

## Conclusion

# The Unfolding of Therapeutic Radiology in the United States: A Participant's Views and Autobiographical Essay

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In the preceding chapters, we have shown the gradual coalescence of physical, technological, and radiobiologic contributions in forming the basis for the specialty of radiation oncology. But the reader has been given only hints of the professional obstacles, vicissitudes, and academic resistance to recognition of the practice of therapeutic radiology. After considerable hesitation, I decided to devote this last chapter to a presentation of the story through my own experiences in the field. This self-centered account in no way implies a disregard for the roles and contributions of others whose biographies should also be written. We count on the indulgence of our readers.

I was born in Camagüey, Cuba, on 1 March 1909, where I joined my parents, Damiana Manzano Nuñez and Juan del Regato Castanedo, and my brother Carlos (1902–1970), seven years my senior. I received my high school education at the Instituto de Segunda Enseñanza in Santa Clara. The curriculum was full and exacting: world geography, world history, Spanish grammar and literature, two years of English, algebra and trigonometry, two years of physics, organic and inorganic chemistry, logic and civics, botany, zoology, and geology. Fifty-one of us graduated in June 1926; in time we numbered six attorneys, eight Ph.D.'s, nine doctors of pharmacy, three doctors of dentistry, one doctor of science, and twelve doctors of medicine.

In September 1926 I enrolled at the University of Havana for a seven-year course of pre-medical basic sciences and medicine. I worked as a clerk at the registration desk of the university hospital. Within six weeks of my arrival, a hurricane hit Havana dead center and destroyed several of the hospital's pavilions. Thousands of injured were brought to the hospi-

tal, and all hands including mine were not sufficient to care for the casualties.

By the fall of 1929 I had become a student intern at the Instituto del Cancer on the grounds of the university hospital known as Calixto Garcia (Fig. 20-1). Within a short time I was offered the position as radiological technologist. When the old Director offered me the job, I replied honestly that I did not know anything about radiology. His classic managerial response: "Damn it, I didn't ask you if you knew anything! I asked if you wanted the job!" The attending radiologist, a diagnostician at heart, offered to develop his own films if I would relieve him of the burdens of roentgentherapy. It was my duty to administer treatments to cancer patients according to routine formulae borrowed from the Memorial Hospital in New York. I operated a two-hundred kilovolt unit with a water-cooled Coolidge tube over three feet wide, a milliampere stabilizer, and a Snook rectifier. I was eager to learn more about the work, and I read a Spanish version of a German book by Paul Lazarus.<sup>413</sup> The technological details of cancer were not as fascinating to me as the protean manifestations of malignant tumors. I read the current journals, made notes on the then controversial practice of post-operative radiotherapy for cancer of the breast, and wrote a paper which was published.<sup>478b</sup> I also undertook a survey of one hundred and fifty women with cancer of the breast, questioning each of them personally. I concluded that there was a frequent history of irregularities in lactation preceding the development of the tumor (Fig. 20-2).

In 1930 the University of Havana was closed due to political disturbances. A number of affluent students transferred abroad. The Cuban Liga Contra el Cancer sent me to continue my study of medicine in

Paris. Because I had shown an interest in radiotherapy, they gave me a letter of introduction to Claudius Regaud, director of the Radium Institute. I was accepted to the fall term of the medical school of the University of Paris, and had the summer to learn French. I took my letter to Regaud, and the kind professor suggested that I attend the morning sessions at the Hôpital Saint Antoine with Iser Solomon,<sup>B</sup> who later presented me with a copy of his book on radiotherapy.<sup>597</sup> In the afternoons I was to observe applications of radiumtherapy at the Fondation Curie. Later I would spend all my free time and vacations there.

The third International Congress of Radiology was held in the classrooms of the Sorbonne in the summer of 1931. Although only a medical student, I was permitted to attend the sessions on radiotherapy. To my good fortune, the Exposition Coloniale, a lavish folk festival was being held in the Bois de Vincennes that summer. Moreover, the tunes and rhythms of my native land were much in vogue in the cafes and concert halls.

