THE TECHNOLOGIST'S ROLE IN DIAGNOSTIC RADIOLOGY

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In the one hundred short years since Röntgen's discovery of the X-ray, radiology has transformed itself from a scientific curiosity to a medical necessity. This evolution was one of the most significant of the twentieth century, changing forever the way disease is diagnosed. Paralleling radiology's transformation were dramatic changes in the roles of those responsible for operating the X-ray equipment itself. Over the years, the responsibility for performing imaging examinations shifted from unskilled office assistants who used trial-and-error guesswork to medical specialists educated in anatomy, imaging technique, radiation safety, and patient care.

THE FIRST TECHNICIANS

Many of the first to operate X-ray machines had no connection whatsoever to the medical profession. Within months of Röntgen's discovery, entrepreneurs began to devise commercial uses for the X-ray to exploit the public's interest in the new technology. Because radiography at the time was considered a form of photography, among the first to purchase and operate X-ray equipment were professional photographers. Studios conducting business in "roentgen photography" sprang up in America and Europe to entertain a public curious to view living bones.¹

Quickly, however, the X-ray was put to use for more serious purposes: to diagnose and treat illness. As the technology gained popularity in 1896, most medical X-ray equipment was owned and operated by independent business persons, including chemists, engineers, and electricians (Fig. 24.1). Physicians would send patients to these X-ray operators for diagnostic and therapeutic services.

By 1900, however, many physicians had purchased their own X-ray machines to install in their medical offices and in hospitals. A few even began to specialize as "roentgenologists." In the beginning these physicians operated the X-ray equipment themselves. Advances in equipment and technique, however, quickly outpaced physicians' abilities to keep up. They found more and more of their time was being eaten up by the mechanics of the X-ray machine, leaving less time for patient contact and treatment. It did not take long for these physicians to realize that to make the most effective use of their X-ray equip-
ment, someone else had to handle the time-consuming tasks of performing X-ray examinations and developing the films. The task most often fell to their office assistants. Across the country, physicians recruited their receptionists and secretaries to crank the handles of static machines, pose as subjects, and rock developer pans. These assistants usually had little knowledge of anatomy or disease; they merely operated the equipment. Hospitals, clinics, and physicians lucky enough to employ nurses quickly put them to work as X-ray technicians, for they at least had medical training (Fig. 24.2).

These pioneer technicians had heavy loads to bear. The vast majority were women, and they were expected not only to operate the X-ray equipment, but also to perform routine machine maintenance such as watching oil levels, cleaning brushes, tightening loose connections, and repairing minor breakdowns. In addition, they usually were responsible for keeping physician’s books, typing, filing, sterilizing gloves and instruments, and cleaning the department.

These first technicians also worked in a climate of indifference to radiation protection, and the death toll among them was high. “No one seemed to realize that X rays could cause damage to skin and tissue,” wrote one technician who began his career in 1900. At the time, X-ray technicians held difficult patients for one another, used their own hands to test fluoroscopic tubes, and stepped in front of the beam themselves to prove to frightened patients that the procedure would not hurt. It was not until nearly twenty years after Röntgen’s discovery that precautions such as lead aprons and protective eyewear came into widespread use.

Because instructional manuals were rare, the first technicians learned positioning and exposure techniques via the “hunch method”—taking X rays according to what felt right, not by any specific amount of exposure time. They had to guess at patient density, calibration of the X-ray generator, and the speed and quality of X-ray films. Apparatus was crude; timers did not exist on early equipment, and voltage and current could not be accurately measured or controlled. For short exposures, the technician would count “one Mississippi, two Mississippi” in an attempt to estimate when to terminate the exposure. Longer exposures sometimes resulted in skin burns to patients. Results were hoped for rather than expected.

Fig. 24.1 Elizabeth Fleischmann Ascheim, a photographer turned radiographer, published this picture of “An American Frog” in 1898 in the Archives of Clinical Skiography. Her considerable skills were used at the Presidio in 1898 and 1899, radiographing casualties from Cuba and the Spanish-American War. She would die in 1908 from her early unshielded work with X rays. (Courtesy of the Center for the American History of Radiology, Reston, Va.)

Fig. 24.2 Most often we do not know the names or even the faces of early technologists. In this photograph, ca. 1898, a nurse or assistant performs an examination using a hand-held fluoroscope. (Courtesy of the Center for the American History of Radiology, Reston, Va.)
Despite all these handicaps, many X-ray technicians were able to achieve what were then considered to be remarkable radiographic images. With no written rules, however, they found it difficult to explain their successes and could not formulate techniques that others could duplicate.\(^7\)

**A SOCIETY FOR TECHNICIANS**

The plight of the undereducated, overworked X-ray technician was largely ignored until the 1920s, when the persistent work of one man, Eddy C. Jerman, finally brought education, organization, and legitimacy to the field. Jerman was one of the first to preach, and later teach, the importance of X-ray exposure technique. As an equipment representative for the Victor X-Ray Corporation, he traveled widely throughout the middle west in the 1910s visiting radiologists. In doing so, he soon discovered how desperately a unified concept of “technic” was needed. The driving force in Jerman’s life during this period is encapsulated by this statement from his memoir:

