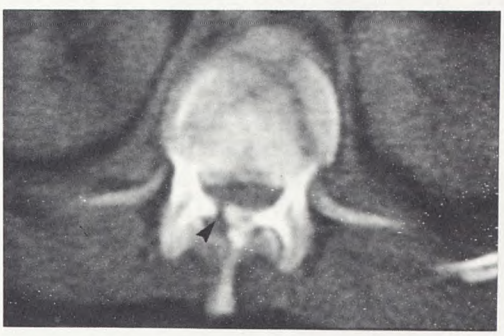
Normal vertebral body and spinal canal.

Spinal Trauma Team's Work With CT

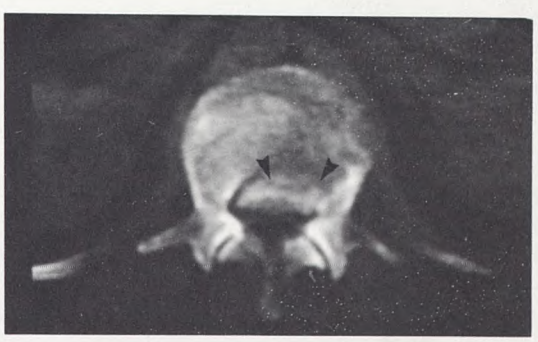
an effective way to demonstrate spinal fractures and compression of the spinal canal by either fracture fragments or foreign bodies, (see pictures).

Prior to CT, the axial section of the spinal canal could be imaged only by the Toshiba transaxial tomograph. "This machine is ineffective, because it has very poor resolution of bone detail," said Dr. Naidich. "Spinal CT achieves far higher resolution of bone detail and can be performed easily at every institution with an ordinary body scanner. Patients with spinal trauma are transferred carefully from bed to scanning couch by a lifting team, placed comfortably in supine position, and studied easily without need to manipulate them further. Patients in traction with Crutchfield tongs can be moved safely and scanned effectively, if the rope from the tongs is passed through the aperture in the scanner and reattached to weights suspended from the table edge," said Dr. Naidich.

With current computer techniques the serial images obtained in the axial plane can be stacked like coins and viewed from the front or side as coronal or sagittal reconstructions to provide a three dimensional view of the spine. With recent advances in computer tomography and gantry design, the spinal cord itself can be visualized without need for any contrast agent. Using this computer technology, the Spinal Trauma Team hopes to demonstrate the effect of herniated discs, bone spurs and tumors on the spinal cord without need for myelography.



Comminuted fracture of the vertebral body with narrowing of the canal and fracture of the lamina (▲).



Comminuted fracture of the vertebral body with marked narrowing of the spinal canal by a posteriorly displaced fracture fragment (▲▲).

MIR Computerized Reporting System

For three years, the Diagnostic Computer Division, under the direction of R. Gilbert Jost, M.D., and Rex L. Hill, M.S., has operated a computerized patient information facility which manages many aspects of patient data in the Mallinckrodt Institute of Radiology. The system was designed in a modular fashion with the file-management system as the foundation for the rest of the components of the system. "We feel that the modular approach has provided us with a method for building a flexible system that grows easily," said Dr. Jost, "and once a proper foundation has been established, software modules can be readily designed for the specific needs of the Institute."

Since early February, 1978, a new application program and separate module, the reporting system, has been in operation. Nine stations operated seven days a week by medical transcriptionists on the second and eighth floors are producing 2,000 reports weekly. Each cluster of stations has its own printer. With the addition of Queeny Tower and fifth floor, the system will become all inclusive.

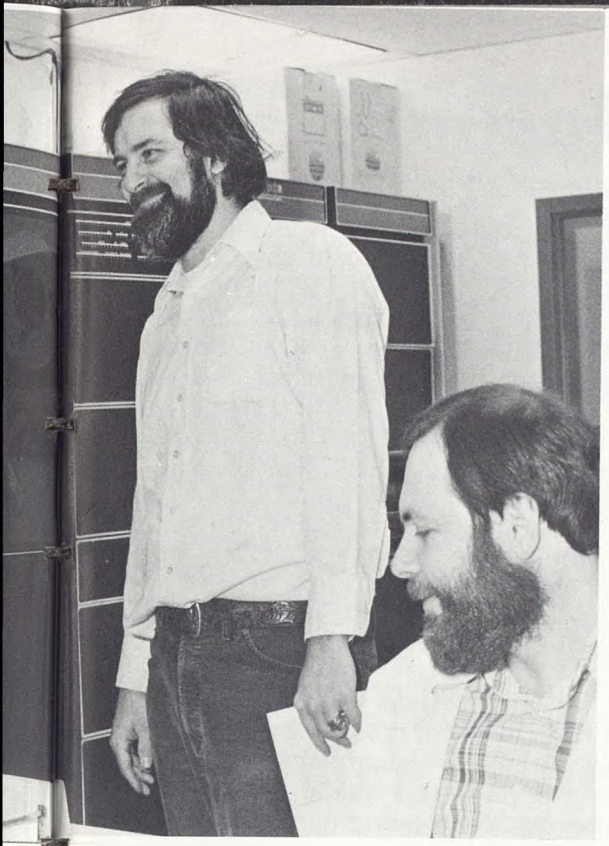
There are advantages of the computerized reporting system. It reduces the amount of typing per report, for the information contained in the heading of the report can be automatically retrieved from a file in the computer; this also provides more accurate and consistent patient information. The system allows the radiologist the latitude of talking into a dictaphone yet offers convenient editing features for the transcriptionist. Reports are now stored on a computer file in the Diagnostic Computer Division for a period of one month. They can easily be recalled for making addendums, editing, or reprinting. In addition, the system provides a mechanism to make sure a report is prepared for every examination. If a report already exists, the transcriptionist is informed so that the report is not duplicated.

Dr. Gilbert Jost, left, and Rex Hill, discuss the transition to the new reporting system with Jack Trachtman, seated right, in the Diagnostic Computer Division.

"I like everything about this new reporting system," said transcriptionist Lucille Linebach. "It's faster than our old method and we can type many more reports each day," said Gina Raciti. Sue Ratliff pointed out the helpful feature of being able to watch the screen continuously. "You can correct errors immediately," she added. "It's great not to have to erase and use carbons," said Sheila Doerhoff. "It allows us to type with more speed without being afraid of making errors."

Both Jost and Hill agreed they are pleased with the smooth transition which has been made to the new reporting system.

"It has taken us over a year to develop the system," said Jack Trachtman, systems analyst and the chief programmer for the project. "With each new application area, the computer system becomes a more integral, visible part of the Institute, providing additional management control." Now in the evaluation stages, the system will be under development another six months before all the features are working at the levels anticipated.



The Diagnostic Computer Division is in operation from 6 A.M. until 11:00 P.M. seven days a week. The system has been carefully designed to protect the integrity of patient data. During the first three years of operation, over 350,000 examinations have been processed without the loss of any critical patient data.

"As more people in the Institute rely on the computers for information," said Hill, "it becomes even more critical to keep them in operation." The Computer Division now has three operating computer systems to support the various operations in the department.