Work at the Radium Institute was an immersion in a truly multidisciplinary approach to the treatment of patients with cancer: pathology, surgery, radiumtherapy, and roentgentherapy were custom balanced in each case in the patient's best interest.<sup>489</sup> I had much to learn and was interested. Over time I

became a *boursier*, a *stagier* and, after completing my curricular obligations, an assistant in the Department of Roentgentherapy under Coutard. He was a remarkable clinician, an original thinker, and an inspiring teacher. He gave me his trust, and I returned it with loyalty. I took care of his patients and, in his absences and vacations, conducted the follow-up clinics of the department usually attended by foreign visitors. Arthur Purdy Stout (Chapter 15) visited during one of these clinics and commented on it in his autobiography.<sup>630</sup>

The first International Congress of Cancer was held in Madrid in 1933. I attended as Regaud's interpreter. There I met Professor Angel Roffo, director of the extraordinarily innovative Instituto de Medicina Experimental of Buenos Aires. He had shown experimental proof of the carcinogenic effects of tobacco, and had estimated the amount of tobacco tar in which the average smoker bathed his or her bronchi.

In the Radium Institute's follow-up clinics, I observed that patients previously treated for cancer of the pharynx or larynx presented peculiar and painless dental caries not previously reported in the literature. I took periodic notes and photographs of these patients, and concluded that the caries resulted from irradiation of the salivary glands.<sup>480b</sup> Lacassagne suggested I could reproduce these lesions experimentally



Fig. 20-1. Instituto del Cancer of Havana, August 1929.

in lower animals, and made arrangements for me to do so. I soon found out that my heart was in the clinic, not the laboratory.

To be awarded my M.D., I was expected to present and defend a thesis before a tribunal of professors of the university. I chose the topic of roentgen-therapy of inoperable carcinomas of the maxillary antrum, and presented my results: four patients cured out of ten irradiated, the first such report of conservative treatment in the medical literature. The thesis was awarded the 1937 Silver Medal of the Faculty of Medicine of the University of Paris.<sup>479,480</sup>

The wide reputation of Coutard's work brought numerous visitors to our department, among them those seeking training and experience. I contributed to the training of a few: Luis M. Pons of Argentina, Simeon T. Cantril<sup>B</sup> of the U.S., and Jean B. Riach<sup>B</sup> of Scotland. Dr. Riach was being trained to be the chief roentgen-therapist of the Marie Curie Hospital of London in 1934. She had learned to outline the field of entry by using the tube's filament light reflected on the target of an open Coolidge tube. She was alarmed to learn that the new shock-proof units being installed for her in London had closed tubes emitting no light. I designed for her a simple lighting device to be adapted to the tube head and shining a beam of light closely reproducing the path of the rays (Fig. 20-3). I delivered my design to one of Vicker's engineers who built it for their units in London.

I used my Easter and summer vacations to visit other centers in Europe. In Hamburg I met Hermann Holthusen and Anna Hamman.<sup>B</sup> I was the guest of Elis Berven,<sup>B</sup> who introduced me to Hugo Ahlbom,<sup>B</sup> soon to be director of the Radiumhemmet in Stockholm. At the Charité Hospital of Berlin I met Henri Chaoul, who advocated using a special tube for contact therapy of superficial tumors. At the Allgemeines Krankenhaus of Vienna I traded radiotherapeutic insights for diagnostic gems from Professor Ernst Meyer. In Warsaw I was the guest of Marie Curie's sister, Dr. Bronya Liuska, director of that city's Radium Institute. In Geneva Professor René Gilbert<sup>B</sup> introduced me to the concept of extended field irradiation for patients with Hodgkin's disease. The world of radiation therapy was smaller then, and an acolyte could travel more freely among names already famous in the field. It was a fortunate time to enter a fascinating field.

