The first radiograph by an American to be published abroad was this “American Frog” of Elizabeth Fleischmann Ascheim. Ascheim, of San Francisco, was self taught and used the rays in both therapy and diagnosis until her death from radiation injuries in 1905. (Courtesy of the Center for the American History of Radiology, Reston, Va.)
Women in Radiation Oncology and Radiation Physics

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The written history of radiation oncology for the most part has overlooked the accomplishments of women in the field; their battles for acceptance also have been ignored. In some instances this has been because women, for whatever reason, traditionally have not attained the career highwater marks that make their male counterparts emerge as historical figures: departmental and institutional directorship, national office in medical organizations, or first authorship on numerous publications. This chapter looks at the many women who practiced radiation oncology and radiation physics over the last century, often against great odds and at some personal cost, and whose stories illuminate areas of our history previously unexplored.

The study of women in medicine allows us to examine women's entry into the professional fields. Medicine was one of the first modern professions opened to women, possibly owing to the belief in women's "natural" healing powers. There is an extensive literature on the history of women in medicine, the great bulk of it concentrated from the nineteenth century on. For the most part these studies do not focus on medical specialists, and one finds a few extraordinary women cited repeatedly as examples. The literature which does focus on one specialty within the broad field of women in medicine tends to examine typically "feminine" specialties such as obstetrics, pediatrics, psychiatry, and public health. Several writers have focused on women as medical reformers in the nineteenth century, an activity supported by male physicians who believed that women's moral vision could improve the national health.

Critics of female physicians claimed that medicine might "defeminize" women and destroy their modesty. These critics also asserted that most women were routinely incapacitated by menstruation, adding that intellectual activity further destroyed women's health. Women were quick to point out that no one feared that nursing would defeminize women and insisted that female patients needed female physicians for the sake of modesty. Physicians supportive of women countered the biological argument with research; they found that women who engaged in intellectual pursuits enjoyed excellent health and that most women did not suffer from debilitating menstrual problems.
MARIE CURIE (1867-1934)

Undoubtedly, the most famous woman to influence the field of radiation therapy was Marie Curie. Her discovery of radium created a new discipline of radiation therapy. In the latter years of her career, much of her support came from the appreciation of the applications of her discoveries to the treatment of cancer. She faced many of the same issues that confronted women physicians, such as discrimination and problems balancing work with family.

Marie Sklodowska was born in Poland in 1867, the daughter of a physics and mathematics professor. She worked for several years as a governess supporting her sister Bronya's study of medicine at the Sorbonne; at twenty-four Marie went to Paris to study physics and mathematics at the Sorbonne. Three years into her studies, she met Pierre Curie while requesting space to work in his laboratory, and a little over a year later they married.

Marie Curie began her work on radioactivity when she chose to study the newly discovered Becquerel rays for her doctoral thesis. She discovered that not only was uranium radioactive, but thorium was as well. This led her to hypothesize that radioactivity was not a property of a single element. She also speculated that pitchblende, an ore of uranium oxide, must contain an undiscovered element, because uranium alone could not account for all the radioactivity present. At this point, Pierre gave up his own research and joined her work. Together they discovered polonium and radium. In 1903 Marie and Pierre Curie shared the Nobel Prize in physics with Henri Becquerel for their work in radioactivity. Thereafter, Pierre and Marie continued their work to prove the existence of radium by preparing it as a pure salt, a process which took several years.

Their marriage was an unusual collaboration. Through Pierre's academic position, Marie Curie was able to gain access to laboratory facilities from which she otherwise would have been barred. She was careful to take credit for those discoveries which were hers alone, although she was not always believed. The Curies did not challenge every blatant insult to her abilities; for example, when the Royal Institution of London invited Pierre to speak in 1903, Marie sat in the audience as he described their joint project. Neither were concerned with the outward trappings of scientific success, but they did care about laboratory facilities and support so that they could continue their research.

During these years, Pierre supported her as she attempted to balance science and family. While they did assume that she would be responsible for domestic affairs, they made it possible for her to focus on science as well. They lived in austere surroundings to minimize housework and kept few social ties. When their daugh-
ters, Irène and Eve, were born, they hired a nurse. In addition, Pierre's father moved in with them and helped with child care. In a letter to a friend, Marie discussed the issue of balancing family and work:

    It became a serious problem how to take care of our little Irène and of our home without giving up my scientific work. Such a renunciation would have been very painful to me, and my husband would not even think of it; he used to say that he had got a wife made expressly for him to share all his preoccupations. Neither of us would contemplate abandoning what was so precious to us both.\textsuperscript{21}

Tragically, Pierre was killed in a street accident in 1906, leaving Marie a widow and single parent at age thirty-eight. Her position was changed from female collaborator to independent scientist. While at first the Sorbonne resisted, under pressure they appointed her as an assistant professor—the first woman to hold such a position there. Years later she attributed her appointment to the emotion surrounding Pierre's death. Without this appointment she would not have been able to continue her research. In the following years she concentrated on proving that polonium and radium were truly elements; she was able to produce salts of radium and polonium and prepare radium as a metal. She received a second Nobel Prize in 1911, this one in chemistry, for this work.\textsuperscript{22,23,24}

While Curie received many honors in her life and was the first person, man or woman, to receive two Nobel Prizes, she also had to contend with the perception that she was only a collaborator who had no original ideas of her own. In 1911 a scandal was spread by the wife of a fellow physicist, Paul Langevin, that Marie Curie was having an affair with Langevin. Copies of a letter said to be written by Marie to Paul were leaked to the Paris tabloids.\textsuperscript{25} Some critics leapt on these stories, claiming that they proved that a woman could excel in science only when "working under guidance and inspiration of a profoundly imaginative man." They believed her work was not original but was guided first by Pierre Curie and later by Langevin.\textsuperscript{26}

Much of Marie Curie's funding and support came from those who hoped her work could be applied for medical purposes, such as cancer therapy. However, medical applications also created a demand for radium which caused its already steep prices to skyrocket out of her reach. She had always refused to patent radium or make any monetary gain from its discovery. In 1920 her Institut du Radium had only one gram of radium and was unable to purchase more for research. An American journalist, Missy Meloney, set up a tour to raise money from American women to buy Curie an additional gram of radium.\textsuperscript{27} While Harvard and Yale quibbled about whether she was important enough to warrant an honorary degree, huge crowds came out to welcome her at every turn.\textsuperscript{28}

Marie Curie's public image was that of a healer, despite the fact that radium therapy was only a consequence of her work and not the focus of her research. In some ways she found more acceptance in the medical community than in the scientific community. The Académie des Sciences refused to admit her when she applied for membership, while the Académie de Médecine spontaneously appointed her as an independent member, although she had not even applied. While Curie herself was not involved in the medical applications of her work, her discoveries had a tremendous impact on the field of radiation therapy. Without her work, radium might not have been discovered for many years and radiation therapy would have lost one of its most potent weapons. Perhaps more important to this chapter, Curie served as a role model to countless young women contemplating science as a profession and remains today the most famous and easily identified of women scientists in history.
But male physicians had more practical reasons to oppose women's entry into medicine. They feared there was already an oversupply of physicians and that women's entry might damage medicine's struggle for higher status. One way of keeping women out of the field was to deny them training. Before the 1860s recognized medical schools rejected women, although a few schools of homeopathy did accept them. The only place that a woman might receive a decent medical education was in Europe. In 1858 the first women's medical school was founded: the Boston Female Medical College. In 1869 the University of Michigan became the first coeducational medical school. In the next few decades more women's schools were founded, and a few more men's medical schools became coeducational, often encouraged by large donations from wealthy women. The number of female physicians rose throughout the nineteenth century, so that by 1900 women made up 5.6 percent of all physicians. The future looked promising for female physicians—in reality, they were to suffer a backlash from the medical establishment during the early decades of the twentieth century.

