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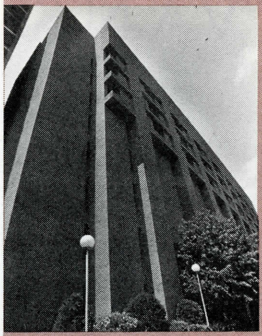

Evans Memorial Department of Clinical Research and Preventive Medicine

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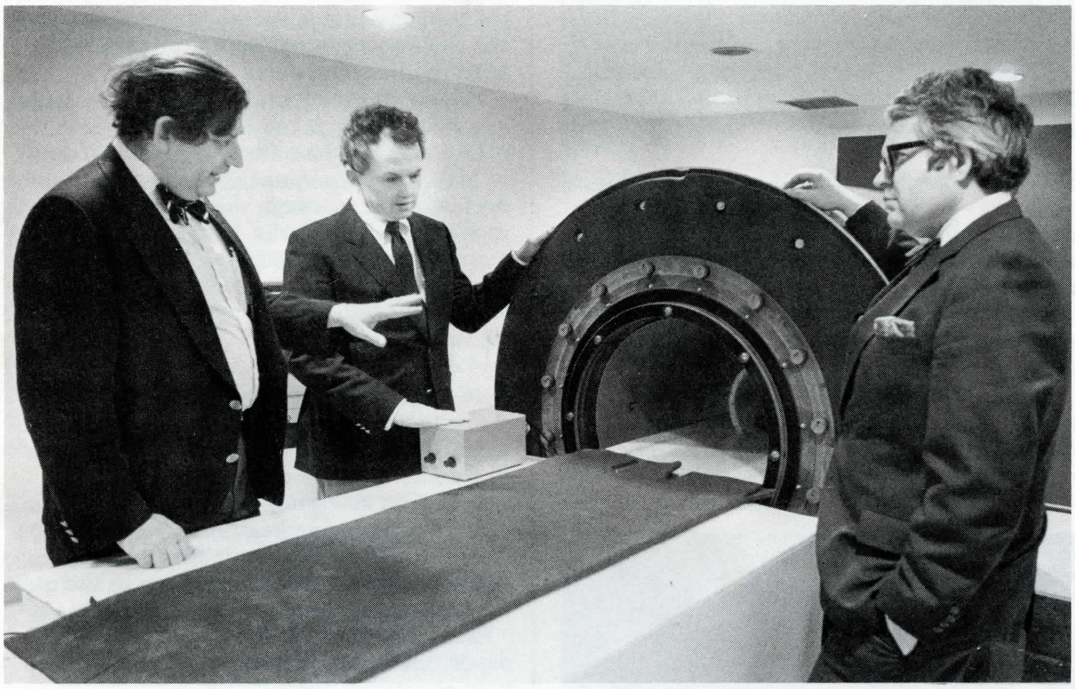

Daniel S. Sax, M.D. (left), professor of neurology at BUSM, questions Field Effects president Ronald Holsinger about aspects of new MRI instrument as Dr. Green looks on. Instrument, currently in development at Field Effects' Acton, Mass., facility, is to be installed in University Hospital early next year. Permanent magnet ring, main element of scanner, is made of cobalt-samarium and weighs five tons.

MRI can help identify otherwise elusive lesions of the brain and can localize disorders of the bone and connective tissue.

MRI technology, no longer experimental, is proving its clinical usefulness

Magnetic resonance imaging (MRI), in its infancy just five years ago, now stands ready to become a major contributor to clinical medicine.

That's the assessment of Allan M. Green, M.D., Ph.D., head of the Evans Section of Nuclear Medicine and director of the new University Hospital/Boston City Hospital Joint Facility for Magnetic Resonance Imaging.

According to Dr. Green, one primary goal of the JFMRI will be to help develop new uses, and more sophisticated applications of existing uses, for magnetic resonance imaging.

"Of particular interest are applications related to head-and-neck trauma, neurologic disorders, cardiac muscle metabolism and the identification of malignant disease," he says, adding that he and his associates will be collaborating with other BCH and UH staff members in exploring these areas.

The Joint Facility is scheduled to be in operation by early next year. To be housed in the basement of the Evans Building, it will provide physicians at the sponsoring hospitals with important new diagnostic capabilities, ranging from the ability to identify otherwise elusive lesions of the brain to the power to localize disorders of the bone and soft tissues with great specificity.

The instrument that makes such achievements possible is manufactured by Field Effects, Inc., of Acton, Mass., and is the first in the nation to feature a rare-earth permanent magnet rather than a superconductive magnet.

