
100
YEARS
OF
RADIOLOGY
AT
MICHIGAN

THE DEPARTMENT OF RADIOLOGY CELEBRATES ITS CENTENNIAL AS A COLLABORATOR ACROSS THE SPAN OF MEDICAL CARE AND RESEARCH

By James Tobin

On April 26, 1896, two University of Michigan professors stood at the bedside of a man who had been shot in the foot. Their question was this: Could they pinpoint the location of the bullet before the man went under the surgeon's knife?

The two professors were Henry Carhart, a physicist, and William Herdman, a professor of electrotherapeutics in the medical department. They had learned of an extraordinary discovery made just a few months earlier by Wilhelm Roentgen, a Bavarian physicist experimenting with electromagnetic rays. Roentgen had stumbled on what he called "a new kind of ray" — he gave it the letter "X" for "unknown" — one that could reveal opaque objects within soft flesh. Since then Professor Carhart had been experimenting with a Roentgen-esque camera of his own.

Now he and Herdman pointed the device at the foot of the unfortunate gunshot victim and produced a remarkable image — not just of the foot itself, but of the bullet inside the foot.

That was the moment when Michigan's work in medical imaging began. It would be years before the university recognized this work as an independent discipline. Indeed, it's fitting that even at the start, it was a joint venture, for radiology as a discipline and a department has been deeply collaborative, bridging boundaries to serve the broad span of medicine as a whole.

The Department of Radiology at Michigan now ranks among the best programs in the nation. That reputation rests on the shoulders of successive generations of forward-looking physicians, scientists and staff.

"I think the department is in very good shape right now," says N. Reed Dunnick, M.D., the Fred Jenner Hodges Professor of Radiology and, since 1992, chair of the department. "Where we are now is due in part to the people who preceded us. We've had some great leaders in our history."

Professors Carhart and Herdman — the ones who located the bullet — continued their experiments, and in 1903 the Regents allotted $1,000 for X-ray equipment. But the first major figure in radiology's history at the U-M was a bright and determined young medical student with special aptitude in anatomy.

He was James Gerrit Van Zwaluwenburg, the descendent of Dutch pioneers who carved farms in the forests of western Michigan. When Van Zwaluwenburg earned his B.S. at Michigan in 1898, even the eminent U-M chemist Moses Gomberg remarked on his brilliance. His family couldn't afford to send him through medical school, so he worked for five years as a chemist and metallurgist to save up for his fees.

When he finally enrolled, he supplemented his savings as a dissectionist. The knowledge he gained from his cadavers would serve him well. When he completed his training in 1907, he was brought on as an instructor in internal medicine.

Van Zwaluwenburg began to use the new imaging techniques to study the chambers of the heart. He X-rayed 187 subjects in all, and his work was so promising that he was put in charge of U-M's small roentgenology laboratory.

This turned out to be a marvelous combination of investigator, subject and method.

"During the period of this X-ray work he showed himself thoroughly familiar with the anatomy of every portion of the human body," a colleague would write, "a knowledge appearing almost uncanny to less favored mortals. While his memory for technical names was marvelous...his visual memory was even more perfect. He had accurate pictures of what lay beneath the surface and could utilize his knowledge at will."

By 1910, the U-M was doing 600 X-rays per year — enough that a schedule of fees was established: $1.50 for an 8-inch by 10-inch plate; $2.30 for a 16-inch by 20-inch plate. But Van Zwaluwenburg was demonstrating that X-rays were not merely one more tool in the doctor's kit. They were opening a whole new vista of scientific inquiry.

So in 1913, the Regents recognized the new field as a full-fledged academic enterprise by naming Van Zwaluwenburg Michigan's first junior professor of clinical roentgenology. Medical students soon were scribbling notes on his weekly lectures.

He turned out to be not only a first-rate teacher and scientist — he used X-rays to explore the abdominal organs, the skull, the spine, the arteries and the sinuses — but a gifted executive. Under his leadership, the department was soon self-supporting. By the early 1920s, it was doing 10,000 X-ray exams annually.

But Van Zwaluwenburg was driving himself too hard, and in 1922 he died of pneumonia at the age of only 48.

Colleagues wrote: "His boundless energy, his wholehearted devotion to clinical roentgenology, his great human kindliness, [and] his important contributions to the examination of the heart, of the great vessels, and of the organs of the abdomen by roentgen methods...led American roentgenologists to regard him as one of this country's outstanding pioneers in his field."

From the beginning, medical imaging was a tool of such extraordinary power that specialists from many fields sought to use it, refine it, claim it, even fight over it.