Some of the literature on the development of radiology has mentioned the accomplishments of a few individual women, without commenting on the general status of women within the field. Only one book on the history of radiology provided any attention to women as a group and did so in a demeaning and frivolous photograph and caption. In this chapter, we discuss the experiences of female physicians and scientists in the "nonfeminine" medical specialty of radiology, with attention to those who practiced radiation oncology and radiation physics during the first half of the twentieth century. The focus has been limited to those women who practiced radiation oncology or its related fields in North America and to the extraordinary women from abroad whose contributions greatly influenced the field in the United States. We investigate the issues pioneering women faced, record their accomplishments, and document their struggles.

**The Radiation Experimenters (1895–1905)**

During the late nineteenth and early twentieth century, the medical community changed its perception of illness as an imbalance of the entire body to the more modern view of illness as specific diseases with specific cures. This was largely due to the development of new theories and technologies which were effective at curing certain diseases. The germ theory helped explain and prevent typhoid fever, tuberculosis, and influenza. Vaccines were used to prevent rabies and smallpox, while antitoxins treated diphtheria and tetanus. Microscopes, stethoscopes, and ophthalmoscopes aided in diagnosis.

There was great enthusiasm about the benefits of science and the fruits of experimentation. The medical community and the public were optimistic that disease was no longer a mysterious terror; and that its causes and mechanisms could be understood. Physicians were confident that they had found the method by which all future discoveries would be made. The X-ray seemed the very embodiment of all that was hopeful in new technology and invention. Physicians quickly appropriated X-rays for their own uses and were eager to experiment with—and speculate about—their possibilities. Radiation therapy held great (if unexplained) promise for those who took the time to learn to use the equipment. The field was new and wide open: any physician could gain expertise quickly through experimentation and reading reports in journals.

At this time the number of women physicians in the United States was growing, and female physicians had won some well-publicized battles against discrimination. In 1893 the Johns Hopkins Hospital was the first prestigious institution to open its doors to women medical students along with its first entering class. However, many schools still would not admit women. Women who did attend coeducational schools were often treated poorly. Ida May Wilson was not allowed to observe "private" operations on men as a medical student in the
1890s and was sexually harassed by a professor at the Ohio Medical University. She then established a private practice only to find that patients were slow to visit a female doctor. Only the encouragement of her brother, also a physician, stopped her from quitting and becoming a nurse. However, Wilson stayed in medicine as a general practitioner and was one of the earliest physicians to experiment with the use of X rays. Like many practitioners then and for years to come, she incorporated X rays into her general office practice. (As late as 1910 only 27 percent of the members of the American Roentgen Ray Society [ARRS] could report that they practiced radiology exclusively.) In 1902 Wilson experimented with X rays in the treatment of three patients suffering with cancer. She believed she had successfully cured two of the patients with skin epithelomas but that the therapy had failed to affect the third, who had a large cancer which had already spread throughout the arm and axilla. In 1903 she published a paper on her experiments using X rays for the purpose of cosmetic electrolysis, and concluded that “the X-ray method is certainly the ideal way, as it is painless, leaves no scars, and is not tedious, either to the patient or the physician.”

Wilson did not publish further articles on radiology; perhaps because the radiology literature was more and more dominated by those who practiced and researched exclusively in the field.

Private schools were created to teach the new techniques of radiology to physicians (as well as to photographers and electricians who sneaked in the open back door of medicine to apply their knowledge of X rays). One woman, May Cushman Rice, became a faculty member at the Illinois School of Electrotherapeutics. Founded in 1899, the school taught the uses of both electricity and X rays. One of the school’s advertisements claimed that “a two week course will make you self-dependent.” While the male professors taught courses on X-ray diagnosis, radiotherapy, and radiography, Rice’s subject area was electrolysis. She may have been involved in the treatment of cancer as well; an article she wrote describing a case of uterine cancer does not make it clear whether she or the school’s head, Emil Grubbé, gave the X-ray treatments. However, she presented a number of papers to radiological societies on the therapeutic uses of X rays. While she was clearly active in the field, her area of specialization was not prestigious.

Compared to other areas of medicine, radiation therapy offered opportunities for female physicians. There was no need to be associated with institutions such as hospitals, schools, or medical associations to be a radiation therapist; all one needed was the equipment and a desire for experimentation. While women were not welcomed with open arms by the medical community, they were able to secure a place in radiation therapy from the very beginning. Many of the names of these women have been lost to us; they practiced radiation therapy as assistants or as office nurses in the shadow of male physicians. They appear now only as grainy figures in the backgrounds of photographs from the period.

**ONLY THE LONELY (1905–1920)**

Few women physicians were active in radiation therapy in the period between 1905 and 1920. The number of women physicians in general was declining due to the closure of women’s schools and the tight admissions quotas of coeducational medical schools. Only two women who practiced radiation therapy in respected institutions are easily identified, and these two practiced only for a short time. Two other women active in radiation therapy were found, but they worked in areas that were considered unimportant and marginal. The attractiveness of the field of radiation therapy to female physicians may have decreased due to the social reform movement of the 1910s and to the lack of technological progress within radiation therapy. The emerging understanding of the dangers of radiation may have discouraged women in the field as well.

When Johns Hopkins School of Medicine began to admit women in
MARGARET CLEAVES (1848-1917)

Margaret Abigail Cleaves emerges as the most important woman in radiation oncology in these earliest years. She was the first female physician to be involved in radium therapy and the first physician in the world to use radium in gynecology. She was one of only about twenty physicians in 1903 to gain access to radium and use it for clinical purposes. Her story demonstrates the appeal of radiation therapy to female physicians, perhaps because the field was more open to women than better-established (and entrenched) medical specialties.

Cleaves received her M.D. from Iowa State University in 1873 and specialized in psychiatry. Her career in psychiatry looked promising, as she rose to the level of physician-in-charge of the Women’s Department at the Harrisburg State Hospital for the Insane in Pennsylvania in 1880. While there she started a new program of treatment and speculated on the causes of insanity in women. At the time the prevailing belief was that gynecological disorders precipitated insanity in women. Female physicians, it was reasoned, should treat the gynecological disorders of these patients in order to improve their mental health. By 1882 Cleaves concluded that diseased reproductive organs led to illness in only a few (mainly venereal) cases; instead, she suggested that female mental illness may have been related to “the endless monotony of the lives of the majority of women” and “too frequent child bearing.” One of her biographers, Constance McGovern, suggested that by questioning the gynecological etiology of mental illness, she undermined the need for her position as a female physician.

Cleaves experienced resentment from her colleagues; they did not approve of her autonomy over the female wards. In each of her annual reports to the Harrisburg Board of Trustees, she made reference to this problem. Ultimately in 1883 she resigned her position to go into the private practice of psychiatry. The hospital trustees then changed the administrative structure of the hospital, citing “friction between the superintendent and the women physicians.” The subsequent female physicians in charge of the Women’s Department of the hospital were relieved of all autonomy in their positions. While practicing psychiatry, once again Dr. Cleaves’s role was questioned; when she asked to attend the 1881 meeting of the American Psychiatric Association, the request caused such consternation that she was not allowed to be seated as a member, although fellow male colleagues from her hospital were accorded this privilege.

Twenty years later Cleaves may have been attracted to the field of radiation therapy because it was a new discipline; there were no established institutions to stand in the way of hypothesizing and experimenting. In the early years of radium therapy, anyone who gained access to radium soon became an expert in the field; this was exactly what Cleaves did. In the 17 October 1903 issue of the Medical Record, Cleaves related how she inserted radium into the uterus of a woman with cervical cancer. Since 1901 she had been eager to experiment with clinical applications of radium, but was unable to do so until 1903, when Charles Baskerville, director of the
chemistry laboratory at the University of North Carolina, loaned her a tube of radium. The cervical cancer of a patient "had been declared inoperable by the best surgical talent," and internal X-ray treatments had improved it only somewhat. Cleaves believed that rays from radium could penetrate more deeply than X rays and so inserted the tube of radium into the patient's uterus for a total of fifteen minutes over two days. However, she had to return the radium to the chemistry professor, and no more applications were possible. A week later the patient was feeling well, and her condition was considered to be good. Cleaves concluded that since there were no guidelines for the use of radium in therapy, she would err on the side of short exposures with least danger to the patient; she felt her report "foreshadow[ed] an important place in medicine for radium."45

Margaret Cleaves wrote one of the first textbooks on radiation and its clinical applications, *Light Energy: Its Physics, Physiological Action, and Therapeutic Applications* (1904). She published regularly, writing a few articles every year about radiation, light therapy, and other uses of electricity in medicine. She maintained an interest in other research topics and wrote popular articles on the prevention of disease and the need for sex education for working-class women.46,47

Cleaves was the founder and chief of the Electro-Therapeutic Clinic Laboratory and Dispensary of New York City and a professor of phototherapy at William Snow's New York School of Physical Therapeutics. She served as the American editor of the British journal *Medical Electricity and Radiology* from 1903 to 1904.