The decision to choose an instrument with a rare-earth permanent magnet was made

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UNIVERSITY HOSPITAL
at Boston University
Medical Center

MRI technology...

Continued from page 1

after extensive investigations of both types of MRI units by Dr. Green and other UH and BCH staff members. "Our decision does not mean that we think superconducting instruments are less effective," says Dr. Green, "but we concluded that the rare-earth permanent magnet has significant technological and financial advantages."

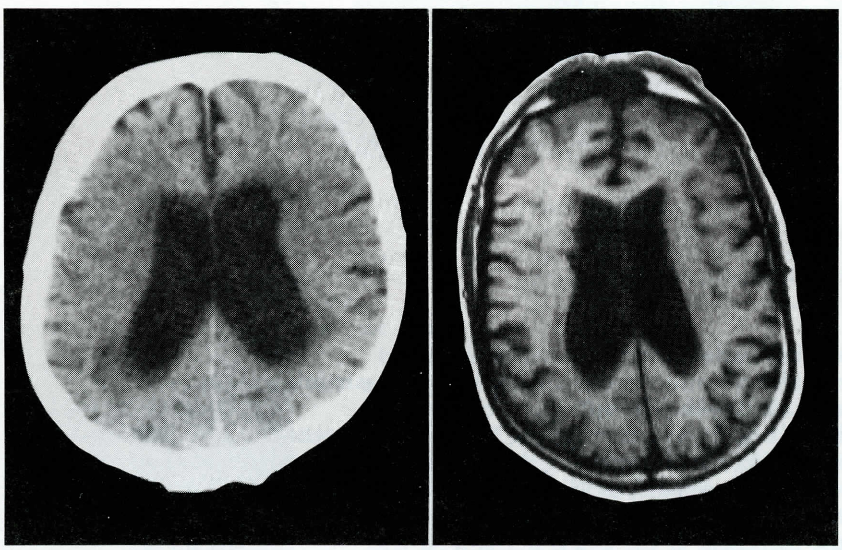
One of the advantages is that the magnetic field is contained entirely within the instrument, so there is no need for the extensive, and expensive, protective shielding required in the walls of the rooms housing MRI units with superconductive magnets. Another advantage, related to the first, is that the cost of the permanent-magnet unit is a third to a half less than that of the traditional types of instruments.

'Metastatic tumors in the liver show up like tiny little BBs against the bright background of the normal tissue.'

Differentiating soft tissues

The key to MRI's diagnostic value is that the technology allows users to distinguish among different types of soft tissues based on chemical differences. Combined with the fact that its signals readily penetrate bone, that feature makes it an ideal instrument for diagnosing certain brain lesions.

"Right now, MRI is the diagnostic approach of choice for posterior-fossa and medullary-cervical junction lesions," says Dr. Green, "because these are not seen very well by other imaging techniques."



CT scan (left) and MRI scan show approximately same transverse plane of patient's brain. Both images demonstrate enlargement of ventricles resulting from brainstem infarct. MRI also provides detail of brain folds, however, demonstrating its ability to depict soft tissue structures. CT scan required use of contrast fluids, but not MRI scan.

MRI also is useful in diagnosing a range of other nervous-system conditions, including multiple sclerosis. And it's effective, as well, in diagnosing tumors in certain other organs, notably the liver.

"The liver has a lot of fatty material, but tumors contain very little fat," says Dr. Green. "That means metastatic tumors in the liver show up like tiny little BBs against the bright background of the normal tissue."

Despite having proven its value for a variety of conditions, MRI's usefulness has been limited by the time it takes to perform scans. Since a typical scan involves generating images of 15 "slices," and each one takes a minute or more, significant movement of the body or the target organ can result in images too blurry to be clinically useful.

Various techniques, however, are helping to overcome that problem. Computer "gating" of images is a key innovation. Measurements of the nuclear transmissions from, say, the heart are timed to the heartbeat. The result is that the heart structures being scanned are in the same position each time the transmission is measured, eliminating the problem of heart-motion interference with the image.

Adding to the technology's value in cardiovascular studies is the fact that movement makes the blood a natural contrast medium in MRI scanning. Since the instrument scans narrow planes through the body, the blood's motion means that the MRI-stimulated atoms have already gone past the imaging plane when their signals are emitted. The result is that the scanner won't pick up any signals from the blood.

A new look at the heart

Cardiovascular applications are a major interest of Dr. Green's. For example, he plans to collaborate with cardiologists from UH and BCH in assessing the new technology's value in diagnosing heart-muscle conditions.