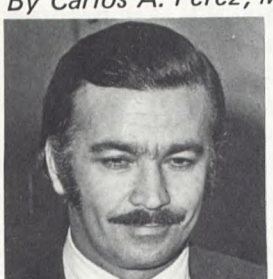
Both Jost and Hill emphasized that they have definite future goals for the reporting system. "We expect to establish remote inquiry terminals in doctors' viewing areas which will enable a physician to conveniently determine if an exam was done," Jost said. "It will be possible in the future to provide for the distribution of a report to a remote location such as one of the hospital floors of the Medical Center."

"Our ultimate goal is to be able to store reports so that they are available for a three month period," said Hill, "and eventually by establishing terminals in central areas, we will enable a physician to obtain in one area all the X-rays reports on the patients he has seen for that day."

Medical transcriptionists at their reporting stations on eighth floor.

Advances In Radiation Oncology

By Carlos A. Perez, M.D.



The medical use of ionizing radiation began at the turn of the 19th century, when Roentgen discovered X-rays and Becquerel and the Curies discovered radium. Throughout the years, a greater understanding of the physical characteristics of ionizing radiations and some of the biological principles underlining their effects as well as numerous clinical applications have been contributed by many investigators.

The ultimate goal of radiation therapy is to yield the highest possible uncomplicated local and regional tumor control with an acceptable quality of life of the patients. The development of megavoltage external therapy equipment, such as betatrons and linear accelerators, cobalt 60 irradiators and recently high energy particle machines have greatly improved the capability of the Radiation Therapist to deliver doses that more effectively eradicate the tumor. Increasing sophistication in treatment planning has allowed the delivery of higher doses to the tumor with less injury to the surrounding normal tissues. Dosimetry and treatment techniques, computerized treatment planning and recently the addition of computed tomography have added to dose optimization with improvement of therapeutic results.

There have been a variety of malignant tumors that are successfully treated with radiation therapy alone or combined with surgery or chemotherapy. There is strong evidence that suggests that irradiation may improve cure rates in patients with low grade gliomas of the central nervous system. A variety of epidermoid carcinomas of the upper respiratory and digestive tracts, such as oral cavity, oropharynx, nasopharynx and larynx are effectively treated with radiation therapy alone. The five year survival rates for early tumors (Stage I) is over 80% and for Stage II 65-70%. In some institutions the combination of either pre or postoperative irradiation and surgery have been shown to be equally adequate in the treatment of these patients. Although highly controversial, it appears that selected patients with carcinoma of the breast treated by a radical or modified radical mastectomy could improve with the adjuvant administration of pre or postoperative radiation. More exciting is the alternative of doing limited resections of the primary carcinoma of the breast combined with irradiation, which allows for preservation of this organ, the loss of which is a major phychological trauma to many patients. Many reports indicate that the five year cure rate for patients with Stage I carcinoma of the breast treated with the conservative approach is 75-80% which is comparable to the best radical mastectomy results. In patients with advanced inoperable lesions the combination of irradiation and chemotherapy is yielding satisfactory results, although it is still early to judge whether long term tumor control and survival can be appreciably improved.

Carcinoma of the prostate which is the second most frequent malignancy in man is treated by radical surgery in only 10-15% of the patients. The rest have been managed with hormonal therapy. In the past 10 years there have been increasing numbers of reports which demonstrate the efficacy of irradiation in eradicating tumor in the prostate and the regional lymph nodes and yielding survival rates in the range of 75% for tumor localized to the prostate (Stage B) or about 50% for those with extracapsular extension (Stage C). As important is the fact that hormonal therapy is not necessary and results are not improved by the combination of this modality with irradiation.

Perennially irradiation has been the most popular treatment for patients with carcinoma of the uterine cervix, with five year survival rates of about 90% for Stage I, 75% for Stage IIA, 65% for Stage IIB and about 45% for Stage III. Preoperative irradiation has been frequently used in the treatment of carcinoma of the endometrium, with enhanced survival in patients with unfavorable lesions.

In the recent past the treatment of some bone tumors and soft tissue sarcomas have been markedly modified with the combination of radiation therapy, limited excision of the primary tumor and multidrug chemotherapy, which has resulted in higher survival rates and preservation of anatomy and function in many patients.

One of the areas in which irradiation has made a major impact, when combined with surgery and chemotherapy, has been in pediatric tumors. Children with Wilms' tumor, neuroblastoma exhibit long term survival without tumor recurrence.

Treating Cancer With HYPERTHERMIA

Another field in which curative radiotherapy has made a major contribution has been in Hodgkin's disease, a malignant process of the lymph nodes which affects most frequently young adults. The five year survival rate of patients with Hodgkin's disease Stage I is 90%, Stage II 80% and Stage IIIA about 70%. In more advanced stages or in patients with unfavorable histological type tumors the combination of irradiation and chemotherapy is a highly efficacious method of treatment.

When one compares the cure rates of many of these patients 20 years ago with present cure rates in many anatomical sites, one can assess an appreciable increased curability, which is largely due to improvements in radiation therapy techniques as well as in the judicious use of multimodality therapy. Radiation Oncology Centers throughout the United States and Europe are engaged in many clinical trials in collaboration with other oncological disciplines in an effort to continue to improve the cure of cancer with the least damage to the normal structures and the anatomical and functional integrity of the patient.

Cancer therapy by hyperthermia involves the heating of malignant tissues to temperatures ranging from 42° to 45°C (107.6° to 113°F) which will kill tumor cells while causing no appreciable damage to normal tissue. Both types of cells, normal and tumor, are most heat sensitive in the proliferating phase of the cell cycle and since malignant tumors are marked by uncontrolled proliferation, they are more susceptible to the effects of hyperthermia. Another characteristic which makes cancer cells more susceptible to the effects of hyperthermia is their inherently poor blood circulation which results in inadequate tissue nutrition and resulting hypoxia. Poor circulation also helps in keeping the tumor core at higher temperatures. Above 45°C both normal and tumor cells are killed indiscriminately. Hyperthermia is a service of Dr. Carlos Perez (Director of the Division and Chief of the Clinical Section) and is coordinated by Dr. Walter Kopecky (Physics Section of Radiation Oncology). Additionally, Dr. Cary Presant (Medical Oncology) of Jewish Hospital is an active participant in the program.

The modality used at Mallinckrodt Institute for administering hyperthermia to the treatment site is microwave. "Presently we are using microwave devices at several frequencies in a clinical environment," said Dr. Kopecky. "The low radiofrequency hyperthermia appears to have advantages when used with intracavitary or interstitial radiation sources. The ultrasound device is presently being used in preclinical investigations to determine the effect of moderate levels of ultrasound combined with elevated temperatures in various biological systems."