> It was difficult to find two operators who were anywhere near in accord regarding technical procedure. Some would advise certain procedures and others entirely different programs. The utmost confusion regarding technical procedure existed. Accurate reliable instruction regarding technique was nowhere available. [I] decided to step into the breach and devote the rest of [my] life work in an effort toward strengthening the link, fully realizing the immense size of the problem and many of the vast difficulties and prejudices to be overcome.\(^8\)

Jerman did much more than simply fill the breach. His persistence eventually persuaded the Victor X-Ray Corporation to establish in 1917 a formal educational program under his guidance.

But his influence on the profession did not end there. In October 1920 Jerman and thirteen technician acquaintances, six of whom were women, met in Chicago to establish the first national technicians society, the American Association of Radiological Technicians (Fig. 24.3). The society was created “for the purpose of affording technicians an opportunity for the interchange of thoughts and ideas concerned with radiologic technique.”\(^9\) Though this purpose seemed noble, some radiologists, upon hearing of the society’s formation, reacted with fear. Even as late as 1937, seventeen years after the society's formation, a member wrote, “From the moment when plans (for a society) were first announced by the technicians, a fear was bred in the minds of radiologists, which still exists, but which is slowly evaporating.”\(^10\)

This fear of technicians organizing came at a time when many who had learned their craft from physicians sought to establish credibility as they assumed increased responsibilities and learned new techniques. A few of the more resourceful among them even began purchasing their own X-ray machines, which in the early 1920s cost about $300.\(^11\) Radiologists worried that these technicians might establish competing clinics for X-ray services or attempt diagnoses without the professional input of a trained physician.\(^12\)

To ease the radiologists’ fears, Jerman strongly promoted a professional
Eddy Clifford Jerman (1865-1936)

As with any discovery of major significance, scientists make the breakthroughs and other people find practical applications. Eddy C. Jerman was one of the latter. The son of a country doctor in southeastern Indiana, Jerman was born in Ripley County in 1865. He had achieved enough formal education and varied life experience by the time he was thirty years old to comprehend fully the value of Röntgen’s 1895 discovery of the X ray. His lifelong career would be devoted to enhancing both the technique and applications of diagnostic medical X ray.

In a brief memoir titled The Ups and Downs of an X-Ray Man’s Life, Jerman wrote that, as early as age twelve, he showed a keen interest in and understanding of electricity, repairing faradic batteries used in his father’s practice. His first “paying” job was installing a burglar alarm in a local furniture store.

Jerman enrolled in nearby Franklin College in 1883 and, as an adjunct to his studies, built and refined his burglar and fire alarm systems, but neglected to patent his ideas. The system, with great commercial potential, eventually was patented by a New York firm. Jerman’s interest in physics at Franklin College led him to experiment with Geissler and Crookes vacuum tubes, but he left college after his third year because of ill health.

For the next several years Jerman traveled to Texas as a book salesman, attended business college at night in Austin, and ended up becoming part of a “prairie schooner” trading expedition traveling by horse and wagon from San Antonio to Chihuahua, Mexico. After recovering his health, Jerman returned to Indiana in 1887, married, and eventually took a job with the H.R. Allen Surgical Institute of Indianapolis, doing everything from electrical wiring to the refurbishing of medical electrical equipment. During his stint with the institute, Jerman also began to manufacture the Pattee Static Machine, which was sold mainly to lightning-rod dealers to illustrate the value of the rods as protection from lightning.

This involvement with the Pattee machine would prove significant. As soon as Jerman began his experiments with X rays in March 1896, he began to upgrade the Pattee machines, which he used as generators, to provide more power for his trials (Fig. 24.4). Obtaining an exclusive right to the Pattee patents, Jerman formed his first company, the Electro Therapeutic Manufacturing Company, which made various kinds of medical electrical equipment, as well as the static machines, until 1903.
Unscrupulous partners and ill health once again forced Jerman to go west, but his move to Topeka, Kansas, was propitious. There he became involved with a group of physicians who would bring him back to health and, more important, further his work in the field of X-ray. Jerman focused his efforts for the next several years not only on upgrading X-ray equipment but on improving what was then often referred to as "technic." Traveling throughout the Midwest visiting radiologists, Jerman discovered how desperately a unified concept of X-ray technique was needed. He began devoting his efforts to training X-ray technicians. With resolve and dedication, he spent several years continuing his journey from doctor to doctor, spending up to ten days in one location lecturing on X-ray technique, often for a meager $50.