Cleaves's views on female physicians' acceptance within medicine are unclear. In her autobiography she stated that "men have always accorded me my place in the profession. I have not had to ask for recognition even."48 On the other hand, her experiences with the American Psychiatric Association and the Harrisburg Hospital suggest that she did indeed experience some conflict. Cleaves was only one of a long line of female physicians who denied any personal discrimination, despite experiences which would suggest otherwise. However, she did reject what she saw as "the exploitation of women physicians as a separate and distinct labor from the rest of the profession."49

Cleaves's autobiography reveals that she was lonely and depressed much of the time. She believed herself to suffer from neurasthenia, a disease of nervous exhaustion in which she was quite interested. Today, she might have been diagnosed as depressive, suffering from radiation sickness or anemia, or having any of number of other diseases which were not well recognized at the time. The typical treatment for neurasthenia was a rest cure; she resisted this, preferring to remain active and care for her patients. Looking back on her life, however, she felt that her work had not been successful: "Scientific experimental work was begun which I never had strength to finish. Others had taken up the same line of work and brought it to a satisfactory conclusion, mine remains only a bit of wreckage on life's tempestuous sea."50

Cleaves blamed her failures on her illness, as well as a lack of social support: "all through life there has been stress and strain with no one to look after my needs." She had few friends and her only source of regular social contact was her physician. She described her patients as her family and friends, and declared that "science is my mistress." She felt that she could not relate to other women as equals because too often she felt professionally responsible for them. Being a physician was her primary identity, however, one of her fantasies was to "play I am a woman not a doctor."51

Societal expectations at that time placed a heavy burden on any woman who shunned the typical feminine life for a profession. Other women physicians found support and intimacy through marriage, relationships with other women, or adopting children: "for some women who chose to remain single, the decision exacted its price in loneliness."52 It is likely that some of the strain that Margaret Cleaves experienced was due not only to her illness, but to the lonely life she led and to the difficulty of defying society's pressures. Yet she still made great contributions as a scientist, physician, and author in the new field of radiation therapy.
In 1919 the roentgenology section of the Mayo Clinic was divided into a diagnostic section and a therapy section, which included both X-ray and radium treatment. However, soon the radium therapy was removed from Stacy's direction, and she returned to work in internal medicine. It is not known whether this was by her choice, or whether her superiors felt that one of the numerous returning veteran physicians should handle the increasingly important specialty of radium therapy. Her transfer coincided with the end of World War I and perhaps with the end of the demand for female physicians to treat European patients with gynecological cancers. Stacy remained at the Mayo Clinic until 1935. At that time she moved to a private gynecology practice in White Plains, New York. She worked there until her retirement at age eighty-three in 1966 and died in 1973.

Annabelle Davenport was the other woman who practiced in a well-known institution (Fig. 9.2). She was the first radiologist at the University of California at San Francisco. She taught a course in roentgenology in 1912 and 1913, which covered both diagnosis and therapy. She held the post of clinical instructor but never rose to the level of professor.

Women in many fields have often found that they gain the most acceptance in areas which are not prestigious, pay less, or are otherwise marginalized.
Between 1910 and 1920 X-ray therapy was overshadowed by the success of radium treatment, and both were overshadowed by the preeminence of diagnostic radiology. James Ewing of Memorial Hospital recollected that at that time “roentgenologists who engaged in therapy were looked upon with suspicion...there was little concept of the possibilities of roentgen therapy.”

One woman, Mary Elizabeth Hanks, spoke out against the neglect of X-ray therapy. A gynecologist who had studied X-ray therapy in the late 1910s, she decried what she felt was an excessive emphasis on diagnosis: “The whole medical fraternity in its engrossed, eager study of fascinating diagnostic problems, has seemed to lose sight of the prime object of all medical science, the cure of disease.” She felt too many roentgenologists did not care about research in therapy and only practiced therapy to bring in money. In an article titled “The Value of the Roentgen Ray in the Treatment of Uterine Fibroids,” she extolled the benefits of radiation therapy over surgery: no mortality, no anesthetic necessary, no hospital stay. Yet, because so many doctors were ignorant of the advantages of radiation therapy, “hundreds of women continue to form the same procession to the operating table, just as ten years ago.” Hanks believed that if physicians took proper care in technique, radiation therapy held more promise than surgery in the treatment of fibroids. She blamed her fellow physicians for not taking advantage of the opportunities presented by radiation therapy. Little heed was taken of her opinions until the 1920s, when Coolidge tubes and improved apparatus enabled more powerful treatments.

Mary Arnold Snow was active in an even less reputable field: electrotherapy. Along with her famous husband, William Benham Snow, she coedited the American Journal of Electrotherapeutics and Radiology in the late 1910s. She was primarily interested in the clinical applications of mechanical vibrations but published on a number of applications of X-ray, including inflammation and the treatment of uterine hemorrhages and fibroids. During this time most radiologists were attempting to dissociate themselves from electrotherapists, a group at odds with the American Medical Association (AMA), the ARRS, and most of established medicine. Radiation therapy limited itself to X-rays and radium; electrotherapists used electricity, mechanical vibrations, ultraviolet light, sunlight, and a host of other agents. The medical establishment believed electrotherapy’s techniques had little medical value and labeled electrotherapists as quacks. The historian E. R. N. Grigg described Dr. Snow and her husband as two of the few ethical and reputable physicians involved in the field. While they may have maintained their individual reputations, their field was not highly regarded.

There are a number of reasons why there were so few women in radiation therapy during this period. Physicians of both sexes had abandoned the field, as it seemed to have lost some of its initial promise. Radium was in short supply, and the difficult-to-operate X-ray apparatus seemed better suited to diagnosis than therapy. Certainly both men and women had doubts about the future of the field.

In addition, fewer women were graduating from medical school, and most of these were faced with the peculiar dilemmas presented by the social medicine of
the Progressive era. Although some, like Dr. Mary Putnam Jacobi, believed that women were the equal of men in medical practice and abilities, more popular was the belief that women were better suited to the "feminine" specialties: obstetrics, gynecology, child welfare, nutrition, and hygiene. The Progressive era was characterized by reform—new movements attempted to solve problems connected to housing, sanitation, education, poverty, and health. Female physicians found they could have a place within the movement by concentrating on public health issues—child welfare, nutrition, hygiene—which coincided neatly with the designated feminine specialties. Radiation therapy had little to do with social reform and, with its flying sparks and heavy machines, was not especially feminine. Thus, women physicians may have been more eager to enter specialties where they could join in the social reform and where they were welcomed.

As other fields in medicine welcomed women, radiation therapy seemed to have lost much of its promise. Even though radiation therapy had not yet erected professional barriers to women, it is little wonder that few women chose to enter the field at this time. As for those who did, it must have been a lonely experience.

Opportunities Open (1920–1938)

The numbers of women involved in radiation therapy increased dramatically in the period between 1920 and 1938 as more women were attracted to the field. Some women in this era owned their own equipment, became heads of departments, or ran their own schools. Most of these women had early opportunities in the 1910s upon which they were able to capitalize. Some women were able to advance their careers through the support of male mentors, by filling in for colleagues during World War I, or by establishing their own institutions.