It was my own good luck to have spent most of the third decade of my life in Paris (Fig. 20-4). There I had acquired professional skills and personal serenity in an atmosphere of inexhaustible cultural opportunities. I especially enjoyed Parisian theatre in the 1930s: *Topaze*, Pagnol's brilliant satire on municipal politics; and *La Guerre de Troy n'aura pas lieu*, Jean Giroudoux's revealing tragicomedy on the eternal folly

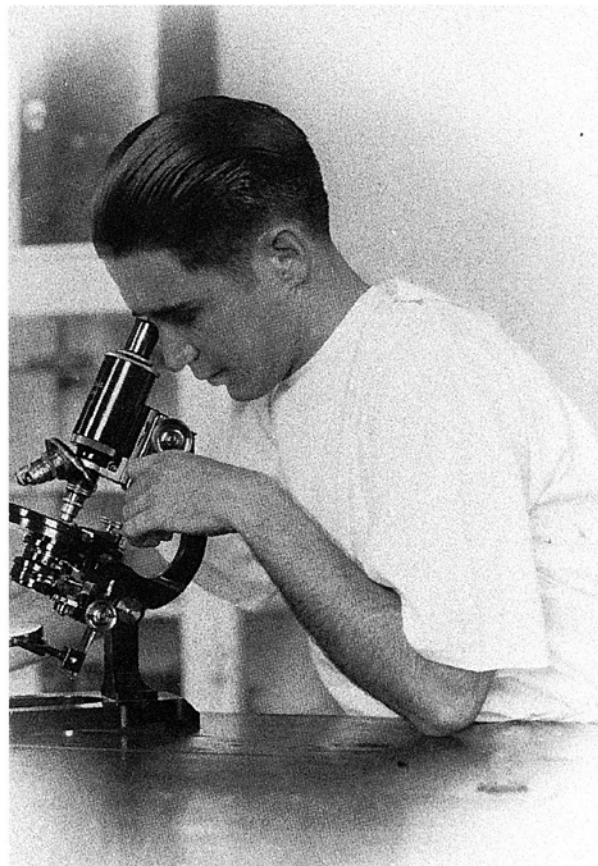


Fig. 20-2. Medical student intern, 1930.

of war. And I will always remember *Margot*, a stunning psychoanalytic drama on the loves of Marguerite de Valois.

My education and independence abroad had their price. Over the years my mother had written encouraging and loving letters. The news of her sudden death in 1933 made me realize the depth of my emotional dependence on her affection. My dreams of returning her some satisfaction through the fruits of my labor were now erased, and I carried with me feelings of remorse.

In the fall of 1937 Coutard agreed to accept Robert Millikan's invitation to go to the Kellogg Radiation Laboratory of the California Institute of Technology in Pasadena (see Chapter 10). I agreed to join him in Chicago six months later. Meanwhile, I remained in Paris gathering notes and illustrations of our work for later publication. From Chicago, Max Cutler<sup>B</sup> urged me to send a copy of the draft for my localizer. General Electric made the lighting devices for their Maximar units at the Chicago Tumor Institute. As planned, I left Paris early in 1938. It was hard to leave the beloved city in which I had lived for seven years and to which I would always be grateful.