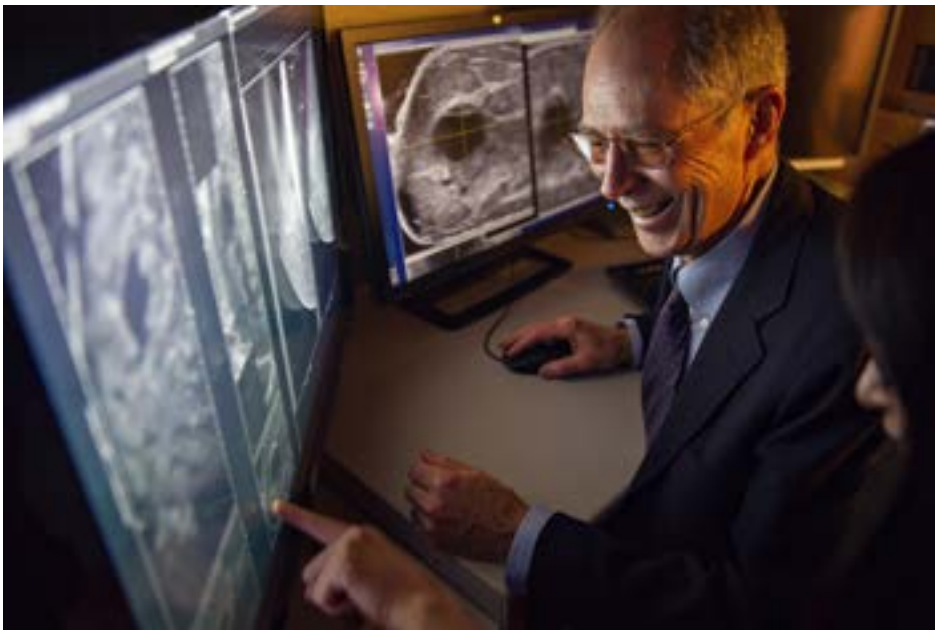
The first experiments were done mostly by physicists such as U-M's Carhart. Van Zwaluwenburg had been trained in internal medicine and his early work was overseen by Charles de Nancrede, M.D., a U-M professor of surgery. Photographers took up the work, and for a time pharmacists were involved. A French neurosurgeon was the first to shoot an arteriogram. Urologists pioneered intravenous pyelography, now known as excretory urography. Cardiologists soon fought for priority in imaging of the heart.

The same pattern was seen at Michigan.

"Radiology has suffered turf incursions forever," Dunnick says. "If you look back historically, I think we've gained more than we've lost."

Indeed, skirmishes, negotiations and peace parlays over the proper boundaries between radiology and other departments went on all through the chairmanships that followed the department's founding era.

Under Preston Manasseh Hickey, M.D. (chair, 1922-1930), who moved the department into expansive quarters in the new University Hospital, parts of radiology were added or subtracted from electrotherapy, physical therapy and hydrotherapy.



Then, under the long tenure of Fred Jenner Hodges, M.D. (chair, 1931-1965), responsibilities were shuffled with the dentists, the urologists, the medical illustrators and the physical therapists. There was also broad cooperation with, among other units, internal medicine on research in pulmonary disease and physics on the Michigan-Memorial Phoenix Project, launched to develop a postwar nuclear reactor for peacetime uses. (In 1953, while Hodges was chair, the department's name was changed from roentgenology to radiology.)

The cooperative endeavors of pediatric radiology, angiocardiography and neuroradiology all came into their own under Hodges and Walter Whitehouse, M.D. (chair, 1965-1979), who saw the department take responsibility for nearly all invasive neuroradiologic procedures as well as for sonography.

One of the great disputes came in the early 1980s, when the department went head-to-head with nuclear medicine, then part of internal medicine, over control of the emerging technology of magnetic resonance imaging (MRI), first known — problematically, from radiology's point of view — as nuclear magnetic resonance imaging. William Martel, M.D. (chair, 1982-1992), won that battle, and in 2000, nuclear medicine itself joined the Department of Radiology.

Paul L. Carson with graduate student Yiying Zhu, (top); Kirk A. Frey, (above).

LEISA THOMPSON PHOTOGRAPHY

The department's turf battles now seem to be over. In the modern era, collaboration is the radiologist's watchword, and many professors appointed recently hold joint appointments in radiology and other departments.

Valerie Castle, M.D. (Fellowship 1990), the chair of the Department of Pediatrics and Communicable Diseases at the U-M, offered an example.

Several years ago, Castle recalls, the U-M's congenital heart experts introduced the idea that very young patients born with heart malformations needed MRI scans designed specifically for children. She consulted with Dunnick, who suggested that MRI specialists in radiology could help.

Castle and Dunnick came to believe that these children should be treated by someone who not only was deeply versed in their specific anatomical problems, but who also had been trained in MRI.

Both doctors realized it would take a long time to develop such expertise in-house. So, they looked outside the U-M for just the right physician.

The result was the joint recruitment of Adam L. Dorfman (M.D. 1998), a native Michigander who had trained further at Boston Children's Hospital and Harvard Medical School. He had precisely what the U-M was looking for — world-class expertise in both pediatric cardiology and cardiac imaging. Appointed in 2007, he has led the development of pioneering protocols in MRI studies of the heart in children. The collaboration between Dunnick and Castle also helped launch advanced tranining in cardiac imaging to develop still more in-house expertise.