His persistence eventually persuaded the Victor X-Ray Corporation, which was later acquired by the General Electric Company, to establish in 1917 a formal educational program under his guidance. But Jerman still was not satisfied, and in October 1920 he and thirteen technician acquaintances met in Chicago to establish the American Association of Radiological Technicians—the predecessor of today's American Society of Radiologic Technologists. Jerman provided the steady leadership that the fledgling organization needed. He also became a charter member of the American Roentgen Ray Society and served as the American Registry of X-Ray technicians' first examiner.

As a result of his tireless efforts Jerman earned the title "Master Radiological Technician" from the registry. In 1928 he published *Modern X-Ray Technic*, a work that was recognized as the most useful publication of its kind in the profession. It remained the standard of excellence far into the 1950s.

Almost every issue affecting technicians, minor and major, bore the imprint of Ed Jerman, whose vision and opinions were quite clear. For instance, he strongly opposed unionism and state registration of technicians; instead, he actively supported the creation of state societies loyal to the national organization. It was as a result of the creation of these state societies that membership continued to grow.

Because of his efforts to bring legitimacy to technicians and the organization that represented them, Jerman became the central rallying figure of the society's annual meetings. During the early 1930s he traveled extensively, visiting South America, Australia, Africa, and Europe, spreading the word of standardized X-ray "technic."

Jerman died in 1936; his legacy, however, remains with all radiologic technologists and in the society he founded.
code of ethics for technicians, advocating "high ideals of loyalty to the profession and to the radiologist."

Despite these assurances, by 1920 leaders of the Radiological Society of North America (RSNA) were developing plans to establish some form of control over the X-ray technician. Their instrument of choice was the American Registry of X-Ray Technicians (Fig. 24.5).

The registry was created to introduce a higher degree of technical expertise and ethical standards into an occupation still searching for professional status. "The American Registry of X-Ray Technicians was not an accident," wrote Alfred B. Greene, its second director, in 1945 (Fig. 24.6). "It came into being as the brain-child of a group of wise and far-seeing radiologists who saw in the future the need for a skill and artistry and fidelity in X-ray that far exceeded Röntgen's modest dreams." According to Greene, too many "lay technicians, who at first entered the field to operate the cranky apparatus, found it an easy and accepted practice for them to cross the boundary between technician and physician and infringe upon the prerogatives of the diagnostician...It was then that the idea of a registry of qualified, ethical, and competent lay technicians was born."

The registry adopted testing guidelines for registering X-ray technicians in 1923 to distinguish "sincere" technicians from "their less scrupulous fellows." It was obvious that Jerman, as one of the few individuals who truly understood X-ray technique, was the only person qualified to serve as examiner. Applicants paid a fee of $10 to take an examination consisting of fifty questions. Jerman allowed 2 percent for each correct answer, and a score of at least 60 percent was required for passage. Records show Sister Mary Beatrice Merrigan of Oklahoma City was the first technician to take the registry examination, receiving passage notification 26 December 1922.

During its first full year, the registry reported that 89 people had passed its examination to become registered technicians. By 1925 the number had grown to 290. That same year, officers of the technologist society and the registry met and agreed to restrict membership in the national professional society to registered technicians. Members were notified they should seek registration or they would automatically be dropped from the roster. All but one immediately achieved registration.

Of the 432 registered technicians in 1927, 352 were women and 80 were men. Some 64 percent of the women were nurses and 34 percent were Catholic nuns, a statistic that illustrates...
the importance of church-supported hospitals to the medical professions.19

As registration of technicians spread, however, radiologists again voiced their concerns, this time pointing out that registration conferred legitimacy on technicians, regardless of whether they practiced under a radiologist or chose a laboratory in which to work. Physicians’ concern about the quality of training for technicians led the registry to reevaluate its testing procedures. In 1927 it found that five sets of examinations, consisting of five questions each, had been used for several years. Complete copies of all of the questions could easily be acquired. Furthermore, no attempts were made to see whether or not technicians were living up to their certification agreement “to work at all times under direct medical supervision, and under no circumstances to give out written or oral diagnoses or work independently, whether in any private office, hospital or institutional laboratory.”

Dramatic changes promptly were made in examination practices. The original five sets of questions were replaced with a master list of several hundred questions, thereby allowing different questions to be selected for different groups of applicants. The passing grade also was raised from 60 to 75 percent. Written verification procedures were instituted for persons listed as sponsors for registry applications (in most cases radiologists). In addition, a high school education was made a prerequisite to examination, although the registry board could accept other preparation as being equivalent. Place and manner of X-ray training and experience also were made considerations for application approval.

As the registry evolved so too did the technician’s society, which changed its name to the American Society of Radiographers in 1930 to establish a clearer distinction between the registry and the professional society. Two years later, the name was changed again, this time to the American Society of X-Ray Technicians (ASXT).