Radiation therapy was more attractive to women in this era for a number of reasons. The effectiveness of the therapy itself had increased. Higher voltage machines and more reliable Coolidge tubes enabled X rays to penetrate further and more predictably into the tissues of the body, raising the chances of curing malignant disease. New treatment techniques were developed using radium. Rather than just placing the radium in contact with the skin or in a body cavity, "seeds" of radon gas were inserted directly into diseased tissue. Radiation therapy was no longer limited to skin conditions and a few restricted types of cancer.

In addition, as the social reform movement of the Progressive era ended, nonfeminine specialties like radiation therapy were becoming increasingly attractive to women. These women believed that the male establishment was more accepting of them and that discrimination was lessening. While hindsight shows this to be overly optimistic, there seems to have been less emphasis on their identities as female physicians. Rather than entering medicine with a spiritual mission to endow it with feminine morals, they could simply be doctors.

Women in this era still faced formidable barriers. A survey of medical school deans showed that in the schools which admitted women there were often policies designed to severely limit the number of female medical students. The number of female medical students accepted stayed at a steady 5 percent until World War II. More students than ever were applying to medical school, allowing the schools to become more selective.

A further barrier to advancement was the lack of postgraduate training for women. Many internships were closed to women: in 1926, 527 hospitals restricted their positions to men only, while only 127 would hire women. Of those 127 hospitals, many would consider a woman only when no qualified man was available. Internships were not yet mandatory to enter the field of radiology; experience could also be gained through preceptorship to an experienced physician, short postgraduate courses, or on-the-job training. Nevertheless, internships were a mark of achievement. In the 1930s, after the newly-formed specialty board, the
American Board of Radiology (ABR), set training requirements for certification, the need for internships became much greater. The increasing need for an internship placed another burden on women; even if they were accepted, this meant delaying full earning capacity for a year or more. Women were less likely to have outside financial support; few families were willing to give their daughters funds for a nontraditional career. Less part-time work was available for women, and when it was available it was at lower wages. In this way, the emphasis on specialization and postgraduate training hurt female physicians.72

Internships did open up for women in the latter years of World War I, due mainly to the shortage of men. Monica Donovan, for example, graduated from medical school at Stanford at an opportune time—1917 (Fig. 9.3). She was taken on as an intern in the radiology department that year, and made an associate two years later. She went on to be quite successful; she became an instructor at Stanford Medical School and in the 1930s was the head of the radiology department at St. Mary’s Hospital in San Francisco.73,74

Jobs as well as internships opened for women as men left for war. Elsie Fox already had training in radiology when she was able to take a male physician’s place as a radiologist at the City Hospital on Welfare Island, New York (Fig. 9.4). However, her male colleague returned a year and a half later from his military service, and she was obliged to leave. With her previous experience she was able to find another position as a radiologist for the Bronx Hospital in New York.75 Gisela Von Poswick had a similar opportunity. She graduated from the Women’s Medical College of Pennsylvania in 1911, but her first experience in radiology was not until 1916, when she was able to gain a position as a radiologist at Hahnemann Hospital in Scranton, Pennsylvania. The position lasted until 1918 and the return of veteran doctors; in later years, she would develop her own private practice.76

Cassie Belle Rose also had the advantage of beginning her career during World War I and went on to advance farther than any other woman in radiology therapy at the time (Fig. 9.5). She graduated from Rush Medical College in 1914, was an intern at Mary Thompson Hospital, and then returned to Rush to work in the radiology department in 1916.77 In 1922 she became the head of the department of roentgenology at Presbyterian Hospital in Chicago and served as an associate clinical professor on the faculty of Rush Medical College. After twenty years at Rush she moved to...
Colorado and became the radiologist at
the Porter and the Boulder Sanitarium in
1936.78,79 She worked there until her
death in 1942.

A number of women found experi-
ence through unconventional paths.
During World War I the Army refused to
commission women as medical officers.
Some women found their way around
this by setting up their own hospitals in
Europe: the American Women’s Hospi-
tals. Barbara Hunt organized a field
hospital in France and treated several
cases of cancer during the war. Previ-
ously she had not decided on a specialty, but
her wartime experiences sparked her
interest in radiotherapy.79

Elsie Fox also found training in a non-
traditional way. She worked as a volun-
tee part-time technician and assistant in the
Radiotherapy Clinic of the Mount Sinai
Hospital Laboratory from 1915 to 1917.
The experience she gained through this
volunteer work may have helped her gain
a paid position as an assistant radiologist
in the X-ray Therapeutic Clinic at the
New York Postgraduate School and
Hospital.80 From there, she was ready to
take advantage of opportunity when
World War I began.

A number of the women in this era
had the support of men, often more
established in the field, who were able
to aid them with their careers. Zoe
Allison Johnston (Fig. 9.6) had the sup-
port of a physician father. After graduat-
ing from the Women’s Medical College
of Pennsylvania in 1911, she practiced
medicine with her father for three years,
and then went into partnership with a
pioneer radiologist, Russell Boggs, until
his death in 1922. She continued on in
a series of partnerships with male physi-
cians until retirement in 1949. Her skills
as a radiologist were gained through her
work with Boggs rather than in formal
training.81 Johnston was a well-respected
physician, especially noteworthy for her
leadership in numerous organizations:
the American Medical Women’s Associa-
tion, and the Allegheny County Medical Society. She
was president of the Pittsburgh Roentgen Ray Society,
the Pennsylvania Radiological Society, the American
Medical Women’s Association, and the
Allegheny County Medical Society. In
addition, in 1935 she was honored as
the first woman elected to be president
of the American Radium Society (ARS).
Barbara Hunt (Fig. 9.7) also enjoyed a
close relationship with her father. He
was himself a physician, and was eager
to have her follow in his footsteps.
When she began to practice medicine in
1912, she assisted him in surgical opera-
tions until she left to organize hospitals
in France. Thus, she was able to gain
experience while supporting herself
through her practice.82

Several of the women radiation
therapists found freedom by practicing
One woman chose not to create an institution but to recreate herself in order to practice in the field. Alberta Lucille Hart graduated with the highest honors from the University of Oregon Medical School in 1917 and was the only woman in her class (Fig. 9.9a). After medical school, she decided to adopt a male identity and changed her name to Alan Lucill Hart (Fig. 9.9b). By living as a male doctor, Hart enjoyed a power and freedom denied to many women and went on to specialize in radiology and to write a popular book on X-ray therapy. In 1925 Alan Hart took a wife, and after many years of practice in radiology, died in 1962. It is hard to say whether Hart's lifestyle helped or hindered; while there may have been less discrimination on some counts, on at least one occasion Hart was recognized by a past acquaintance and hunted out of town by the local physicians.86,87,88

Creating one's own institution is not easy in any specialty, but particularly difficult in radiology. Many historians of medicine have used radiology as the primary example of the hospital-based specialty: "radiology grew directly out of hospital needs and largely in hospital contexts" and "the hospital became the setting for training and a good proportion of radiological practice."89 Working on their own may have been somewhat unorthodox, but it gave these women more control and a chance to escape from some of the hostilities seen in male-controlled institutions. A few women seem to have thrived in these institutions. Rieva Rosh (Fig. 9.10) worked at Bellevue Hospital as an associate visiting radiation therapist in the 1920s and later as an assistant in surgery at the New York University Medical School. She was interested in bone tumors, published widely in the field, and was an influential teacher.

The appeal of radiation therapy and its increasingly effective technology found more women entering the field in this period. Professionalization of the field sometimes obstructed the entrance and advancement of women; but many found other ways to gain experience and positions. Their methods proved
successful as they found satisfying and innovative work in radiation therapy.