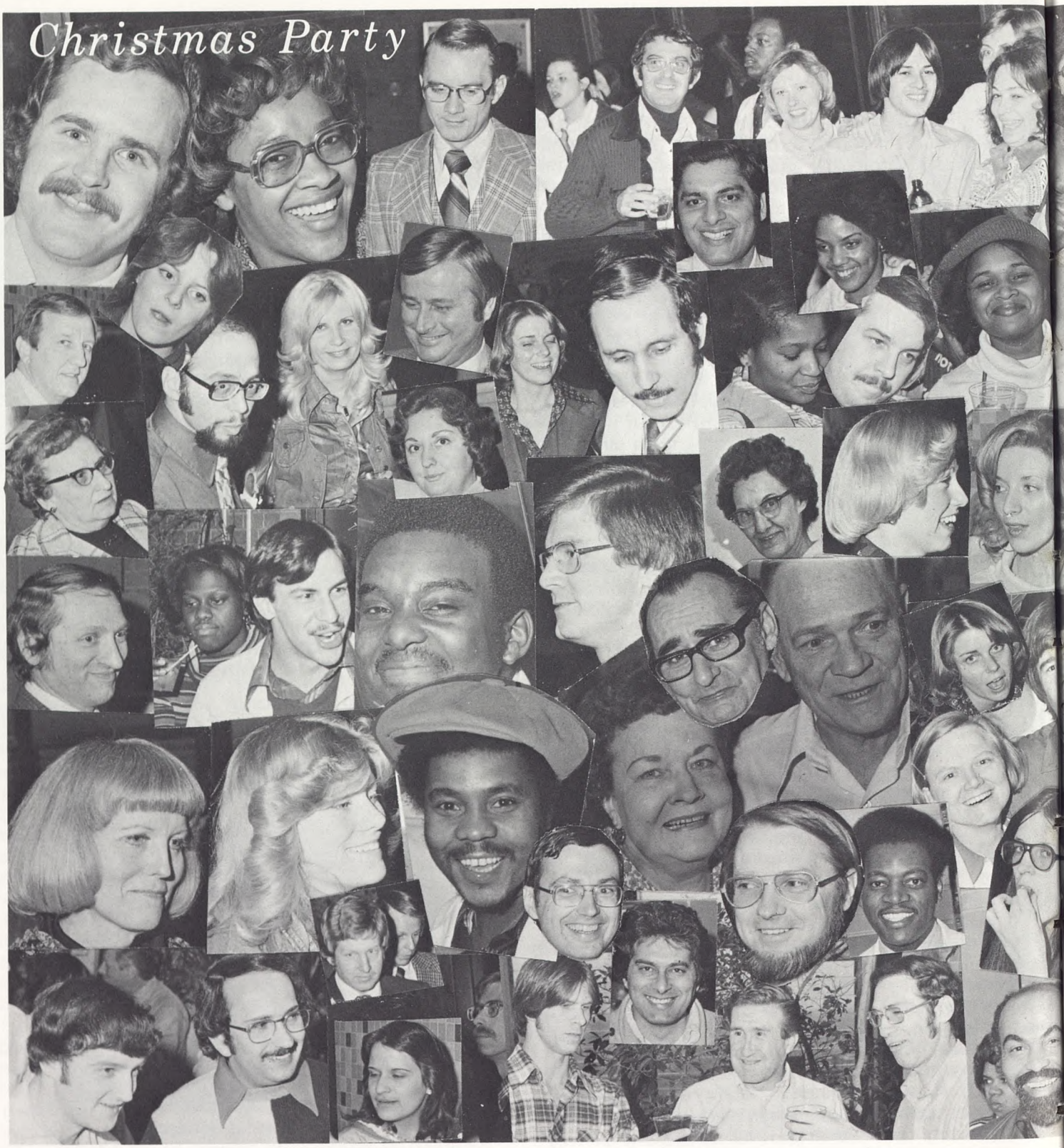
The effects of combining hyperthermia with other established cancer treatment methods are also being examined. Recent studies indicate that radiation therapy is 40 to 60% more effective when combined with hyperthermia. The sequence of radiation and hyperthermia is very important. "Hyperthermia administered during radiation therapy appears to be the most effective combination," said Dr. Kopecky, "however the technical problems of combining an applicator and X-ray collimator system are hampering this effort. The next best way is hyperthermia immediately following radiation therapy and we are presently using this sequence."

"The results and insights gained from preclinical experimentation," said Dr. Kopecky, "have allowed us to treat patients with hyperthermia who have demonstrated resistance to conventional palliative treatment. The tumors treated are confined to the skin, mucosa, subcutaneous tissue, or superficial lymph nodes."

At present we are participating in several clinical hyperthermia protocols," said Dr. Kopecky. "Our ultimate goal is to improve the efficacy of modern cancer treatment while further increasing our growing knowledge of hyperthermia's therapeutic possibilities."

Dr. Walter J. Kopecky

Christmas Party



NEWS---

Committee Appointments

Dr. Ronald Evens has been appointed by the Board of Directors of The Radiological Society of North America to serve on the Refresher Course Committee for the year 1978.

Dr. Ronald Evens has been appointed to serve as a member of the Medical Radiation Advisory Committee of the Bureau of Radiological Health for the Department of Health, Education, and Welfare. This Committee is the principal medical advisory committee to the Bureau and concerns itself with problems related to the medical use of all forms of radiation in diagnosis and therapy.

Editor of Syllabus

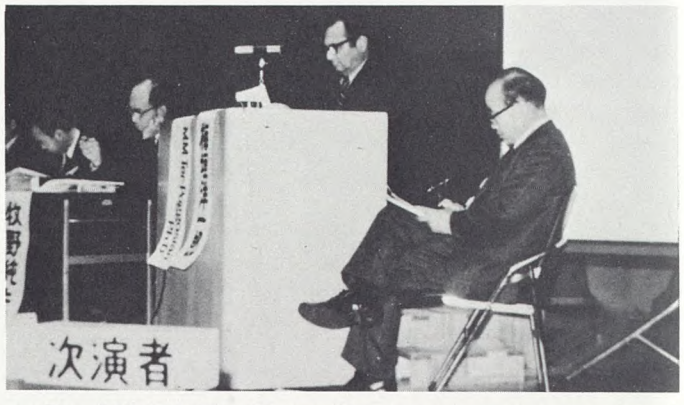
Dr. Barry A. Siegel is the Editor of the Second Nuclear Radiology Self-Evaluation Test and Syllabus published by the American College of Radiology. This continuing education program has been in preparation for four years. The self-evaluation test was mailed to nearly 2,000 participating radiologists in October, 1977, and the Syllabus will be distributed in April, 1978. Dr. Siegel was a contributing author to the first Self-Evaluation Test and Syllabus distributed in 1973-74 and edited by MIR alumnus, Dr. E. James Potchen, Chairman of Radiology Department of Michigan State University, Lansing, Michigan. The chairman of the committee to prepare the third Nuclear Radiology Self-Evaluation Test and Syllabus is Dr. Philip O. Alderson, Associate Professor of Radiology at Johns Hopkins University School of Medicine and also a MIR alumnus.

Resident Exam

Dr. G. Leland Melson directed the first in-training examination for residents of Mallinckrodt Institute of Radiology on April 6. The written examination, devised by the American College of Radiology, provides radiology residents and their program directors with an opportunity to assess their level of competence in various areas of diagnostic radiology as compared to national norms in residency training.

Foreign Lectures

Dr. Michel Ter-Pogossian was an invited speaker at the annual meeting of the South African Association of Physicists in Medicine and Biology in Johannesburg, Feb. 22 - March 2. While in South Africa, Dr. Ter-Pogossian also lectured at hospitals and universities in Pretoria, Durban, Cape Town and Bloemfontein.