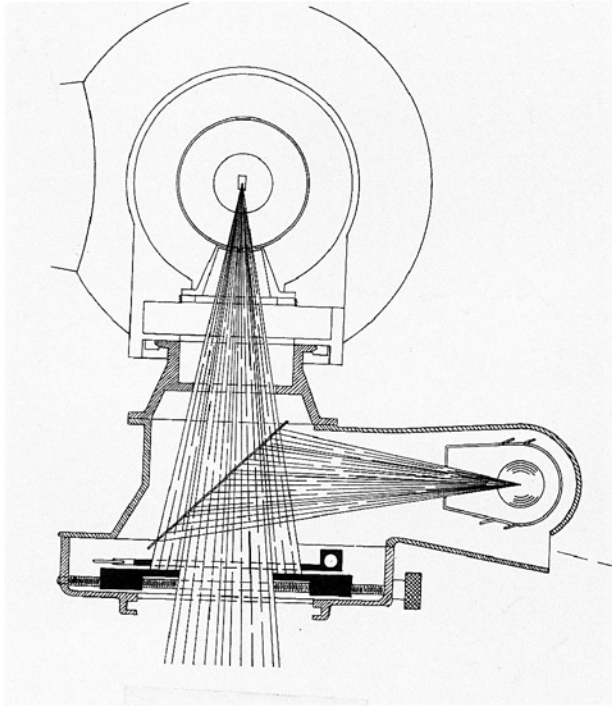


Fig. 20-3. Design of a lighting device intended to reproduce the course of the beams of rays by means of a mirror.

Before proceeding to Chicago, I went first to visit my father in Santa Clara. Primarily a photographer and movie theater projectionist, he was also a jack-of-all-trades who had always managed to earn a living. He was a model of perseverance and tenacity, and my respect and love for him remained unchanged through the years. More than anything I wanted to give him reason to feel proud of me. He had remarried, and I now had a cute little half-brother, Santiago. I left Cuba believing I would someday return to practice radiotherapy.

In March 1938 I went to the Chicago Tumor Institute, where Franz Buschke<sup>B</sup> had just finished the book on which he had worked for two years. Although Sim Cantril had done extensive final revisions on the entire volume, it was published as *CANCER*, by Cutler and Buschke. It was the first clinical text on the subject. Max Cutler had arranged for a series of six-week courses on clinical oncology, and it was our obligation to lecture to the U.S. and foreign physicians who enrolled. While in Chicago, I became curious as to how many "straight" radiotherapists there were in the country. Not without difficulty we were able to count a total of thirty-nine: among them three at the Mayo Clinic, three in Los Angeles, four in New York, one in Denver, one in Detroit, one in Cleveland, and four of us in Chicago.

Edwin Merritt, a senior partner in the leading radiological practice in Washington, D.C., attended one

of the Chicago courses. He proposed that I join his firm on a clinical research project. There were few patients at Cutler's institute, and I decided to accept. I started work at the Warwick Clinic of the Garfield Hospital, concentrating on transvaginal roentgen-therapy, following external irradiation, for cancer of the cervix. I designed a set of specula for this purpose. Douglas Quick<sup>B</sup> was interested in this application and visited us. He was impressed by the use of the lighting device and requested one for his office in New York.

In Washington I was the guest of Dr. Merritt at his home in north Chevy Chase, where the District slopes gently into Maryland. The house was surrounded by dogwood, the many varieties of French lilacs he had imported, and graced by a white Japanese cherry tree reflected in a lilypond. In this romantic hilltop setting, surrounded by thousands of daffodils, I proposed to Inez Johnson, a registered nurse from Chicago. Amid nature's fortuitous cooperation, she accepted. We were married, and made our first home in Bethesda.

The third International Congress of Cancer took place in Atlantic City in the first days of September 1939, as the *blitzkrieg* began its roar across Poland. I presented a paper on roentgen-therapy of malignant lymphomas of the tonsil: thirty-seven patients with an absolute five-year survival rate of forty percent. It was the largest such series published to that date.<sup>480c</sup> Later, Cantril and Buschke wanted to start a journal, *Radiation Therapy*, and asked me for an article. I sent them the paper from Atlantic City, which otherwise would have seen a larger readership.

Toward the end of my engagement in Washington, in the spring of 1940, I went to Boston to be interviewed by Professor George Holmes of the Massachusetts General Hospital. He was entertaining the idea of putting a radiotherapist in charge of a new division with a van de Graaf unit. The supervoltage unit was fixed to the ceiling, and they were working on an elevator on wheels to carry the heavy lead "cones" from the shelves to the tube head. I suggested that instead they could use a lighting device and collimator fixed to the tube head. Dr. Holmes asked me to explain this to the M.I.T. engineers, which I did. Thereafter every commercially available van de Graaf unit had a lighting device. I was not offered the job nor given credit for the innovation.