"I think that's a perfect example of the kind of collaboration that we've had to meet the needs of our patients and our programs, and to place Michigan always at the leading edge," says Castle, the Ravitz Foundation Endowed Professor of Pediatrics and Communicable Diseases.

Radiology is now interwoven with treatment and research all through the health system.

In the care of cancer patients, for example, Dunnick says, "Radiology extends perhaps more broadly than any other field — diagnosis, staging, surveillance, and sometimes therapy." Indeed, he adds, "I think we have greater depth in our involvement across the entire spectrum of medical care than any other department."

Take a child, for instance, being treated for cancer. A typical patient coming to the U-M Health System is attended by a pediatric tumor board made up of multiple specialists. Each plays his or her role, but the radiologist's imaging studies provide the foundation of treatment.

In medical research, too, radiologists have played a fundamental role, and only more so in recent decades. Neurology, for example, has been all but revolutionized by advances in imaging over the last 40 years. Radiologists have long been essential to the study of the entire nervous system, and teamwork among radiologists and neurologists is now routine.

"We can look at functional imaging of the brain and neurotransmitters that we couldn't ever do before," says David J. Fink, M.D., Robert W. Brear Professor and chair of the

Top: James Gerrit Van Zwaluwenburg Bottom: N. Reed Dunnick
Opposit page: Brian Fowlkes (right) checking an acoustic scalpel with Timothy L. Hall, Ph.D.

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Department of Neurology. "That's one of the most exciting aspects of advances in neuroscience, and they're our partners in that."

Examples in neurology abound. One of the best known is Kirk A. Frey (M.D. and Ph.D. 1984, Residency 1988, Fellowship 1989), who conducts research on molecular-neuro imaging. In his work, Frey, the David E. Kuhl Collegiate Professor of Radiology and a professor of neurology, aims at the long-term goal of precisely measuring the effects of disease and drug therapies in the brain, where the boundaries between radiology, nuclear medicine and neurology are all but invisible.

"RADIOLOGY EXTENDS PERHAPS MORE BROADLY THAN ANY OTHER FIELD — DIAGNOSIS, STAGING, SURVEILLANCE AND SOMETIMES THERAPY," DUNNICK SAYS.

In recent years the field has been criticized for high doses and high costs. But "Image Gently" campaigns have taken hold and, as for costs, Dunnick cautions against being penny-wise and pound-foolish.

"If you eliminated all medical imaging, the costs would go up," Dunnick says. "In the old days, surgeons would do an exploratory laparotomy. They aren't done any more because we do CT scans. The surgeons won't operate without an imaging study. We get to the diagnosis faster, which means treatment can start earlier, which means it's easier to cure the patient or to control the disease process. So I think imaging actually contributes to lower health care costs, even though we're in the news as one of the high-expense items."

In U-M laboratories, the future of radiology can be glimpsed across extraordinary vistas.

One example is the research of Brian Fowlkes, professor of radiology and biomedical engineering, and Charles Cain, professor and founding chair of the Department of Biomedical Engineering. The two, in collaboration with biomedical engineering and urology colleagues, are developing a noninvasive surgical technique called "histotripsy" (meaning tissue breakdown). The procedure uses highly focused ultrasound waves as an "acoustic scalpel," dissolving lesions without so much as breaking the patient's skin or damaging surrounding tissue.

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That breakthrough, if it reaches the clinics, will come at the cutting edge of high-tech medicine. But change is coming in everyday care as well. With basic ultrasound technology becoming simpler and less expensive, Paul L. Carson, Ph.D., M.S., the BRS Collegiate Professor of Radiology, has speculated that ultrasound machines might fairly soon become as common in home medicine cabinets as thermometers.

And in clinics and hospitals, Carson says, radiology may come to play an even more important role than it does today.

"Now that we see the possibility of imaging diseases at the genetic and other molecular levels, even most diagnosis is going to be done with imaging," says Carson, also a professor of biomedical engineering. "It's also going to be possible to treat directly based on those images in most parts of the body. So you can imagine that radiology, or certainly in vivo imaging, could be strongly involved in 40 or 50 percent of medical diagnosis and treatment. Certainly, radiology can be doing a large part of the treatment procedures as well as most of the diagnosis."

"We're just learning for the first time how to treat many diseases," Carson says. "It's a wonderful time." [M]

Sources included Fred J. Hodges and Carleton B. Pierce, "Department of Roentgenology," The University of Michigan: An Encyclopedic Survey*; William Martel, "The Rich Tradition of Radiology at the University of Michigan,"* American Journal of Radiology *(October 1995); and "Ultrasonic Technique Appears Promising for Non-Invasive Surgery,"* Sonoworld.