EARLY TRAINING AND SAFETY STANDARDS

Throughout the 1930s the discussion of ethics and professional training continued. Again and again, both the registry and the technicians’ society debated the issues of education and professional preparation. Finally, in 1933 the ASXT and RSNA formally agreed on what technician training should include. The guidelines stated that to become registered, a technician must be at least twenty-one years old and complete a minimum of one year’s training in anatomy, physiology, physics and electricity, X-ray production, darkroom technique, positioning, basic radiographic procedures, ethics, and fluoroscopy.

Also during the 1930s technicians began to demand safety standards. Many pioneers had suffered greatly from the effects of overexposure to radiation, and in 1930 the ASXT recommended that X-ray personnel should not work more than seven hours a day nor more than five days a week, should spend their days off outdoors in the fresh air, and should receive at least one month’s vacation per year.20 It is hard to say how many hospitals and physicians’ offices took these guidelines seriously.

In 1940 the ASXT formed a Council on Education and Registration, which issued a plan for securing certain rights and protections for X-ray technicians.21 The plan centered on securing more cooperation from radiologists, new educational standards, recognition by the American Medical Association (AMA) or some other established medical group of registry-approved education courses, endorsement of a program to provide retirement or Social Security protection for X-ray technicians, and some method for standardizing and monitoring educational courses. The plan met with predictable results. The AMA refused to consider a lowering of training prerequisites, and radiologists could not agree on higher ones. The retirement and Social Security initiative would require a mandate of Congress, and that did not seem immediately forthcoming. Thus thwarted, the registry and technicians’ society went back to work devising ways that they themselves could improve educational standards and delivery.
TECHNICIANS GAIN NEW STATUS

X-ray technicians made a number of significant advances toward earning professional recognition during the 1930s and 1940s. Technicians played a vital role in the mass tuberculosis screenings of the era, where patients were examined in assembly-line fashion in school auditoriums (Fig. 24.7). These screenings not only demanded technical expertise, but also brought new attention to the profession and created a nationwide need for more X-ray technicians. In 1940 there were 90 accredited schools for X-ray technicians in the United States; by 1946 that number had swelled to 190—a 45 percent increase in just six years.22

Perhaps the first sign that trained X-ray technicians had begun to achieve a status worthy of acknowledgment was a survey conducted by New York State in 1939, which described the position of X-ray technician as a “good opportunity,” in part because:

X-ray technicians are not greatly affected by fluctuations of the business world. The number of opportunities presented in one year is small... but, at the same time, there are relatively few adequately trained X-ray technicians to be found.

The position of X-ray technician has many advantages and ranks higher than that of nurse or laboratory technician. It is extremely interesting to the scientifically inclined, varied and stimulating, clean, without hazard and affords the opportunity for personal achievement.23

According to the survey, 88 percent of the state’s technicians were employed by hospitals. Hours worked and duties performed varied greatly. Wages ranged from a low of $50 per month with “maintenance” to $100 per month without. The head technician in a large laboratory might expect as much as $300 per month.

Still, the fallacy that X-ray technicians were mere “button-pushers” persisted. A 1942 article in the X-Ray Technician stated:

Sad to say, too often X-ray technicians and button-pushers are confused in the minds of many. It is granted that equipment manufacturers have come a long way toward the elimination of many knobs and buttons on the control panel, and X-ray equipment these days carries more automatic and fool-proof devices than in an earlier period, but so long as the individual patient remains the causative factor behind an X-ray examination, X-ray pictures will not be easy to make.....It is precisely to dissipate this prevalent fallacy that X-ray technicians are making definite steps towards limiting this field to those better qualified by training and educational background.24

Those steps included stiffening eligibility requirements for certification

![Fig. 24.7 Chest screening, Long Island, 1931. The children hold tags with their names to mark films for later review. Technologists staffed these early “mobile” efforts at mass screening. (Courtesy of the Center for the American History of Radiology, Reston, Va.)](image)
by the registry. The new requirements, which went into effect in July 1942, stated that to become certified a technician had to have a high school education or its equivalent and have two years experience and training in a hospital or radiologist's office.25

In addition to these higher educational standards, another force of change during the 1940s brought new respect to the profession: World War II. Because radiologists, the majority of whom were men, were drafted into the armed forces, the X-ray technicians who were left stateside, the majority of whom were women, virtually took over their hospitals' radiology departments in the absence of functioning medical staff. As a result they gained new confidence and respect in the institutional setting.

World War II had another interesting effect on the profession. Before 1940 men were not encouraged to enter the profession due to its poor salaries and domination by women—about 80 percent of registered technicians were women.26 During the war, however, women were not permitted to serve in the battlefield as X-ray technicians; they could only be employed as civilian technicians in service hospitals.27 The army and navy, desperate for men to run their X-ray equipment, trained nearly nine thousand men as X-ray technicians (Figs. 24.8 and 24.9). Following the war, many of these veterans sought formal education as X-ray technicians and found employment in clinics and hospitals.28

Had professional credibility for the technician arrived? Not entirely, but some major hurdles had been cleared. By 1943 the registry rolls listed 4,600 technicians, 4,000 of whom were in good standing.