**THE SEARCH FOR AUTONOMY (1938-1950)**

From the late 1930s to the 1950s, the field of radiation therapy was changing; fueled by war-inspired research, new equipment such as supervoltage machines and the electron beam were introduced. Women during this transitional age began their careers in the so-called Golden Age of radiology, the period between the two world wars, in which many developments occurred in X rays and radium. During this time, many women became deeply involved with the research that was changing the field so rapidly. Opportunities were opening for women, but they still faced discrimination in residency training programs, in publication of scientific work, and in academic advancement. Perhaps the most important issue for many women was autonomy; many radiotherapists, both men and women, felt they did not have sufficient control over the management of their patients.

The number of women in medical school stayed at a steady 5 percent throughout this period, except during World War II, when declining male enrollments forced the admission of more women. Once in medical school, women faced additional challenges: Anna Hamann, for example, had the privilege of being taught physics by Professor Röntgen himself in Germany. However, Röntgen was not fond of medical students, and even less fond of women medical students. When she was late for class one day, he failed her in the course. She was reinstated only after her father, also a physics professor and respected colleague of Röntgen, intervened on her behalf.

![Fig. 9.9a Alberta Lucille Hart](Author's collection)

![Fig. 9.9b Alan Lucille Hart](Author's collection)

![Fig. 9.10 Rieva Rosh, center front, in the fall of 1942, in a photograph taken by Dr. Louis Raider at a staff outing at Dr. Rosh's home in Connecticut.](Author's collection)
By the late 1930s postgraduate training was required for those who wanted to enter the field of radiology. In 1938 the five national societies of radiology gathered to form the ABR, a national board that would "protect the public from irresponsible practices and preserve professional dignity" by certifying qualified radiologists. In addition to passing the examination, candidates also had to have had a one-year internship and a three-year course of study in radiology. Outstanding radiologists were "grandfathered in" without examination for the first few years, and then the process was discontinued.

At the beginning of World War II, of the 712 hospitals which offered internships, only 105 accepted applications from women. Given that an internship was necessary for board certification, this created an even greater institutional barrier for women to overcome. Two of the women of this era managed to escape the American internship. Anna Hamann was already a well-established physician when she immigrated from Germany, and Vera Peters substituted personal training in Canada in place of official postgraduate training.

Even those hospitals that claimed to accept women for an internship year did not always encourage them to enter. Ruth Gutmann, for example, applied for a residency at Memorial Hospital in New York in 1940. The director of the hospital, James Ewing, advised that rather than accept the residency, she would be better off to "settle down in the country." She was crushed, but persevered. Ewing agreed to accept her on a six-month probation. At the end of the probationary period, he agreed that she could stay for another six months; she remained at Memorial Hospital for nine additional years, working as a member of the staff when her residency was complete.

Florence Chu chose radiology as a specialty because it fixed hours allowed time for family (unlike surgery or medicine). She then chose therapy over diagnosis because she enjoyed the patient contact. Selma Hyman also looked for a specialty that would permit family time and first chose pathology. She was not accepted into a pathology residency and felt that it may have been because she was a woman. However, she did accept a radiology residency at Brooklyn Jewish Hospital. Esther Martin wanted to combine her love of sculpture with medicine by becoming a plastic surgeon but found that the field was "entirely closed to women." Instead, she entered radiology. Ruth Gutmann chose radiology for a pragmatic reason—it was the only residency open when she applied to Memorial Hospital. She specialized in therapy for the same reason as Chu—she enjoyed the patient contact.

World War II has been acknowledged as a time of opportunities for many women in medicine due to the shortage of men. Even Harvard Medical School, one of the last bastions of male-only medical education, finally became coeducational. Across the country, the numbers of female medical students rose, and many internships were opened to women. The women discussed in this section were already established in their careers by the time of World War II and were not able to benefit from increased medical school admissions or opening of internships.

For two of the women of this era, the political situation before World War II provided urgent reasons to leave their native Germany and come to America. Anna Hamann came from Germany, and Ruth Gutmann was born in Germany and was beginning her internship there when her father's anti-Nazi politics made it necessary for her to leave Germany and move to the United States.

All of these women were involved in research, exploring the possibilities of new technologies and reexamining past assumptions. For some, recognition for their work trailed their research by decades, often because of the hostility of their peers and the rejection of their ideas by radiology journals and meeting program chairs.

Not all women experienced hostility from their peers. Selma Hyman always felt welcomed and accepted by her colleagues. She relayed, however, that she had never been ambitious for status. During her stay at the University of
Anna Hamann (1894-1969)

Anna Hamann was born near Hamburg, Germany, and studied medicine at the University of Munich, where her physics professor was Wilhelm Röntgen. Her doctoral thesis, presented in 1924, was on radiotherapy, which she subsequently practiced in hospital settings in Germany. On attending the 1937 International Congress of Radiology in Chicago, she made arrangements to come to the United States to work as a radiation therapist at the University of Chicago. Her father was a socialist and also was at odds with the Nazi party. It was rumored that Anna had helped Jews leave the country and had been forced to emigrate when suspicion fell upon her.103

Once in the United States, however, she faced suspicion that she was a German spy. This was in part because of her frequent trips to Germany to visit her ailing mother. More important, she was viewed with suspicion by those in Enrico Fermi's lab, in which key research on the atomic bomb was being conducted. The Federal Bureau of Investigation kept Anna under surveillance, although she was never questioned. Workers at the University of Chicago were warned “not to get too close” to her.104 One of Hamann's colleagues believed that her German background “denied our [the University of Chicago's radiology] department any but a marginal connection with the Manhattan Project.”105

Anna Hamann was aware of the distance kept by her fellow physicians, as demonstrated by a story she later told. She once fell into a ditch dug for a sewer line and broke her arm. She jokingly noted that she “must get out in a hurry or some of my professional colleagues from the University of Chicago might start throwing in the dirt.”106 One of her acquaintances believed that she was distrusted because she was German, but it is also possible that her forthright manner did not sit well with her peers.107 A further difficulty for Hamann was that she had lost her fingerprints from her prior exposure to radium, and this presented a problem for security at the University of Chicago. Her habit of wearing tiny pearl-buttoned kid gloves at all times (even in the clinic) added to her reputation as an eccentric. Denied advancement at Chicago, she went on to head up her own department at the Evanston Hospital.
Oregon Medical School, she never had to compete with a man to head the department of radiology because she never wanted to become the chair. She wanted to be involved in the clinical side of medicine, not in climbing the academic hierarchy. This may have removed many potential sources of tension for her.

Three women from this era did become heads of their departments; Ruth Guttman (Fig. 9.11) was the director of the Department of Radiotherapy at the Francis Delafield Hospital at Columbia University from 1955 to 1976, and Florence Chu was the chair of the Department of Radiation Therapy at Memorial Hospital from 1976 to 1984. Anna Hamann, on the other hand, was never promoted beyond associate professor during her long career. She did become the director of the Department of Radiation Therapy at Evanston Hospital; when younger men were promoted to head the radiotherapy departments of several hospitals associated with Northwestern University, she felt passed over and commented that they were too young for the job.

One of the greatest issues for many of these women was that of professional autonomy. For example, when Hamann was at the University of Chicago during the 1940s, she was frustrated by the lack of admitting privileges. Furthermore, younger physicians, even residents in other fields, could discontinue the treatment of her radiotherapy patients. Hamann left the University of Chicago for the Evanston Hospital in 1948. During her negotiations with the director of the Evanston Hospital, she specifically requested written approval for "some sort of security for the position of a hospital radiotherapist as to its independence on changes in the administrative and professional staff." The director was able to assure her that her position as director of the radiation therapy department would be permanent and independent; she accepted his offer and left the University of Chicago for the more secure and independent position at Evanston Hospital.

Other women had similar experiences. According to one of her colleagues, Ruth Guttman felt that she was nothing more than a technician at Memorial Hospital and did not have control over her work. Guttman stayed on staff at Memorial until 1950; Florence Chu began working there in 1949, and her opinion was that it was hard for the radiation therapy department to gain independence because Memorial Hospital was a surgically-oriented institution. As the field of radiation therapy became more complex, she felt that the situation improved. Guttman and Hamann found similar solutions to their similar problems—they left, finding independence in other institutions. Radiation therapists in general had difficulty obtaining referrals from surgeons, but the problem seems to have been enhanced for the female radiation therapists.