In the United States, radiotherapy had made slow advances. Through the efforts of Maurice Lenz<sup>B</sup> and William Harris<sup>B</sup> of New York, the advantages of fractionated radiotherapy for cancer of the upper air passages were being recognized. But the Memorial Hospital surgeons who had pioneered the use of radium remained the acknowledged arbiters of what

was right or wrong in the treatment of cancer. Moreover, general radiologists were unable to accept the notion of anyone practicing radiotherapy exclusively: they feared dismembering the specialty of radiology.

I had a genuine desire to return to the country of my birth and to give my countrymen the results of my training, in part to repay the efforts of the Liga Contra el Cancer on my behalf. My wife agreed, and in 1940 we went to Havana. But the requirements for certification of my French medical degree were preposterous: intense oral examinations before three tribunals of professors from the Faculty of Medicine covering all subjects in the seven-year medical curriculum. I failed the first exam, and was almost out of funds. We decided to return to the U.S. to look for available positions. Before we could leave Havana, our first daughter, Ann, was born prematurely. By the time she was two weeks old she was back in the U.S. and on the way to visit her Swedish grandparents in Illinois.

It was not easy to find a job as a radiotherapist in the 1940s. In one interview I was asked if I would agree to do fluoroscopy on weekends. I was offered a position in New York, but decided to become a Research Fellow at the National Cancer Institute. The NCI did not yet have clinical facilities in Bethesda, but instead had radiotherapy facilities at the U.S. Marine Hospital in Baltimore, where I was quartered. I had already begun work when the administration discovered that as I was not yet a U.S. citizen, I could not be paid. Thus, for the three months until I became a citizen, I worked for free.

We were in Baltimore on the day the Japanese attacked Pearl Harbor. Our work at the NCI took a back seat to other war work. In January of 1943 I was urged to take a position as radiotherapist to the Ellis Fischel State Cancer Hospital in Columbia, Missouri, which had lost much of its staff. Several things appealed to me in the institution: I was to be in charge of two-thirds of the one hundred hospital beds, there were excellent colleagues in surgery and pathology, and there was an abundance of patients with a wide variety of malignant tumors. The hospital had an excellent social service department assuring thorough follow-ups of patients treated. With the consent of my colleagues, I devoted considerable time to reorganizing the medical records to reflect clinical continuity, rather than having separate files for each admission. In years to come, these records, with typewritten progress notes, brought the admiration of all who consulted them.

The abundance of patients at the Ellis Fischel permitted us to demonstrate the advantages of fractionated roentgentherapy with one hundred kilovolts in the treatment of carcinomas of the eyelid and those which overlay cartilage, as well as on carcino-

mas of the lower lip.<sup>481,482b</sup> We were also able to treat a significant number of patients with various stages of cancer of the cervix by combined external pelvic irradiation (200 kV) and transvaginal roentgentherapy (100kV).<sup>483b</sup> This integral method proved particularly fruitful in the treatment of advanced cases. We also found that transvaginal X-ray therapy was an ideal conservative treatment for carcinoma-in-situ of the cervix in young women wishing to preserve their ability to have children.<sup>483b</sup> We also discovered that external pelvic irradiation had definite advantages over radium as a pre-operative surgical adjuvant.<sup>490b</sup> A Long Island company at this time undertook the manufacture of a lighting localizer and collimator bearing my name and adaptable to any equipment (Fig. 20-5). They also produced a set of vaginal specula. Both prototypes are now at the Smithsonian Institution.