Technician recognition took another giant step forward on 6 May 1943, when the American College of Radiology became a cosponsor of the registry with the ASXT, taking over the responsibilities of the RSNA. This action represented a new level of official recognition of the technicians' society by physicians. At the same time, the AMA's Council on Medical Education and Hospitals accepted the responsibility of classifying and listing approved schools for X-ray technicians. The council also took on the task of overseeing inspection of educational programs, thereby stabilizing standards so that qualifications for registration might be more rigidly enforced.

Continual advances in professional recognition during the remainder of the 1940s and into the 1950s culminated in 1964, when the technicians' national society changed its name to the American Society of Radiologic Technologists (ASRT) to reinforce a semantic distinction between technician (a term the society believed implied a worker with minimal on-the-job training) and technologist (a highly skilled, well-educated professional). At long last, the occupation and its organizations were gaining legitimacy. This complicated evolution from "X-ray operators" to "X-ray technicians" to "radiologic technologists" was perhaps best described in 1954 by F. L. Pengelly, who entered the profession in 1900:

Had the pioneers kept diaries of their routine daily work, and had their records been assembled into a single report, it might have reminded us of the Bible story of the children of Israel in their

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Fig. 24.8 Radiology equipment ads in World War II for the first time appealed to a broad spectrum of workers in the field: female and male technologists, as well as physicians. (Courtesy of the Center for the American History of Radiology, Reston, Va.)
wanderings in the wilderness, and of their trials, disappointments, tragedy, and final success in reaching the promised land.²⁹

**TECHNOLOGIST SPECIALIZATION**

As technologists grew professionally, the science of imaging continued to grow. The military development of sonar for World War II led to medical applications that became sonography. Nuclear medicine emerged from new radiopharmaceuticals. X-ray equipment improved in design and became linked with the ever-expanding world of computers. Physicists exploring the properties and applications of magnetic waves developed magnetic resonance (MR) imaging technology.

These technological explosions sent shock waves through the radiologic technologist community in the 1960s and 1970s, requiring a new emphasis on continuing education as radiographers—and radiologists—struggled to keep up with emerging technical specialties. Technologists began to specialize in mammography, MR, computed tomography (CT), nuclear medicine, and sonography. Others moved into hospital and clinic management and the higher ranks of academia. As a result, new special-purpose associations began to spring up outside the ASRT.

**ACADEMIC CAREERS**

In 1967 twenty-six educators from colleges and universities throughout the country met in St. Louis to discuss how they could best establish radiologic technology as an academic career. Their efforts resulted in the Association of University Radiologic Technologists (AURT), designed to encourage the exchange of teaching concepts and curricula and establish minimum standards for teaching radiologic technology at the certificate, diploma, associate, and baccalaureate levels; to stimulate an interest in academic radiologic technology as a career; and to advance radiologic technology as an allied health science by encouraging members to conduct research and write technical papers.³⁰

"At the time, education for technologists was not encouraged," said Laverne Gurley, one of the earliest advocates of in-service education for technologists.³¹ In 1969 she presented the first lecture on in-service education for technologists at the AURT annual meeting, after which she said, "A radiologist came to me and asked, 'How does your boss feel about you being involved with in-service education?' The perception that a little knowledge is a dangerous thing "was indelibly stamped in the mind of every physician in this country," she added.³²

But many events over the next few years set the stage for changes in attitudes and educational standards. Nurses had long been required by the American Hospital Association (AHA) to attend in-service education in order for member hospitals to maintain accreditation. Hospital administrators regarded in-service education in the nursing profession as a sound investment, and many employed directors of in-service education on their nursing staffs. Subsequently, Gurley and other radiologic technology educators petitioned the AHA, the Association of Schools of Allied Health Professions (ASAHP), and others to set similar requirements for technologists. "Why do you require it for nurses and you don't require it for us? Our technology is changing much more rapidly than theirs is," said Gurley, who at the time was on the fac-
ulty at the University of Tennessee College of Medicine.\textsuperscript{32}

In 1969 she published what was probably the first article on in-service education for technologists in ASRT’s journal, Radiologic Technology. Citing the lack of uniformity in educational programs throughout the country, she wrote, “While in-service education may be firmly established in many professions, it is in its infancy in radiologic technology. This has been a great failing in our profession.”\textsuperscript{33}

The rapid growth and acceptance of community colleges also contributed to change. At first, some animosity existed between the new institutions and what some considered the college and university “elitists.” But once the community college system was in place, Gurley said, “We had to expand and develop curricula and methods of program evaluation. You must realize that at that time even the university programs weren’t degree programs. Most programs were hospital certificate programs. We’ve had to move very slowly on this.”\textsuperscript{34}

In 1984 AURT changed its name to the Association of Educators in Radiological Sciences (AERS) to reflect the organization’s growing membership in all imaging modalities and radiation therapy. Soon after, more and more hospitals began to approach colleges and universities to take over their radiography education programs, to enable the hospitals to focus their efforts on patient care. Changes in technology and educational regulations by the government were leaving them hard-pressed to keep current, propelling many hospital program directors into the realm of postsecondary education. Many found themselves ill prepared to handle the details of funding, curriculum development, state and federal regulations, and the many academic protocols of the university environment. By 1995 AERS membership had grown to more than one thousand; the association is headquartered in Oak Brook, Illinois.