Women in private practice had more control over their own practices. For example, when Selma Hyman was frustrated by the lengthy delay and complex bureaucracy surrounding the purchase of a supervoltage machine in her department at the University of Oregon Medical School, she left and joined her husband's private practice of radiother-
apy. Together, this husband and wife team bought and ran the first private practice cobalt unit on the West Coast of the United States (Fig. 9.12). But not all women who worked in hospitals felt their autonomy was limited. Vera Peters felt that the surgeons at the Toronto General Hospital were happy to give up cancer patients to the radiation therapists and did not attempt to interfere with their treatment.¹¹⁵

As radiation therapy became a more accepted profession, women had to cross even more barriers to advance in the field. There were fewer ways to gain practical experience outside the required internship, and the possibility for doing research became limited to academic institutions. However, within academia female physicians found little autonomy, and a number turned to more flexible positions offered in private practice. Those who persevered in academic centers found that their work was not always taken seriously. While women were making impressive contributions in radiation therapy, their accomplishments were not always recognized.

**Recognition At Last (1950–1960)**

While the number of women in the field of radiation therapy did not increase during these years, these women are distinguished from those in earlier eras by the fact that they rose to greater heights in their careers and received more of the recognition due to them. Many of these successful women had been able to find supportive work environments and felt that they had not suffered for their gender. Nevertheless, discrimination had not disappeared from some of these women’s lives.

During and immediately after World War II, the enrollment of female medical students doubled from 5.3 percent of all graduating students in 1941 to 12.1 percent in 1949. In the postwar era, when male entrants were once again graduating, the percentage of women dropped back to prewar levels.¹¹⁶ Since the women of this era graduated from medical school during the 1940s and 1950s, one might expect to see this surge in enrollment demonstrated in the number of women active in the field, but this was not the case. Norah Tapley and Patricia Trettler were among the few women physicians in radiation therapy who graduated from coeducational schools during the peak years of 1948, 1949, and 1950. Radiation therapy did not experience an influx of women due to World War II.

The women graduating during the peak years of 1948 to 1950 may have found themselves directed into traditionally feminine fields, such as pediatrics or psychiatry. After the war, there was a strong cultural backlash against women who worked. Many women physicians were removed from hospital positions to make room for male physicians returning from war. The “cult of domesticity” demanded that women return to their traditional place at home with family after their brief experience in the working world during World War II. Although the number of employed women continued to rise, new female workers tended to be older women who had raised their children and were entering lower-level jobs in clerical service work.¹¹⁷ Faced with a society that disapproved of women entering professional fields, female medical graduates may have found it easier to specialize in a feminine subspecialty.

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*Fig. 9.12 Selma and Milton Hyman (Author's collection)*

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Women In Radiation Oncology and Radiation Physics
A number of the women interviewed for this chapter had strong family support in entering medicine. Eleanor Montague was the child of Italian immigrants, and her father worked as a coal miner, along with other jobs, during the Depression. Her family saw education as the only path for advancement and felt that medicine would be a good career. Lillian Fuller had an interest in commercial art, but decided that the field was very limited. Her secondary interest was medicine, which her parents supported (Fig. 9.13). During medical school Fuller contributed cartoons to the school paper. A professor of radiology asked her to draw illustrations for a cancer detection brochure, and he influenced her decision to enter radiation therapy. Patricia Trotter had initially wanted to be a nurse, until the sixth grade, when her father pointed out that she might prefer giving orders rather than taking them; at that point, she changed her career goal to that of physician.

Eleanor Montague chose radiology because its hours allowed time for family, and radiation therapy because she felt that seeing patients was more exciting than reading films and performing fluoroscopy in the dark. She worked in a radiology department prior to entering medical school and initially had some interest in diagnostic radiology but was only able to find a position in radiation therapy. Norah Tapley had an early interest in diagnostic radiology, but changed to therapy after training under Morton Kligerman. Initially, she had difficulty with the depressing aspects of therapy; on more than one occasion she was found weeping in the corner of Kligerman’s office, unable to complete her assignments because she could not bear to see terminally ill patients. However, she was determined to prove to Kligerman that she could do the job. In fact, she did such an outstanding job that he later recruited her to a faculty position at Columbia University.

A number of the women of this era had the same mentor in Morton Kligerman. He helped both Lillian Fuller and Eleanor Montague find positions with Gilbert Fletcher at the M. D. Anderson Hospital. In 1954, when Kligerman was in the midst of recruiting Norah Tapley to a faculty position at Columbia, evidence of salary inequity and discrimination against women became apparent. The hospital intended to pay Tapley considerably less than what they had paid the male who previously had filled the position to which she was being recruited. Kligerman objected and threatened to resign as director of the radiation therapy teaching service if the hospital did not pay Tapley a salary equal to that offered to males. Eventually the hospital relented, and she joined the radiation therapy department at a standard salary level. Many women at the time must not have been so fortunate to have such a determined and powerful mentor.

Three women of this era, Fuller, Montague, and Tapley, worked at the M. D. Anderson Hospital in the radiation therapy department chaired by Gilbert Fletcher (Fig. 9.14). Fletcher was a strong believer in the merits of women physicians; his own wife was a pediatric ophthalmologist. His department had equal pay for men and women for equal levels of advancement. It does not come as a surprise that the women who advanced the farthest came from an unusually supportive environ-
clinical skills. Norah Tapley contributed definitive work on the physics and clinical use of electron beam therapy; her book, *Clinical Applications of the Electron Beam*, was the standard in the field (Fig. 9.16). She also did pioneering work in the use of radiation therapy in the treatment of infants with retinoblastoma. She was well recognized by her colleagues: she was a fellow in the American College of Radiology (ACR), an editor of the *International Journal of Radiation Oncology, Biology, and Physics*, a trustee of the ABR, and president-elect of the ARS at the time of her death.¹³³,¹³⁴

Eleanor Montague specialized in the treatment of women with breast cancer; she "pioneered many techniques and approaches to the treatment of breast cancer which are standard in the treatment of breast cancer today" (Fig. 9.17).¹³⁵ She received the gold medal of the American Society of Therapeutic and Radiation Oncology (ASTRO), the gold medal of the Radiological Society of North America (RSNA), the Janeway Lecturer of the ARS, and many other honors. She was also active as a member of the board of directors of ASTRO and on many committees.

In contrast to the prior era, women of this period were promoted within their departments. A number of women became directors or chairs of their departments. Norah Tapley was the director of the radiation therapy department at Presbyterian Hospital in New York in the late 1950s. Martha Southard (Fig. 9.15) was cochair of the Department of Radiation Therapy and Nuclear Medicine at Thomas Jefferson University Hospital. In 1979 her colleagues honored her by presenting her portrait to the university; she was the first woman in the history of the school to receive this honor. She was often considered the alter ego of Simon Kramer, chair of the Department of Radiation Therapy. She took responsibility for both clinical practice and residency training when he was away. She specialized in the treatment of gynecological malignancies and lymphomas. She died from cancer in 1979.¹²¹,¹²⁵,¹³⁶ Lillian Fuller was the deputy chair of the Department of Clinical Radiotherapy at the M. D. Anderson Hospital from 1986 to 1990.¹³⁷ Compared to the earlier experience of Anna Hamann, who retired after a long and productive career while still at the level of associate professor, women in this later era fared much better.

While some women in this period found their achievements ignored or recognition delayed, many received due recognition for their research and
organize and chair a radiotherapy section in an oncology cooperative group. Her major focus was in malignant lymphoma. Martha Southard specialized in the treatment of gynecological cancer and lymphomas and became the president of the Keystone Area Society of Radiation Oncologists. Joyce Kline Puletti also specialized in gynecological cancer and was awarded fellowship in the ACR (Fig. 9.18). She was a president of the Wisconsin Society of Radiation Oncologists and was the associate director and clinical director of the division of radiation oncology at the University of Wisconsin Hospital and Clinics. Florence Chu (Fig. 9.19) was acknowledged as a major contributor and received the prestigious Marie Curie Award from the American Association for Women Radiologists (AARC) in 1993.