Through the years I had become convinced that failures in the treatment of cancer were often due to the inadequate preparation of physicians who first saw and advised the patients. There was a need for a text providing realistic information on differential diagnoses, indications for curative treatment, prognoses, etc. With this in mind, I had been collecting appropriate illustrations and references, and had de-

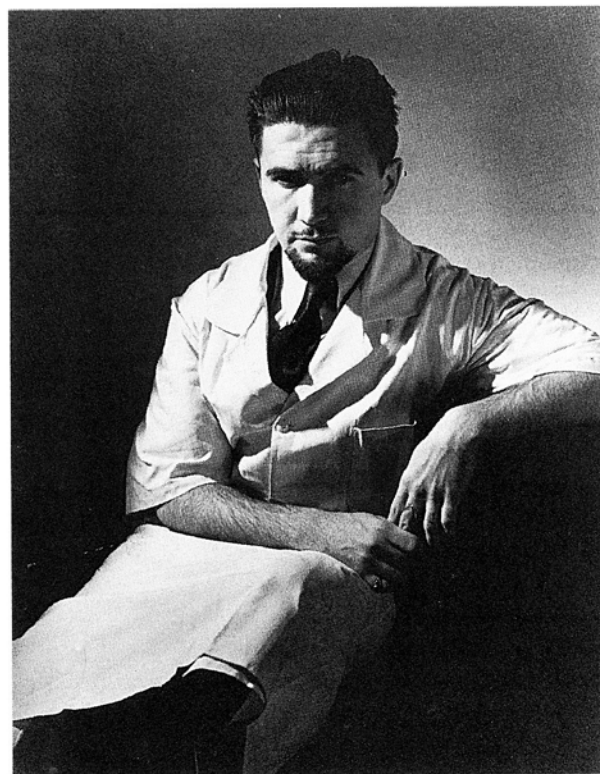


Fig. 20-4. Assistant of the Department of Roentgentherapy of the Radium Institute of the University of Paris, 1936.

veloped the format for a one-volume book for general practitioners and students, one that would give equal emphasis to pathology, surgery, and radiotherapeutic techniques. In Columbia I discussed the matter with the pathologist of the institution, Laurence Vedder Ackerman (1904–1993), and decided to tackle the project together. We thought it would be best to have a third author, an oncologic surgeon, and divided the tasks accordingly. But our surgical colleague, a most capable man in the operating room, was not an equally gifted writer. So we ended up writing the whole book ourselves. It was no minor task. We engaged a full-time assistant and plunged into an extensive review of the world literature. I sketched diagrams of the lymphatics of various organs which Ackerman's sister-in-law drew to perfection. We agreed our names should appear as equal co-authors on the title page, and that Ackerman's name would be first on the spine in the English editions, with mine first in the foreign editions (Fig. 20-6).

A group of physicians planning a new cancer hospital in Houston visited us repeatedly during this time. They were interested in our methods of operation, free from petty jealousies because of our basic understanding on the proper indications for treat-

ment. They were also interested in our records, including follow-ups and social service. However, they ended up imitating the Memorial Hospital of New York in its division of clinical work prior to the establishment of indications for treatment. In accordance with the prejudices of the time, they also euphemistically avoided the word "cancer" in the name of the institution.

During the war, Milton Friedman,<sup>B</sup> of New York, became Chief of the Department of Radiotherapy at Walter Reed in Washington, D.C. From this influential position, Friedman issued a directive, approved by the Surgeon General, to the effect that certification in general radiology was not a sufficient guarantee of proficiency for a physician to head a division of radiotherapy in the U.S. Army. This unprecedented but righteous departure caused consternation among the trustees of the American Board of Radiology and, in particular, among its physicists who had somehow become the arbiters of radiotherapy.

After the war, Colonel Friedman officially informed me that the army had two surplus radiotherapy units, one of a million volts and another of two million. He stated that our institution could have either one simply by paying a few hundred dollars of