Dr. Michel Ter-Pogossian was a guest speaker in Tokyo, Japan at the Symposium on Physical and Technical Aspects of Transmission and Emission Computed Tomography Jan. 23-25. From Tokyo, he traveled to Kyoto to serve as a Visiting Professor at the Kyoto University of Medicine.

Dr. Carlos A. Perez made the following presentations at the Congreso de Cancerologia de Centro America y Panama meeting Feb. 20-25, Guatemala, Central America: "Radiation Therapy Treatment of Pediatric Tumors", "Radiotherapy in Cancer of the Nasopharynx", "Radiation Therapy Treatment of Gynecological Tumors" and "Radiotherapy in Cancer of the Prostate".

Dr. Barry A. Siegel presented the lecture, "Thrombosis Detection With Indium-111 Platelets," on Jan. 12 as Visiting Professor at the University of Toronto, Canada.

UPDATE

International Attendance at Symposium

Participants from Japan, France, Holland, Switzerland and the United States will be attending a Symposium on Positron-Emitting Radionuclides and Tomography in Nuclear Medicine at the Lodge of the Four Seasons, Lake Ozark, Missouri, April 19-21. Dr. Michel Ter-Pogossian is Chairman of the organizing committee. The format of the symposium will consist of presentations by invited lecturers, proffered papers, and group discussions. Among the distinguished speakers are, from Mallinckrodt Institute, Marcus E. Raichle, M.D., Barry A. Siegel, M.D., Michael J. Welch, Ph.D., and Michel M. Ter-Pogossian, Ph.D.

Elected Officer

Dr. Robert Stanley has been elected vice-president of the Greater St. Louis Society of Radiologists.

Honored

Dr. William E. Allen, Jr. was awarded the St. Louis Medical Society's highest honor, the Award of Merit for scientific achievement.

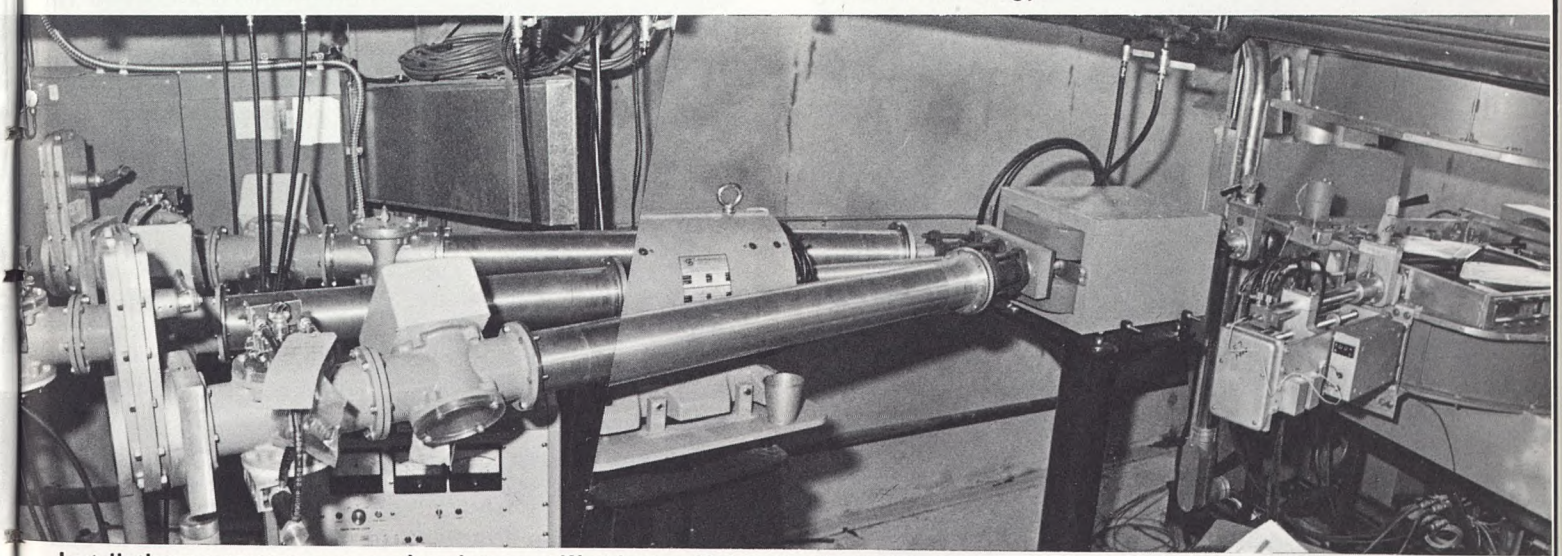
PETT V

The Division of Radiation Sciences, under the direction of Dr. Michel Ter-Pogossian, is presently building a more advanced version of the Emission Tomographic System called PETT V. It is a highly sensitive, very rapid system designed for the examination of the brain. Although developed with the same basic principles as the PETT IV, it is appreciably more condensed in size. The detectors are closer together and the cross-section imaging is faster at collecting data.

"We have obtained sufficiently reliable information through pre-clinical testing and now expect to move the PETT IV to the Coronary Care Unit of Barnes Hospital at the end of April," said Ter-Pogossian, "as a joint research effort with the Division of Cardiology under the direction of Dr. Burton E. Sobel."

Second Cyclotron

Presently being installed in the medical center is a new, state-of-the-art, compact cyclotron. This second cyclotron will allow greater flexibility in radioisotope production and permit a greater workload of research in that concurrent studies can be done — e.g. isotopes can be produced for several groups of investigators at the same time. For example, while Carbon II is being produced for ultimate chemical synthesis of Carbon II palmitate for a clinical heart study, 0-15 can also be produced for diagnostic research studies. The first cyclotron, installed in 1964, will be used primarily for 0-15 production for research and clinical studies in neuroradiology.



Installation progresses on second cyclotron at Washington University Medical Center.

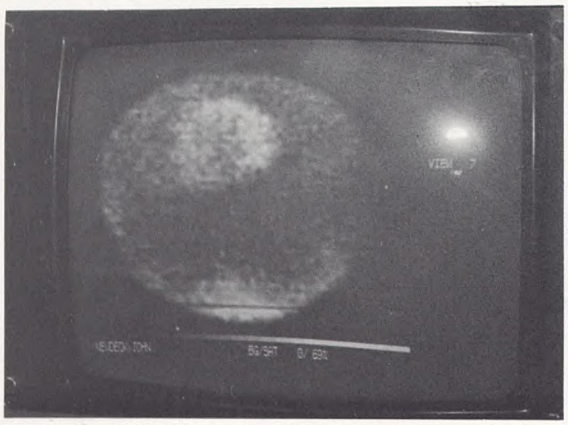
Nuclear Cardiologist Visits MIR

By Stuart A. Jones, M.D.