Women of this era felt they had chosen their careers well; most believed that women physicians had to work harder than men but that overall they did not suffer for being female. They were able to advance further in their careers and received more honors and recognition than women in prior eras. However, their numbers were still small: they could not depend on other women radiation therapists for support or as role models because there were so few of them. The of the ACR, the ARS, and the American Cancer Society. In 1993 she was inducted into the Texas Women’s Hall of Fame.

Other women in the field also have received distinctions and honors for their work. Lillian Fuller, a fellow of the ACR, served on numerous national and international committees concerned with the treatment of Hodgkin’s disease. She was the first radiotherapist to
Vera Peters (1911-1994)

Vera Peters is acknowledged as a pioneer in research on Hodgkin's disease and breast cancer. Her decision to choose radiology and then radiation therapy was influenced by the inspirational and brilliant Gordon Richards, who treated her mother for breast cancer when Peters was a medical student. When she graduated from medical school, Richards became her personal mentor, directing her postgraduate training. In 1940 she was the first to examine the use of radiation in the treatment of patients with Hodgkin's disease, then regarded as uniformly fatal. In 1950 she published a seminal paper demonstrating otherwise: patients with pathologically proven Hodgkin's disease treated with radiation therapy had five- and ten-year survivals of 51 percent and 35 percent. She had difficulty getting the paper published. The Canadian Medical Association Journal rejected it, claiming its tables were too intricate. She believed that the initial rejection of this paper and the disbelief of the data were related to the fact that she was a woman. Only people who worked closely with Peters believed that her research was valid. In the late 1950s the medical establishment began to take an interest in Hodgkin's disease, and soon others were demonstrating what Peters had already proven. Twenty-nine years after her 1950 paper, the American Society of Therapeutic Radiology (later ASTRO) awarded her its highest honor, the gold medal. In doing so it was acknowledged that: "This [the 1950 paper] was a major paper in the history of the profession's approach and understanding of this disease, although it was some years before many members of the profession accepted the viewpoint demonstrated by the data analyzed and reported by Dr. Peters."

Even after her research was validated, she was not always accepted by her colleagues. Other radiation therapists endeavored to keep her off committees, scoffed at her work, and told her to specialize in a different area, such as breast cancer research. They seemed to be jealous of her success; she felt sorry for them, and tried to ignore such "little things." Her conclusion was that none of the poor treatment she received mattered as long as she knew that she was doing the right thing.
numbers of women in radiation therapy would not increase until the 1970s.

The numbers of women physicists and biologists involved with radiation therapy increased during this period as well, including the work of Edith Quimby (see sidebar on Quimby in Chapter 4). Henrietta Corriigan was involved in the measurement of radiation dosage, the effects of radiation on the brain, and the application of radioisotopes. She was an assistant professor of radiology at Wayne State University. Lucille Ann DuSault was unusual in having only a bachelor's degree, but was able to contribute a great deal to the area of time/dosage research. Elizabeth Focht was a world authority on the effects of radiation on the eye and was a member of the staff at the New York Hospital.

Anna Goldfeder (Fig. 9.20), a radiobiologist who was neither a physicist nor a physician, made many contributions to cancer research in more than sixty years of work. Born in Poland in 1897, she came to the United States in 1931. She developed methods for culturing human breast cancer cells, bred a strain of mice with no naturally occurring tumors, researched the effectiveness of different radiation dosages, and demonstrated the necessity of radiation shielding during treatment. She was the director of cancer and radiological research at the New York City Hospital Department, and did research at Harvard, Columbia, and New York University. She was extremely dedicated and continued to do research in her laboratory in the Delafeld Hospital for years after the building had officially closed. She died in 1993; in an autobiographical essay, she stated that she had no regrets about choosing cancer research despite the complexity of the field, for its very intricacy had been her reason for selecting it.

DEFINING ISSUES FOR WOMEN IN RADIATION ONCOLOGY

Family Decisions

Women physicians in every era have had to consider whether or not to have families of their own. Medicine is a demanding profession, particularly for women, and balancing the demands of both family and career is delicate. When female physicians have chosen both, many found that their male colleagues believed them no longer capable of high quality work.
Most of the earliest women radiation oncologists did not marry or have children. Margaret Cleaves is one of the few women who became her view known on the subject, describing her patients as her family and declaring that "science is my mistress." We know little about the women of these early years. Leda Stacy never married; Mary Arnold Snow married and collaborated with her husband in the editing and publishing of their journals. We have no personal information on Annabelle Davenport or Mary Hanks.

Among the women who practiced during the following era, 1920–1938, the group was split between those with families and those without. Elizabeth Newcomer married a fellow radiologist; they met in medical school and later practiced together. They specialized in different areas, he in diagnosis, she in radiation therapy, which may have reduced competition between them. They had one son. Zoe Allison Johnston married an attorney, and they adopted a child. Barbara Hunt never married; she believed "she could never have been a good wife to any man." This did not stop her from raising children—she adopted four and was pleased to see one son follow her to become a physician.

Many of the women radiation therapists in this era did not marry or have children: they include Monica Donovan, Elicie Fox, Gisela Von Poswick, and Cassie Belle Rose. It is interesting to note that the women who did have families were in private practice. The women whose careers advanced further academically or by running institutions did not have families. Single women had more time to devote to their careers, while married women may have found less acceptance because of their marital status.

During the next period, 1938–1950, much more information was available on how women handled families as well as careers. Those women who had private practices felt that they had an advantage in balancing work and family. Since they set their own hours, they could adjust their schedules to family demands. Selma Hyman felt she was capable as both mother and physician when she practiced with her husband as her partner, and it was easy to be relieved at work if a family emergency called.

Esther Martin took the combination of work and family one step further; she established her radiation therapy practice in the basement of her home. This included several examination rooms and two kilovoltage machines. Her husband had his neurology office on the first floor, while the family lived on the second floor. This integration of professional and personal lives was not disruptive. "For us as children, it was never as though our parents were away at work—just downstairs...if we needed to see mother, more often than not we'd just wander into the examination room after a discreet knock, somewhat to the bemusement of the patients," her daughter wrote. Martin initially had an academic position, which carried with it little flexibility. She was the assistant director of the Chicago Tumor Institute from 1943 to 1946. During this time, while her husband was away at war, she balanced a demanding career and raised her children alone. In 1944, with one infant daughter, Suzannah, and pregnant with her second daughter, Priscilla, she worried about being dismissed from her position because of the pregnancy. She successfully concealed her figure by wearing tight girdles and bulky laboratory gowns. When a colleague at the hospital was told that "the baby has come," he replied, "I didn't know Suzannah [her older child] had been away." Martin kept up a full-time career throughout but did admit, "it isn't easy to juggle family and home with work." Her experiences in an academic practice may have prompted her decision to enter private practice, where she could create a more flexible work environment for herself (Fig. 9.21).

Some women with families stayed in the academic arena. Florence Chu felt that it had been necessary to divide herself between her work and her family, and that her family had suffered as a result. She had a housekeeper to help take care of the children, and her husband shared the responsibilities. On the other hand, Vera Peters felt that bal-
ancing work and family had been easy with a supportive husband and live-in help. Not all women had children, of course. Ruth Guttmann was married and did not have children. Anna Hamann never married—she was "married to her work" and thought of herself as a physician before she thought of herself as a woman, according to one of her friends.\textsuperscript{136}

In the next era (1950–1960) there was a nearly equal division between women who had children and those who did not. Norah Tapley never married but dedicated herself to her work. Lillian Fuller was married during her career in radiotherapy. Although she had no children, she believed that balancing the responsibilities of a physician, a wife, and a mother was not always easy for her colleagues who had done so.\textsuperscript{137} Patricia Trettel found balancing work and family to be easy, as long as she had good live-in help. When the help was not reliable, "then it got rough," but for the most part she felt little difficulty.\textsuperscript{138}

Eleanor Montague had two children before her residency and two more later in her career. After the birth of her children she spent only a month or two at home before returning to work. She also had occasional problems arranging for child care: on one occasion she had to take a few weeks off from her residency to find someone to replace a previous helper. Her supervisors allowed her the time off but warned her that it should not happen often. When one of her children needed extra care for several years, Montague moved from full-time work at the M. D. Anderson Hospital to the less pressured Methodist Hospital for a part-time position. She felt that the work was less interesting, but it allowed more time at home. After a few years her father moved in with the family and helped with child care, freeing her to return to a full-time practice of radiation therapy.\textsuperscript{139} The authors cannot recall ever hearing a similar story from a male physician.