Other organizations for educators sprang up in the 1970s. In 1975 representatives from twelve western United States colleges and universities formed the Western Intercollegiate Consortium on Education in Radiologic Technology (WICERT). The founders sought to improve the quality of college-level radiologic technology education by providing a network for radiologic science educators who found themselves newcomers to the college and university setting. The consortium’s boundaries included the states of California, Oregon, Washington, Idaho, Utah, Wyoming, and Nevada. WICERT patterned its institutional membership structure after the Western Institutional Consortium for Nursing Education and the ASAHP.

From the outset, technically-based programs faced an uphill battle to achieve credibility and recognition in the university arena. According to the organization’s first president, Jane Van Valkenburg, “Some academicians felt we were contaminating their territory, and we received little help from colleagues in other university departments, especially when it came to federal funding. We were all floundering at first.”\textsuperscript{35} She added, “Through the years we have maintained an informal philosophy that promotes the need for research and sharing instructional methodologies.” This is evident during the group’s annual meeting, which is characterized by small discussion groups in which members exchange information, seek solutions to common problems, and develop continuing working relationships with fellow radiologic technology educators.

The organization’s accomplishments include standardizing course content to facilitate the transfer of credits among member institutions; publishing the book Principles and Practices of the College-based Radiologic Science Program; developing curricula for health administration, health education, advanced radiography, mammography, and quality assurance; and developing student admission criteria.

In 1991 a name change to the Association of Collegiate Educators in Radiologic Technology (ACERT) recog-
nized the organization's expanding geographic membership and evolution to include all imaging and therapeutic modalities. By 1994 ACERT counted seventeen member institutions and associate members in states well beyond its original western borders. The non-profit educational organization has its headquarters at Weber State University in Ogden, Utah.

NEW CAREERS IN MANAGEMENT

As radiologic technologists were struggling to find their place in academia, other career paths were opening up in unfamiliar territory. As late as the 1960s radiologists were still managing day-to-day operations in radiology departments in most hospitals across the country, but the paperwork load, in the form of Medicare and Medicaid reimbursement claims and a multitude of other administrative hoops, was becoming unbearable for professionals whose real interest was in practicing medicine. Into the breach stepped the technologists.

In many cases, the chief technologist assumed the administrator's role. But depending on the institution's philosophy, any number of other health care specialists, as well as business managers, were offered the radiology administrator position. From the hospital and private practice venues two similar groups of radiology administrators emerged. In 1968 a group of administrators, most of whom worked in the private practice setting, formed the Radiology Business Management Association (RBMA). These managers faced many of the same challenges as hospital department administrators, but they did not have to contend with the problems that go with large staffs typical of hospitals or the internal administrative requirements. "Although there is a definite duplication of effort between the two administrative organizations, the RBMA at the time would not accept the hospital administrators into their ranks," said former RBMA member Hal Magida, who became one of the founders of the American Hospital Radiology Administrators (AHRA).56

Magida spearheaded a nationwide survey of hospital radiology administrators that found an odd mix of pharmacists, physicists, technologists, nurses, doctors, and business managers working in clinical management. So, in 1973 Magida, Edward Cohen, Robert Wagner, and Tammy Waldhauser formed the new special-purpose association, which quickly eclipsed the growth of RBMA. In 1986 it changed its guidelines and its name to the American Healthcare Radiology Administrators to include members from free-standing radiology imaging centers. By 1995 the association, now headquartered in Sudbury, Massachusetts, had more than thirty-five hundred members.

"Ten years ago, I would have said that there is a definite advantage in having a technologist as a radiology administrator," said AHRA member Louise Broadley, who received her technologist training in the navy in the 1940s and now serves as administrator of radiological service at New York Medical College. "I no longer think that. Nowadays, administrators have quality assurance people to oversee the imaging aspect."57 This is true for large urban facilities where radiology departments are big business, dealing with multimillion-dollar budgets, complex labor negotiations, labyrinthine regulatory management, and documentation. But in rural hospitals, even today, it remains more common to find radiology administrators who still function as both chief technologist and business manager.