"Chronic hypertension and severe atherosclerotic disease produce changes in the metabolism of the heart muscle," he notes. "These may involve either scarring or the deposition of fat, both of which can be seen very accurately with MRI."

So far, magnetic resonance imaging of regions like the upper and middle GI tract doesn't appear feasible. The technology is effective, however, in diagnosing lesions of the lower GI tract and some reproductive organs. Their location within the complex bony structure of the pelvis minimizes the problems associated with body movement.

Diagnosing bone lesions

MRI is also increasingly useful in diagnosing lesions of the bone and connective tissue. For example, while it doesn't generate clinically useful images of bone calcium, it can distinguish between normal and diseased marrow.

The technology also is proving itself in the diagnosis of bone conditions that affect attached muscles and ligaments. Dr. Green cites the example of the jogger with a bone spur that has produced inflammation in nearby tissues, and is causing the victim much pain.

"Using so-called surface coils to record MRI signals, which allow you to get very high-resolution images of small parts of the body," he says, "you can see the extent of inflammation in muscle and ligament in exquisite detail." □

New dermatology chief conducts research at the bench and in the clinic

Barbara A. Gilchrest, M.D., has spent the past several years performing that most difficult of juggling acts: carrying on both clinical and basic research while at the same time maintaining an active practice.

It's a career that has yielded some impressive dividends for Dr. Gilchrest, who recently became chief of dermatology at UH. She's nationally known for her innovative work in the laser treatment of port-wine stains, and has helped many patients with such stains to escape the high social and psychological costs the disfigurements often carry. In the basic-research realm, she has, among other achievements, helped to identify new skin-cell growth factors.

Hers also is a career that in no sense emerged from any master plan. "I just happened to be in certain places where certain things were going on, and I guess fate took over from there," says Dr. Gilchrest, who also has been named professor and chairman of BUSM's Department of Dermatology.

In any case, she doesn't regret the way things have turned out. "It's wonderful when someone with an M.D. is able to find an interest that spans the bench and the clinic," she says.

Studies of skin aging

The new dermatology chief comes to Boston University Medical Center from the Human Nutrition Research Center on Aging at Tufts University and the New England Medical Center. Prior to that, from 1977 to 1983, she was at the Beth Israel Hospital and Harvard Medical School. (She's a 1971 graduate of that school.)

Dr. Gilchrest's chief basic research interest is in cellular aspects of skin aging. In pursuit of this interest, she and her associates have created serum-free systems that allow for tightly controlled nurturing of different skin cells in culture. It was from their quest for such systems that the discoveries about growth factors emerged.

"We were using bovine hypothalamus as one supplement for cells in culture," notes Dr. Gilchrest, "and we discovered that it contains growth factors for both keratinocytes, which are the main component of the epidermis, and melanocytes."

Probing immune-function losses

With the help of the new culture systems, Dr. Gilchrest and her co-workers have been exploring the impact on cells of skin aging. One series of experiments disclosed that cells from sun-exposed areas have shorter life spans than non-exposed cells from the same donor. Another series turned up a possible clue to the loss of immune function that goes with aging.

"Epidermal-derived thymocyte-activating factor is a mediator very similar to interleukin 2 that was first discovered in lymphocytes and that has a series of specific immune functions," she notes. "ETAF is also produced by keratinocytes, and we discovered that the keratinocyte production of the mediator in culture declines with the age of the cell donor."

Dr. Gilchrest chats with patient who is due for laser treatment of skin lesion.

Treating port-wine stains

On the clinical side, Dr. Gilchrest's main research interest is modifying the laser so as to minimize the risk of scarring in the treatment of port-wine stains.

The argon laser has been used to treat such stains for several years, with generally good results. In more than 90 percent of patients, the discoloration is largely eliminated. In some cases, though, the treatment produces an unsightly scar. The problem is especially severe in children. Roughly a quarter of the youngsters with port-wine stains treated with the laser have wound up with serious scars.

The scarring phenomenon has kept most dermatologists from treating children. Yet it is as children that many bearers of port-wine stains face the most difficult social stigma.

Strong parental reactions

"Parents often have very strong reactions, ranging from horror to anger to guilt, when a child is born with a lasting port-wine stain," she says. "And studies have shown that as soon as a child has any self-awareness—often as early as the end of their first year—they become aware that they're different." The cumulative impact of the negative reactions of parents and others over the years may be permanent damage to a child's self-esteem.