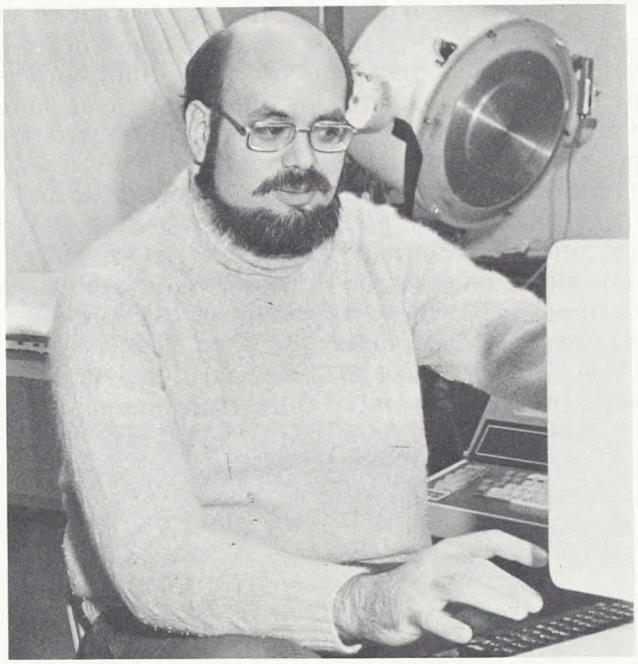
On February 13, Mallinckrodt Institute was visited by Dr. H. William Strauss, Chief of Nuclear Medicine at the Massachusetts General Hospital, and one of the pioneers in studying the heart with radio-isotopes. Dr. Strauss spoke at citywide conference on "Recent Advances in Nuclear Cardiology", describing some of the new and exciting non-invasive methods for evaluating how well the heart works, and how good its blood supply is.

One of the topics covered in this lecture was nuclear imaging of the heart with Thallium-201, a radionuclide which is taken up by heart muscle according to blood supply. Thus, a myocardial infarct (dead muscle resulting from a heart attack) appears as a "cold" spot in the image of the heart, since the infarct has little or no blood supply. More important, if a patient with narrowing of the coronary arteries is exercised, then Thallium is injected, the areas of the heart supplied by the narrowed artery will show decreased thallium uptake, relative to the rest of the heart. If a subsequent Thallium study is performed with the same patient at rest, those areas abnormal on the exercise study will have relatively more uptake, since the arterial narrowing makes less of a difference in blood supply at rest. Thus, rest/exercise Thallium imaging permits the non-invasive diagnosis of coronary artery disease — formerly only possible by means of cardiac catheterization.

Another exciting development described by Dr. Strauss is the use of a computer to generate moving pictures of radioactivity in the blood within the heart, during different parts of the heartbeat. These pictures can demonstrate how well the different parts of the heart contract, and can show where and how much the damage is from previous heart attacks, as well as how various drugs affect the ability of the heart to pump blood. This motion-picture display of the heart actually gives more information than some of the X-ray pictures generated during cardiac catheterization since all of the cardiac chambers can be seen simultaneously on the isotope study, although more detail can be seen on the X-rays, which are also necessary to show the exact location of coronary artery narrowing or blockage.



Thallium scan of the heart on the Varicam color-TV display.

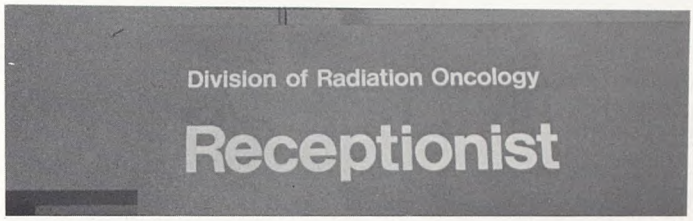


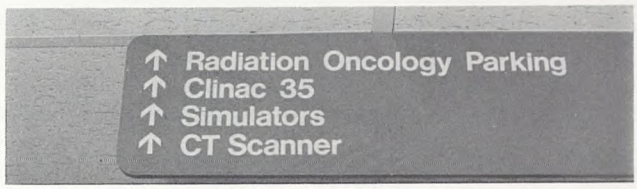
Dr. Stuart A. Jones demonstrates Nuclear Medicine's new computer programmed to generate cardiac motion picture displays.

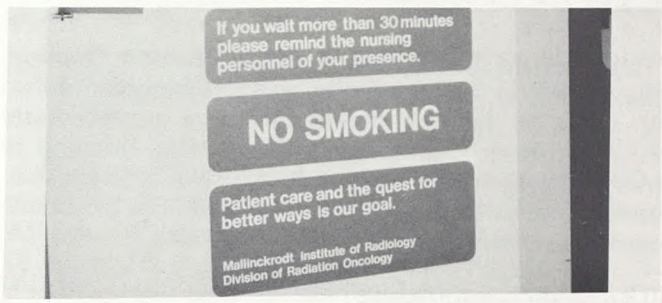
The techniques Dr. Strauss discussed are new, but rapidly gaining wide use in many hospitals. Thallium studies have been performed at MIR since November 1977. The new computer in Nuclear Medicine is now being programmed to generate cardiac motion-picture displays (the pictures used for the movies can now be acquired by the computer, though no studies on patients have yet been performed). These exciting advances promise rapid, safe diagnosis of coronary artery disease as well as new methods for discovering more about the function of the heart in health and disease.

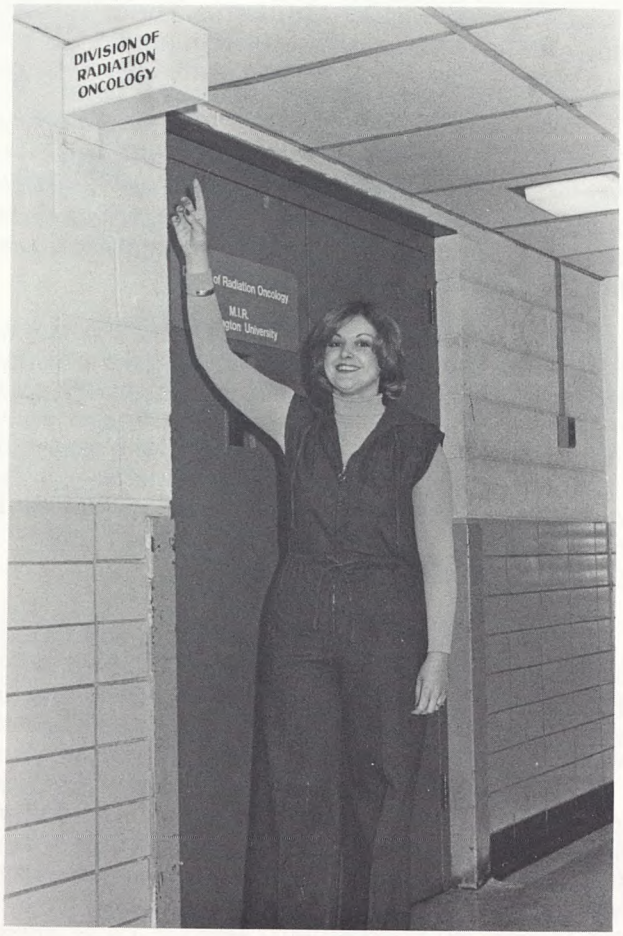
New Signs Brighten Radiation Oncology

The Division of Radiation Oncology has added new signs, color coordinated in lime green and nectarine orange to match the decor on the ground and first floors to inform patients, visitors, and new personnel about the location of facilities. In addition, all rooms now have a room number sign above the door with directories correlating to these numbers posted at various locations on ground and first floors. New staff directories for the Clinical Services Staff have also been added to the first and ground floors. "We are continuing to get everything into a unified theme," said Kathy Black, administrative assistant, "and we find these new additions improve the patient flow, as well as help us work more efficiently."