A gradual evolution seems to have taken place in the way female radiation therapists were able to juggle families and careers. The earliest women did not marry or have children; in the next group, those who had families generally had private practices, while those without families advanced farther within the field. During the more recent era women have found that they could balance a family with an academic career, but that it was difficult. The academic arena was not noted for being accommodating, and women without reliable child care or with children needing extra attention experienced additional burdens. Private practice appeared to allow a flexibility which eased the strain of balancing motherhood with medicine.

**Discrimination**

Many women in medicine have faced discrimination at some point in their careers. In the early part of the century this was quite blatant. As the years went on formal barriers gave way to more subtle forms of bias. Women were hired but at lower rates of pay and were less likely to be promoted than their male colleagues. Many women were criticized for choosing demanding careers instead of becoming full-time homemakers.
It is difficult to speculate about the experiences of the earliest women in the field. For instance, we do not know whether Leda Stacy wanted to give up her work on radium therapy at the end of World War I or whether she was removed against her wishes. Thanks to personal interviews and better information, we know much more about women's experiences during the next two eras. We have seen that women faced discrimination in many different ways, from helpful suggestions that they should settle elsewhere to the offer of longer hours for less money. Many women physicians believed they had been expected to work harder than men. Esther Marting specifically counseled a group of female premedical students. "You must work harder than your male counterparts, be so good that you are acceptable when the opportunity comes."\(^\text{160}\) The female radiation therapists also felt that women were not as likely as men to be promoted to higher positions.

Although many of the women interviewed for this chapter told stories about specific instances of discrimination to others, most asserted that they themselves never had faced insurmountable problems being a woman in medicine. For example, despite Ruth Guttmann's experiences when applying for a residency, she did not feel that she had suffered as a woman.\(^\text{101}\) Lillian Fuller felt that she never had any problems as a female physician with any of her colleagues or patients but acknowledged that women in medicine are not as likely to be promoted to higher positions.\(^\text{102}\)

This pattern of recognizing societal discrimination while denying personal discrimination has been studied by some psychologists. One explanation is cognitive bias: it is difficult for one person to feel victimized without access to aggregate data about her colleagues. Many people, especially women, also do not want to be labeled as victims and wish to avoid labeling an individual person as a villain. Thus they can acknowledge that society as a whole does not treat a specific group fairly, while believing that they have never suffered personally as members of that group.\(^\text{163}\)

Some women allude briefly to possible discrimination, then brush it aside by saying that the people involved were not important. Both Vera Peters and Eleanor Montague coped with criticism or personal attacks by ignoring them or treating them as irrelevant. One woman, Florence Chu, even felt that she may have been treated better than her male colleagues because she was a woman. Selma Hyman also may have benefited by being a woman; she felt that she was chosen for a position as an assistant director of the tumor clinic at Michael Reese Hospital in Chicago because the director felt that she was "safer," and less of a threat than a male rival.\(^\text{104}\)

Some women may have felt reluctant to talk about discrimination because they did not want their stories to be published. Many of the participants in these stories are still living; often, there is no hard evidence of discrimination, only allegations and rumors. For instance, some men are more willing to talk about discrimination than their female colleagues; yet they qualified their stories as only rumors, not fit to print. From the stories told by both the men and the women, there is no doubt that women radiotherapists in every era have had to fight discrimination.

**Appeal of Radiation Therapy to Women**

In order to understand whether radiation therapy was more attractive to women than other medical specialties, and whether radiation therapy was preferred over diagnosis, we obtained certification data from the ABR. Since the ABR was not formed until 1938, only post-1934 data are available. The sample size is so small for the pre-1965 data that it is not always included. The system of classification varied over the years: therapy consisted of categories of both therapeutic radiology and radiation oncology, while the diagnostic/general radiology category covered roentgenology, general radiology, diagnostic roentgenology, diagnostic radiology, and nuclear medicine. Figure 9.22 demonstrates the number of men and
women becoming certified in radiation therapy during the last fifty years.

In order to examine whether radiation therapy was more or less attractive to women than other medical fields, the percent of female radiation therapy diplomates was compared to the percent of female medical school graduates from the preceding five years (Fig. 9.23). Thus, the percent of female diplomates from 1970 to 1974 was compared to the percent of female graduates from 1965 to 1969. The time lag was created because it typically takes four to five years of internship plus residency training before a candidate can become certified in radiology. Thus, the women in these two groups would have graduated from medical school at approximately the same time.

From 1965 on we can see that radiation therapy consistently was more attractive to women than other fields, as demonstrated by the higher percentage of women entering radiation therapy as compared to women entering medicine in general. One of radiology’s main attractions for many of the women interviewed was its regular hours, which made it easier to balance practice and family. The women also cited intellectual interest, previous exposure to the field, or inspirational mentors as reasons for their choice.

Radiology does not carry a particu-
Lyrical feminine image as has pediatrics, or a masculine image, as has surgery. It carries an emphasis on physics, which traditionally has been an area largely of male expertise. However, all physicians must have a firm science background, including physics, chemistry, and biology; thus, female physicians may not have been deterred by the need for proficiency in physics.

The percentage of women certified in radiation therapy was compared to the percent certified in diagnostic or general radiology (Fig. 9.21). Most radiology residencies through the 1960s focused largely on teaching diagnostic radiology, so many physicians never received much exposure to the field of therapeutic radiology. Therefore, it is surprising to see that therapy has been a more popular choice than diagnosis or general radiology for female radiologists. Many women mention intellectual interest and patient contact as reasons for choosing therapy over diagnosis.

For many years, therapy did not carry as much prestige as diagnosis or other areas of medicine; thus women may have found it easier to secure a residency position in this area. Both Esther Martin and Selma Hyman believed that discrimination may have denied them their desired residencies, in plastic surgery and pathology, and thus accepted positions in radiology. When she began work in radiation therapy in the 1940s, Selma Hyman thought that the field had a poor reputation and that surgeons were reluctant to refer patients to radiotherapists.165

The amount of respect given to the field could vary by institution; when Eleanor Montague worked at the M.D. Anderson Hospital, radiation oncologists were treated well and were included in the multidisciplinary team that made treatment and management recommendations for the patient. However, when she switched to working at the Baylor College of Medicine in 1969, she found that the radiation oncologist was called only after the surgeon decided that he was finished with the patient. "Radiation therapy was not only in the basement physically, but also in the basement psychologically."166 Today, all respected institutions accept the multidisciplinary approach to treating cancer, and radiation therapy is an honored specialty.

**QUALITIES**

These pioneering female contributors have emerged as leaders and have helped build the discipline of radiation oncology. Although we acknowledge only a few in this chapter, we recognize there were many research scientists, clinician-healers, and educators. Some of these women have been lost to history, their contributions have been overshadowed by the difficult times and the

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**Fig. 9.21** The percent of women certified in radiation therapy as compared to diagnostic and general radiology. (Author's collection)
largely nonsupportive society in which they practiced. In the early days it was
not acceptable for a woman to be educated, let alone study science. Medical
schools had strict admission policies and tight quotas regarding female
applicants. As a specialty radiation oncology was never thought of as a par-
ticularly feminine specialty. Not surpris-
ingly, most of the leading women in
radiation oncology served as role mod-
els to others behind them. All these
women share qualities which most cer-
tainly contributed to their success.
The women we credit today as the

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