The laser modification, developed by two Boston-area physicists and clinically tested by Dr. Gilchrest and her associates, involves rotating the laser tip at 1,400 rpm. The result is that no one skin area is exposed to the laser beam for more than a millisecond—too short a time for the laser-generated heat to spread from the blood vessels that are its tar-

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'Parents often have very strong reactions, ranging from anger to horror to guilt, when a child is born with a port-wine stain.'

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Ms. Irene Christopher
Librarian
BUSM, L12

Noteworthy

Two new staff members have been appointed to Evans positions in recent months. They are:

Dennis M. DiSorbo, Ph.D., special scientific member of the Evans Section of Medical Oncology. Dr. DiSorbo previously was a staff member at Nassau Hospital on Long Island and an assistant professor of medicine at the State University of New York (SUNY) at Stony Brook. He received his doctorate in biochemistry from the Roswell Park Memorial Institute at the SUNY Buffalo, and did postdoctoral work at the Fels Research Institute of Temple University School of Medicine in Philadelphia. He also has been appointed an assistant professor of medicine at BUSM.

George Triadafilopoulos, M.D., Section of Gastroenterology. Dr. Triadafilopoulos is a graduate of the Aristotlean University of Thessaloniki Medical School, Thessaloniki, Greece. His residency training was at hospitals affiliated with Wayne State University in Detroit. Prior to his present appointment, he held a gastroenterology fellowship at Boston University Medical Center. Dr. Triadafilopoulos also has been appointed as a staff gastroenterologist in the University Hospital Department of Medicine and as an instructor in medicine at BUSM. □

Dermatology chief...

Continued from page 3

get to surrounding connective tissues and produce scarring.

"We've only been using the modification for a short time, so we don't have definitive results," says Dr. Gilchrest, "but we've tried it in a variety of patients, including some children, with good success, and that's very exciting." □

Evans Medicine is published by the Evans Memorial Department of Clinical Research and Preventive Medicine of University Hospital, a member of Boston University Medical Center. Editor is Jay D. Coffman, M.D., associate director of the Department; associate editor is Richard P. Anthony; designer is Kredlow & Gonzalez. *Evans Medicine* is produced by Boston University Medical Center's Office of Informational Services, Owen J. McNamara, director. Send any correspondence to the Evans Memorial Department of Clinical Research, 75 East Newton St., Boston, MA 02118. Norman G. Levinsky, M.D., is director of the Department.

Photo credits: Pages 1 and 3, Bradford F. Herzog.

Evans/Transition

A total of 13 Evans members completed their University Hospital residencies earlier this year. The graduates, and their present pursuits, are:

Dan Berlowitz, M.D., general medicine fellowship, University Hospital.
Stephen Bresnahan, M.D., private practice, Abingdon, Mass.
Mike Czorniak, M.D., pulmonary fellowship, University Hospital.
Paul Demchak, M.D., hematology/oncology fellowship, New England Medical Center.
Lionel Faitelson, M.D., cardiology fellowship, Baylor University, Houston, Tex.
Mitchell Fogel, M.D., renal fellowship, University Hospital.
Kamran Ghalili, M.D., chief resident, University Hospital.
Raphael Kieval, M.D., rheumatology fellowship, Brigham and Women's Hospital.
Laurie Letvak, M.D., hematology/oncology fellowship, New York University.
Rosemary Mehl, M.D., hematology/oncology fellowship, Massachusetts General Hospital.
Larry Moschitto, M.D., cardiology fellowship, University Hospital.
David Polakoff, M.D., geriatrics fellowship, Bedford Veterans Administration Medical Center.
Steven Sepe, M.D., private practice, Cranston, R.I.

The new Evans trainees, and the medical schools from which they graduated, are:

Manuel Anton, M.D., Emory University.
Mary Lou Ashur, M.D., University of Connecticut.
Andrew Chodos, M.D., Albany Medical College.
Phyllis Croke, M.D., University of Pennsylvania.
Helene Fischer, M.D., Cornell University.
Peter Francis, M.D., New York University.
Russell Gerry, M.D., University of Connecticut.
Eric Manning, M.D., University of California at Davis.
Joanne Murabito, M.D., Mount Sinai.
Margaret O'Donoghue, M.D., Johns Hopkins.
Robert Peterfreund, M.D., University of California at San Diego.
Kenneth Silverstein, M.D., New York University.
Alan Steele, M.D., Boston University.
Kenneth Steinberg, M.D., New York Medical College.
Richard Taikowski, M.D., Boston University.
Robert Weiss, M.D., Columbia University.
Anthony White, M.D., Case Western Reserve University. □

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