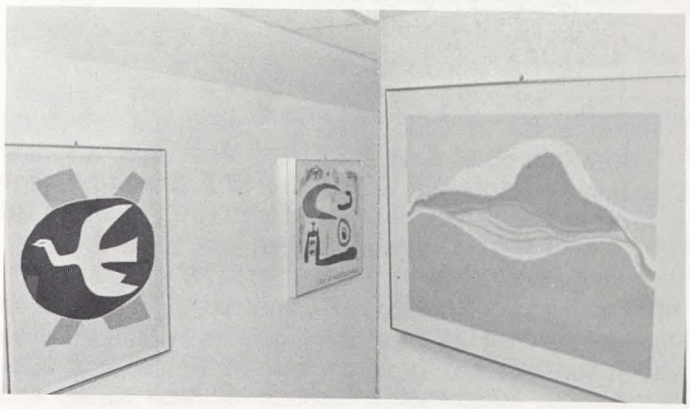








Debbie Elliott shows new lighted sign at in-patient entrance.



Latest additions: New signs and colorful framed prints.

WHAT'S UP, DOC?

Dr. Robert J. Stanley spoke at the Twenty-First Annual Postgraduate Course in Diagnostic Radiology given by the Department of Radiology, University of California School of Medicine in San Francisco, California, on March 6-10.

Marcus E. Raichle, M.D., **Michel M. Ter-Pogossian,** Ph.D., and **John O. Eichling,** Ph.D., presented papers at The Eleventh Princeton Conference on Cerebral Vascular Diseases, March 5-7 in Princeton, New Jersey.

Drs. Ronald Evens, Barry Siegel, Robert Stanley, Leland Melson, Daniel Biello and **Christopher Moran** will serve as faculty members for a postgraduate course entitled "Noninvasive Diagnostic Imaging in Patient Management" at the American Medical Association Annual Convention, June 17-21, in St. Louis. The course director is Dr. Philip Alderson.

Dr. Bruce L. McClennan spoke on CT of the Abdomen at the 8th Annual Aspen Radiological Conference, Beth Israel Hospital, Feb. 26 - Mar. 3.

Dr. Mokhtar Gado presented two papers and an exhibit at the American Society of Neuroradiology meeting, Feb. 27 - March 1, in New Orleans: "Angiography in Evaluation of Superficial Temporal – Middle Cerebral Artery Anastomosis" and "Clinical Comparison Between CT and PETT Scanning. The exhibit was "Functional Anatomy of the Brain by CT."

Dr. Robert J. Stanley will speak at a Symposium in Newark on May 20 entitled, "Abdomen: The CAT vs the Echo" given by the Academy of Medicine of New Jersey, The Radiological Society of New Jersey and the New Jersey Institute of Ultrasound in Medicine.

Dr. Robert J. Stanley was invited by the Department of Radiology, Hospital of the University of Pennsylvania, to be a Visiting Professor lecturing to radiology staff, residents, and invited radiologists from other Philadelphia Medical Centers, Feb. 14-15.

Drs. Stuart Sagel, Gilbert Jost, and **Barry Siegel** will be guest speakers for a refresher course on Chest Radiology at the AMA Convention, June 17-21.

Drs. Robert Stanley and **Stuart Sagel** were members of the faculty for The Society of Computed Body Tomography meeting in San Diego, Jan. 30 - Feb. 2.

Dr. Mokhtar Gado presented the following lectures for a neuroradiology postgraduate course sponsored by the Medical College of Virginia in Williamsburg: "Supra-Tentorial Tumors" and "Hydrocephalus and Atrophy of the Brain," March 8-9.

Drs. Bruce L. McClennan, Carlos Perez, and **Barry Siegel** will be guest speakers at a seminar on Cancer of the Prostate sponsored by the American Urological Association, April 27-29.

Dr. Robert J. Stanley was a participant in the "Workshop on Diagnostic Techniques in Hepatobiliary Disease" sponsored by the American Gastroenterology Association and the National Institute of Health in San Diego, Mar. 12-15.

Dr. Bruce L. McClennan spoke on CT of Lymphoma of the Testes at the 2nd International Conference on Integrated Cancer Management Feb. 22-25.

Dr. Carlos A. Perez presented the following papers at the Texas Radiological Society, March 16-18, in Houston: "Treatment of Vaginal CA", Treatment of Prostatic CA", "Preoperative Irradiation" and "CT Scanning in Radiotherapy".

Dr. Robert J. Stanley was a guest speaker at a Postgraduate Surgical Course on CT given by the University of Kansas Medical Center in Kansas City, Mo., April 12.

During the International Symposium on Computed Tomography in Miami, March 20-24, **Dr. Mokhtar Gado** lectured on "Physiologic – Anatomic Correlations", "An Overview: Intracranial Neoplasms" and "Cerebral Atrophy and Aging."

Dr. Bruce L. McClennan spoke on CT of the Kidney to the Chicago Urological Society, April 5.

HONORED

Dr. Hywel Madoc-Jones has been awarded a first year Junior Faculty Clinical Fellowship from the American Cancer Society for the period July 1, 1978 - June 30, 1979.

NEW STAFF

Dr. Marilyn J. Siegel was appointed as an Instructor in Radiology to the Institute's staff as well as Instructor in Radiology in Pediatrics, effective January 1, 1978

OFF STAFF

Dr. Aly Razek has entered private practice with two former MIR trainees in radiation oncology (Dr. Alvin Korba and Dr. Fred Zivnuska) in Evansville, Indiana.

Dr. Javad Jamshidnejad has joined the West Bank Medical Center, Joe Ellen Smith Memorial Hospital in New Orleans where he will do special procedures, computed tomography, and ultrasound.

ALUMNI NEWS

Dr. John Forrest, who was Associate Professor of Radiology at Mallinckrodt Institute before joining the diagnostic radiology staff of the Veteran's Administration Hospital at the University of California, San Diego, has been appointed Chief of Diagnostic Radiology at the University Hospital, UCSD.