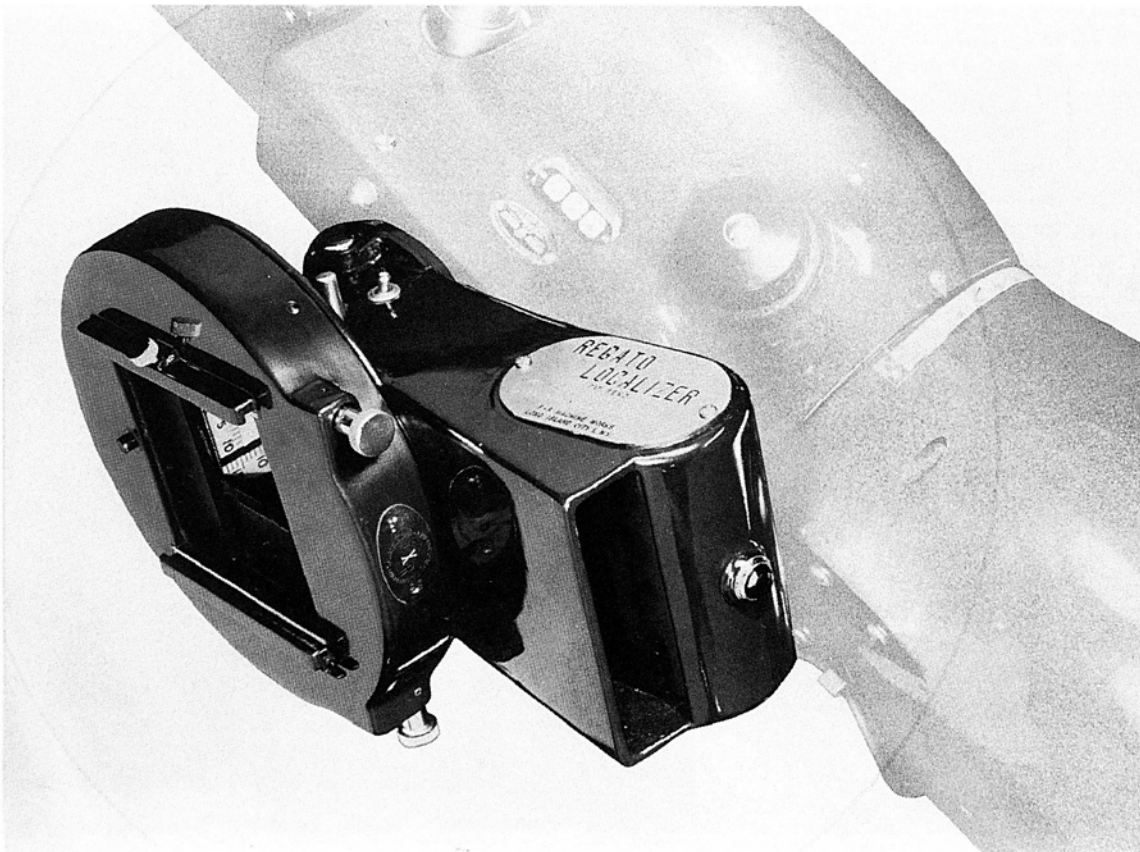


Fig. 20-5. Commercial model of the Regato localizer, 1947.

freight. I requested and obtained written endorsements from ten American radiologists who had been privileged to use super-voltage clinically, including Professor George Holmes of Boston and Professor Robert Stone<sup>B</sup> of San Francisco. I submitted copies of their letters to the Missouri State Cancer Commission with our request to authorize the cost of freight. The physician members of the Commission thought it proper to solicit the opinion of Professor Sherwood Moore of the Department of Radiology at Washington University in Saint Louis. Although he had no personal experience with supervoltage, he wrote that he was "unmistakably opposed to the use of a million volts in the treatment of malignant disease." The Commission opted to take his advice. We had to turn down an unbelievable bargain, and lost the opportunity to offer supervoltage radiotherapy to the patients of Missouri.

Even after World War II, there were only sixty radiotherapists in the United States. From 1941 to 1950 the American Board of Radiology issued forty-seven certificates in Therapeutic Radiology. But fourteen of these went to surgeons who practiced some radium therapy, and fourteen others to candidates in general radiology who flunked the radiodiagnostic part of their examination. I protested to the Board this practice which granted flunking candidates the accreditation my residents needed three years to get. Dr. Byrl Kirklin promised to stop the practice in 1953.