AHRA's diverse membership has served the association well, and its "manager personality" has shown through in its dealings with other radiology organizations. In 1987, for instance, AHRA organized the Summit on Manpower, an eighteen-member coalition of national health care organizations that united to tackle a temporary personnel shortage in medical imaging and radiation therapy. Once the radiology employment situation was in hand, the coalition moved on to other issues, such as health care reform.
SONOGRAPHERS AND NUCLEAR MEDICINE TECHNOLOGISTS

Among the key members of the coalition, besides ASRT, were the Society of Diagnostic Medical Sonographers (SDMS) and the Society of Nuclear Medicine Technologist Section (SNM/TS). These two organizations are significant not only because of their large memberships and service to the profession, but also because of the way they evolved in relation to the physicians’ groups that pioneered their medical specialties.

According to Joan Baker, one of the founders of SDMS, the organization has roots in the American Institute of Ultrasound in Medicine (AIUM). At AIUM’s annual meeting in Winnipeg, Canada, in 1969, Baker says, six technical specialists decided it was time to form an association for technologists performing ultrasound procedures. Although the AIUM board did not oppose the formation of a technologist society, the majority felt that the formation of such a group was premature, but they forged ahead and, at AIUM’s 1970 annual meeting in Cleveland, the American Society of Ultrasound Technical Specialists (ASUTS) was chartered. “It was difficult to choose a name because we didn’t want to get involved with the technician-technologist controversy that was going on at the time,” said Baker.

Over the next decade the technical specialist group established its own annual meeting, its own registry, and a separate educational accreditation body. The group succeeded in having the AMA officially recognize its field as “diagnostic ultrasound technology,” and it established executive offices in Dallas. The “technical specialists” became “sonographers” in 1974, and in 1980 ASUTS changed its name to that by which it is known today: SDMS. In 1986 SDMS for the first time held an annual meeting separate from AIUM’s annual meeting, and the cord finally was severed completely.

SDMS membership in 1995 stood at more than ten thousand. In a piece on the history of diagnostic ultrasound for a Smithsonian Institution exhibit, Baker wrote:

The early officers of ASUTS/SDMS had a particular commonality; they were all dedicated teachers who had been involved in the early, rapid growth of this new modality. All were acutely aware of the serious shortage of technical specialists—but more importantly, they understood that the future of ultrasound was dependent upon the ability of the field to provide qualified manpower.

Unlike their sonographer colleagues, technologists in nuclear medicine who sought to form their own organization never split from their fostering physician organization. Early on, the board of the Society of Nuclear Medicine recognized the need to serve its technologist members, and it established a Committee on Nuclear Medicine Technologists, chaired by Ervin Kaplan of Chicago.

As early as 1966 a group of nuclear medicine technologists in Houston petitioned for formal affiliation with SNM. That group’s leader, Gary Wood, worked with SNM’s Thomas P. Haynie and the SNM’s Southwest Chapter to include technologists in chapter bylaws. By 1969 Haynie was requesting a stronger voice for technologists in nuclear medicine’s professional society. He proposed developing a technologist section within SNM, allowing for the election of its own officers and separate meetings to coincide with those of the main society. “In my opinion, this would do much to clear the air and provide for rapid growth in this segment of our membership,” Haynie wrote. Less than three weeks later, SNM President C. Craig Harris, in his report to the board of trustees, suggested that the chapter representation of technologists be expanded to a different kind of national-level representation. In 1970 the trustees approved the revised bylaws proposed by Wood and Haynie creating the Technologist Section, which held its first business meeting in 1971. Like most of its contemporary organizations, the SNM Technologist Section devoted much of its early energies to education.
This effort led to the creation of its own scholarly journal, certification board, and continuing education program. By 1995 the Technologist Section comprised nearly half of SNM's thirteen thousand members.

**Magnetic Resonance Technologists**

Educational need was the driving motive behind the most recently formed major technologist association, which dates from 1990. The principle behind MR—that certain nuclei have a magnetic moment—was first postulated in the 1920s.41 It was not until the 1940s, however, that scientists were able to demonstrate the effect, and it was not until 1977 that researchers were able to build a prototype and perform the first human scan. By the end of the 1970, MR scanners became available commercially, and since then MR medical applications have expanded almost exponentially.

Early on, hospital radiology departments had to scramble to find operators who could perform the new examinations. Quite often they turned to radiologic technologists who were already experienced in CT, because both CT and MR imaging require extensive knowledge of cross-sectional anatomy. Some of those technologists later chose to specialize in MR imagery.

The technologists who were working in MR at its infancy could not have imagined all the technical advances and new applications that would unfold. In the mid-1980s MR was used mainly for neuroradiology and imaging the musculoskeletal system. By the early 1990s medical applications surged into MR angiography, functional MR, and cardiac MR.

In search of continuing education in this fast-paced science, many MR technologists began attending annual meetings of the Society of Magnetic Resonance in Medicine (SMRM) and the Society for Magnetic Resonance Imaging (SMRI). SMRM, established in 1980 by physicians and scientists, was created to promote research in MR in the medical sciences. SMRI was chartered in 1982 by clinical and basic scientists devoted to researching MR techniques in medicine, with emphasis on imaging. The annual educational conferences of both organizations were designed to link the raw science of MR with its clinical applications in diagnostic imaging.