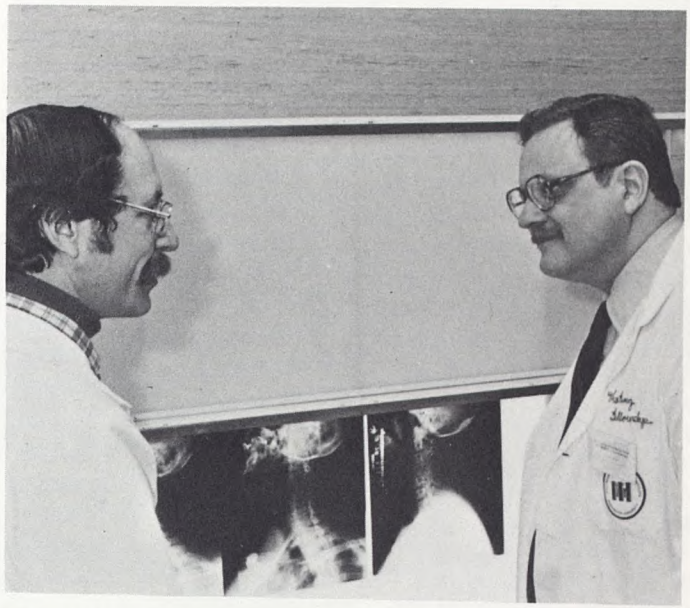
Physics Section Presentations

The following presentations were made by the Physics Section staff of Radiation Oncology when they attended the Missouri River Valley Chapter of the American Association of Physicists in Medicine on February 11, Kansas City, Kansas.

An Operational Computed Tomography Radiotherapy Planning System, Satish C. Prasad, Ph.D. Glenn P. Glasgow, Ph.D., and James A. Purdy, Ph.D.

Total Body Surface Irradiation: Low Energy Electron Beam Therapy, James A. Purdy, Ph.D., and Glenn P. Glasgow, Ph.D.

VISITING PROFESSOR



John Gehweiler, M.D., Visiting Professor from Duke University, Department of Radiology, visits with Louis A. Gilula, M.D., in the Bone and Joint viewing room prior to his lecture on neck trauma.

Electron Beam Shaped Field Techniques and Dosimetry Considerations, Myung C. Choi, M.S., Fred G. Abrath, Ph.D., Bruce J. Gerbi, M.S., Glenn P. Glasgow, Ph.D., and James A. Purdy, Ph.D.

A Comparison of the Beam Characteristics Between the Varian Clinac 6 and the Varian Clinac 4 Linear Accelerator, David J. Keys, M.A., Fred G. Abrath, Ph.D., and James A. Purdy, Ph.D.

Phase I Study of Hyperthermia in Human Neoplasm, Walter J. Kopecky, Ph.D.

The Dosimetry of Whole Body Photon Irradiation, Glenn P. Glasgow, Ph.D.

David Keys was recently certified as a Therapeutic Radiological Physicist by the American Board of Radiology. Currently in charge of the physics responsbilities in Radiation Oncology at St. Luke's West and Missouri Baptist Hospital, David has been promoted to clinical physicist in Mallinckrodt's Division of Radiation Oncology.

BOY SCOUTS REPORT TO THE GOVERNOR

Eagle Scout Ron Evens, Jr., represented the St. Louis Area Council Boy Scouts of America in the annual presentation of the "State of Scouting" message to Governor Joseph Teasdale and the Missouri Legislature. Ron was selected by the St. Louis Area Council which, with 36,000 youth members and 16,000 adult volunteers, is the largest of the eight councils in the state of Missouri.

Ron is an Eagle Scout, Brotherhood Member of the Order of the Arrow, and former Senior Patrol Leader of Troop 457 in Kirkwood, Missouri. He was escorted by a member of the Missouri State Patrol to Jefferson City where he met with the Governor, Secretary of State, and served as an Honorary Page to the Missouri State House and Senate. Ron is the son of Dr. and Mrs. Ronald G. Evens.

Eagle Scout Ron Evens, Jr., second from left, represented the St. Louis Area Council Boy Scouts of America in presenting a "State of Scouting" message to Governor Joseph Teasdale.

CITY-WIDE RADIOLOGY CONFERENCE 1978

St. Louis, Missouri

Scarpellino Auditorium, Mallinckrodt Institute of Radiology, 5:30 P.M.

DATE	TOPIC	LECTURER	CLINICAL PRESENTATIONS
4/10/78	Newer Aspects of Neuroradiology	Speaker to be Determined	Mallinckrodt Institute Section of Neuroradiology
5/8/78	Hematologic Bone Disease	Dr. Stanley S. Siegelman Professor and Chief of Diagnostic Radiology Johns Hopkins University School of Medicine	Mallinckrodt Institute Section of Musculoskeletal Radiology

MIR Attracts Foreign Visitors

Ms. Julia Bello of Santiago, Chile, is visiting Mallinckrodt Institute on a ten month fellowship from the International Atomic Energy Agency for training in medical physics. Ms. Bello spent the first five months of her fellowship at M.D. Anderson in Houston. She holds a M.S. in Physics and works as a medical physicist with the Chilean Nuclear Energy Commission visiting their various departments in Nuclear Medicine and Radiotherapy.

Working especially in the computerized treatment planning area of Radiation Oncology, Julia said, has given her a broader view of what the role of physics is in radio-therapy.

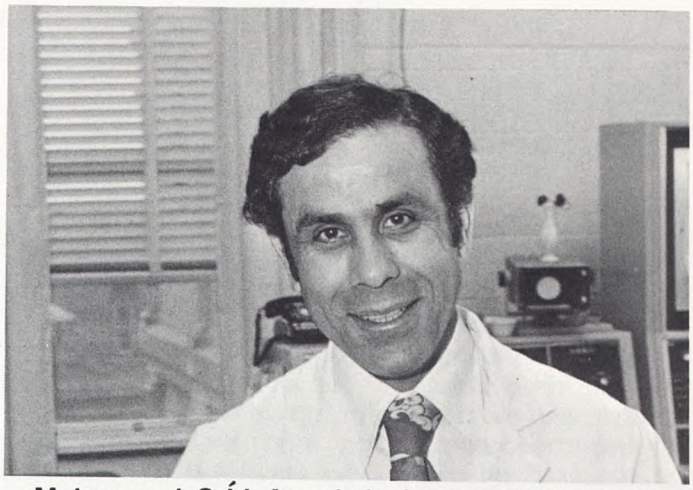
"The program at Mallinckrodt has been very flexible and everyone within the division has cooperated to give me training and help in those areas of physics most important to my work in Chile."

Techno Info

Don Bernier, R.T.N. and Director of Technical Education, Nuclear Medicine, conducted a "Scintillation Camera" Workshop for the Technologists' Section of the Society of Nuclear Medicine Annual Meeting in Orlando, Florida, Feb. 2-5.

Representatives from the Joint Review Committee on educational programs in Nuclear Medicine Technology conducted a site visit, March 14, of the Mallinckrodt Institute Training Program.

Don Bernier, R.T.N., attended a meeting, March 9-12, of the Nuclear Medicine Technology Certification Board which was held to finalize the new national examination in Nuclear Medicine Technology.



Mohammad Saíd Amasheh, from Jordan, a nuclear technologist, is visiting Mallinckrodt Institute on a one year training fellowship arranged by his government and the International Atomic Energy Agency. Mr. Amasheh has a degree in physics and law, and a diploma in radiologic technology. He works at Al-Bashir Hospital in Amman, the largest hospital in the Ministry of Health.

"We have small Nuclear Medicine and Radiation Oncology Divisions, and an adequate Diagnostic Radiology Division", said Mr. Amasheh. Receiving training in Radiation Oncology and Nuclear Medicine while at Mallinckrodt, Mr. Amasheh hopes to implement some of the new and useful techniques he has learned here when he returns to his country. "From what I have observed, the Institute staff and personnel in Radiation Oncology and Nuclear Medicine work very hard to provide the best of patient care and treatment," he said.

New Technologist

Welcome to **Harriet M. Davis, B.S.R.T.,** new technology clinical instructor on 2nd floor. Harriet is a native of Paducah, Kentucky and holds the degree of Bachelor of Health Science in Radiologic Technology Education from the University of Kentucky.

Computer Assists Radiation Oncology Clinical Operations

The progress of a MIR Radiation Oncology patient is aided and checked by computer operations from the time he is first seen by a staff physician. Various computer tasks schedule the patient for treatments and follow-up visits, bill for all Radiation Oncology services, and maintain information for the patient and for departmental statistics. First, the patient is seen by the staff physician who decides if and how the patient will be treated. Pertinent information obtained from the patient by the Patient Accounts office is entered into a unique permanent patient file in the computer.

The Physics section may use the computer as an aid in treatment planning, which describes in detail the course of treatment a patient will receive. The patient's treatment scheduling by the radiation therapy technologist is entirely computer-supported. The technologist picks an appropriate time and enters minimal patient indentification to update the schedule.

Upon reporting for treatment, the patient is logged on to the system by the receptionist or nursing station. A large CRT in the patient waiting area shows the QUEUE, a dynamic computer-generated display of patients who are waiting for treating on the machines, for simulation, or to be seen by nursing. The QUEUE display is echoed throughout the treatment area: at each therapy station, in the staff room, and at the nursing station. A patient is called from the QUEUE for treatment, the doses and settings are stored in the permanent patient file, and a charge for the treatment is automatically generated.

Upon completion of a course of treatment, a computerized dose summary is coded and data is entered into the Tumor Registry.

The patient is scheduled for a follow-up visit and shortly before the appointment, a computer-generated reminder card is sent to the patient.

Daily, monthly and yearly departmental statistics for all the areas described are provided by the Clinical Services area of the Oncology Data Center under the direction of Dr. Don Ragan.

From 15% to 20% in 20 years

(Editor's Note):
(A patient's wife shares their experience in facing up to cancer.)

In 1958 my husband entered Barnes Hospital with cancer of the salivary gland. He received radium seeding and radical surgery, and at that time was given a 15% chance of survival. In the next five years he had surgery fourteen times, including all the plastic work of making a new jaw bone from one of his ribs; but after twenty years, there has been no recurrence of that type of cancer. However, in 1978, he entered the hospital again with cancer of the esophagus of another type, and this time has been given a 20% chance. For five weeks he was an out-patient at Mallinckrodt Institute of Radiology, from where we have just returned. This time the cancer is inoperable, but treatable. But there is no reason to give a 20% chance of survival a second thought, for if only a 15% chance in 1958 became a complete cure, then a 20% chance in 1978 seems like a sure thing!

And what an experience our weeks of treatment at Mallinckrodt was! We soon found we were a part of one big family — everyone there came for the same reason — to take the radiation therapy of one type or another, and eventual cure of their specific disease. Even if this had been our first bout with cancer, it would have been easier to take after being a part of the great group of doctors, nurses, technicians and aides, for never have we been so impressed with the high quality of professionalism.

LECTURER

Mrs. Sally Morse, pastoral assistant in Radiation Oncology, was a guest lecturer April 3 at Florissant Valley Community College. In the group discussion following her lecture Mrs. Morse reflected on the problems and concerns of oncology patients with whom she has worked at Mallinckrodt and focused on the importance of the patient's participation in the healing process.

"Our Patients"

David Norman at age twelve was wearing the same size clothes he wore at age nine. This not only concerned his parents, Mr. and Mrs. Dale Norman of Marion, Illinois; it was disturbing to David. Here he was, an outstanding sixth grade student and a promising young "entrepreneur" with a paper route yielding him hundreds of dollars, for which he kept very concise records, and he was only 4'2" tall. Fortunately for David, physicians at St. Louis Children's Hospital made an early diagnosis of Cushing's disease, a rare disease in which the pituitary gland causes the adrenal gland to produce too many steroids.

Since February 22, David's daily schedule has consisted of attending school in Marion until noon followed by a 250 mile round trip to St. Louis with his mother for radiation therapy treatment at Mallinckrodt Institute.

"I write a lot of letters," said David, "so I will receive a lot of mail." Requesting free booklets which range from "Buying Thermometers" to "How to Move from One Place to Another" to "Insects" provides him with a steady supply of incoming mail. On snowy days he enjoys his stamp collection and reads rather than watches TV. "I like reference books and I've read the People's Almanac from cover to cover. I play second base in baseball and try to keep up with my dog that's part goat and part rabbit. Well, he eats like a goat and jumps like a rabbit!"

David Norton is accompanied by his mother each day of his five weeks treatment.

And we are sure that David will continue to make good use of his time when his mother told us that David loaned her $300.00 from his paper route and made a collection chart for payments plus interest! This young patient provides a lesson in personal courage and inspiration to others.

Donetta Dodwell, radiation therapy technologist, prepares Mark Arnett for his treatment on the Clinac 4.

Seven-year-old Mark Arnett of Benton, Illinois, is looking forward to riding his yellow racer bike this summer. Mark has Hodgkin's disease, a rare form of cancer for a child his age. Since January 3rd, when he began five weeks of radiation therapy treatment at Mallinckrodt Institute, Mark's family has lived with the hope that the treatment will give Mark a chance of survival.

It's been a year of problems for the whole family as Mark's father, Douglas Arnett, was among the striking Illinois miners. Concerned friends and neighbors in Benton organized a fund drive to help the Arnett family with medical expenses and on March 24, members of the St. Louis Football Cardinals played a Mark Arnett Benefit basketball game in Benton.

A second grade student who likes mathematics and the television show, "Happy Days," Mark still hopes for happy days in his struggle with cancer.

MIR CALENDAR OF EVENTS

April 20, 1978
4th DISTRICT M.S.R.T. MEETING
Missouri Baptist Hospital, 8:00 P.M.

April 30 – May 4, 1978
SCARD/AUR
San Antonio, Texas

May 8, 1978
CITY WIDE RADIOLOGY CONFERENCE
Scarpellino Auditorium, Mallinckrodt Institute, 5:30 P.M.

May 14-17, 1978
RADIOLOGISTS BUSINESS MANAGERS ASSOCIATION
St. Louis, Missouri

May 18, 1978
4th DISTRICT M.S.R.T. MEETING
Cardinal Glennon Memorial Hospital, 8:00 P.M.

June 17-21, 1978
AMERICAN MEDICAL ASSOCIATION
St. Louis, Missouri

July 14-21, 1978
AMERICAN SOCIETY OF RADIOLOGIC TECHNOLOGISTS
Anaheim, California

FOCAL SPOT

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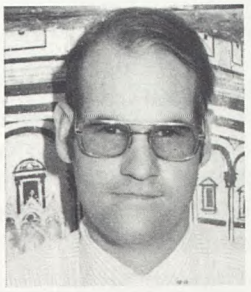

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