As technologist attendance grew at their annual conferences, SMRM and SMRI realized by the mid-1980s that they needed to start offering education sessions specific to technologists. The response to these new educational sessions was overwhelming, with hundreds of MR technologists traveling thousands of miles to attend. According to Bill Faulkner, a pioneer MR technologist:

> ...the desire for education was what motivated these technologists. They were trying to keep up with the technology. MRI had grown phenomenally since its first clinical use, and technologists were starved for education. The SMRM and SMRI meetings were about the only place you could get it. Eventually, you began seeing the same technologists at the SMRM conference as you would at the SMRI conference. By 1990, a group of us began talking about forming our own technologist section.42

SMRM and SMRI supported the idea, and at the 1991 RSNA meeting in Chicago a committee of radiologists, physicists, and technologists from both groups gathered to draft the articles of cooperation for the combined Section for Magnetic Resonance Technologists (SMRT). Faulkner was elected president of the section by its three hundred members. By 1994 SMRT's membership had approached one thousand.

"The formation of the technologist section was driven solely by the need to keep pace with the rapid evolution of the technology," said Faulkner. "Because the quality of an MR image is very dependent on the skills of the technologist, SMRM and SMRI recognized the importance of providing continuing education through an organization that was geared specifically toward technologists."43

The technologist section set up business operations in Berkeley, California,
where the SMRM office was located. Its board of directors consisted of an equal number of officers from SMRT, SMRM, and SMRI. “It was one technologist group parented by two physicians societies,” explained Carolyn Kaut Watson, director of the MRI Technologist Fellowship Program at the University of Pennsylvania, who was elected SMRT’s second president in 1992.44 By that time SMRT had firmly established itself as a provider of MR technologist education. It began publishing a quarterly newsletter and holding its own annual meeting, featuring clinical plenary symposia and papers and posters presented by technologists. It also began sponsoring six regional educational seminars annually for the benefit of technologists who could not attend the annual meeting.

In 1994 SMRM and SMRI merged to form the Society for Magnetic Resonance (SMR), representing more than thirty-six hundred MR physicians, physicists, engineers, and biochemists. SMRT became an affiliated section of this new society, welcoming all technologists working in MR at the clinical or research level to join its ranks.

SMRT’s goals during radiology’s second century include establishing links with MR technologists worldwide. “We want to promote international communication on the topic of magnetic resonance and establish a forum for its dissemination,” said Watson.45 As a first step toward that goal, the SMRT held its first European regional meeting in London in 1994. Its continuing purpose, however, is to keep technologists informed in the rapidly changing world of MR imaging. “The emphasis through it all has been education,” said Watson. “That’s our sole reason for existence.”

**CHANGES IN ASRT**

During this period of reinvention, when so many new technologist groups formed, the ASRT was far from stagnant. The “old gray lady” of technologist associations itself was being reshaped. In 1969 the ASRT’s board decided to move the organization from Fond du Lac, Wisconsin, the home of the society’s first full-time executive secre-

retary, Genevieve Eilert, who for a time had operated the ASRT’s business out of her own house.

The society, logically enough, located its offices in Chicago, where the RSNA was headquartered and where Ed Jerman had worked so long with the Victor Company. An executive director was hired, and the staff eventually grew to eleven. In 1983, because of rising office rent costs and other issues, the society relocated its offices to Albuquerque, New Mexico, where they remain today. The full-time professional staff exceeds forty, and the society’s membership has passed forty-six thousand, making ASRT by far the largest of any technologist group in the United States and, in fact, the world.

In 1986 ASRT changed its political structure to incorporate a House of Delegates, allowing for greater representation from all regions of the country as well as the major modalities. In 1993 this house structure was amended to create a chapter system, providing even greater representation from the various disciplines and special interests within technology, such as management, education, radiation therapy, mammography, nuclear medicine, MR, sonography, and CT. Most of the new ASRT chapters have higher membership numbers than the independent specialty groups that have formed through the years.

In 1991 ASRT succeeded, through its appointees, in gaining a majority representation of technologists for the registry board of trustees and the board of directors of the Joint Review Committee on Education in Radiologic Technology. Leaders in the society say that the majority representation victory finally gave technologists control of their professional destiny—not necessarily freedom to practice their profession independently of radiologists and other physicians. Technologists still carry the ideal of professional ethics, but majority representation assures that technologists will be able to set their own standards for education and professional criteria. Through the ASRT’s efforts, technologists themselves will be able to define their own profession.
REFERENCES

7. Ibid.
16. Ibid.
17. Ibid.
18. Greene, "The Registry Comes of Age.
19. Ibid.
26. Ibid.
29. Ibid.
32. Ibid.
34. Personal communication, Gurley.
42. Personal communication with Bill Faulkner, January 1994.
43. Ibid.
44. Personal communication with Carolyn Kaut Wilson, January 1994.
45. Ibid.