The Radiological Society of North America offered five refresher courses in each of the six days of its annual meeting. In 1946, two of these were courses offered by physicists on x rays and radium dosimetry; two others on cancer of the breast and cancer of the cervix were given by surgeons; and one on transvaginal roentgentherapy was offered by a general radiologist. Milton Friedman and I gave separate courses on the treatment of cancer of the male genitals and of the pharynx and larynx, respectively. Thereafter, Dr. Charles Edgar Virden, in charge of the refresher courses, requested my help in choosing and procuring speakers in radiotherapy. In subsequent years refresher courses were offered by Lenz, Lampe, Cantril, Buschke, Milford Schulz, Manuel García, and others I asked to participate. These RSNA courses aroused interest and promoted understanding of the role of radiotherapy in the treatment of cancer.

The physicists had responded well and promptly to the general radiologists' need for better understanding of radiation physics. Quimby of New York, Glasser of Cleveland, and Weatherwax of Philadelphia offered courses to residents in training and wrote on details of dosimetry. They also published a handbook of radiation physics that was widely used

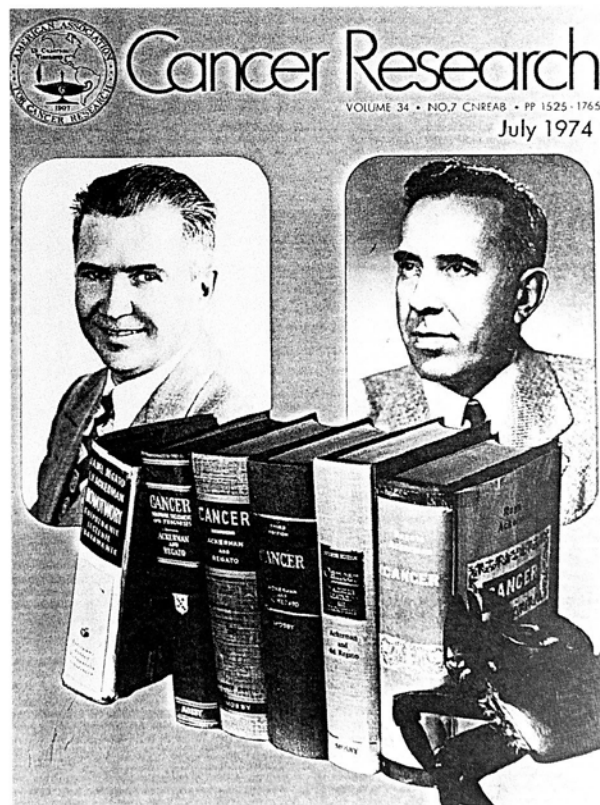


Fig. 20-6. Front cover of *Cancer Research*, dedicated to the authors of *Cancer*, showing the first three editions of the English version by Ackerman and Regato. The first one on the left, the Polish edition, and the first one on the right, the Spanish edition, by del Regato and Ackerman.

by radiologists everywhere. As a member of the American Board of Radiology, Quimby exacted the requirement that all candidates be examined in physics. There was more to radiotherapy than physics, though, and few American radiologists followed the lead of Albert Soiland in renouncing their diagnostic work and dedicating themselves strictly to radiotherapy. Among these few were: Manuel García of New Orleans, Milton Friedman of New York, Milford Schulz of Boston, U.V. Portmann of Cleveland, and Sanford Withers of Denver.

The scarcity of academically-trained therapeutic radiologists led Professor Leo Rigler to entrust his Division of Radiotherapy to Karl Stenstrom,<sup>B</sup> a physicist who had done seminal studies on fractionation. Stenstrom held that position at the University of Minnesota for twenty-five years, wrote a handbook on radiotherapy for residents in training, and was an early advocate of extended field irradiation of Hodgkin's disease.

In spite of the need, there were no centers of training for radiation oncologists in the United States. The American Cancer Society offered one-

year fellowships to residents in general radiology who wished to go abroad in quest of radiotherapeutic experience, but once there they were often merely observers.

I had long wished to train radiotherapists, and Ellis Fischel offered an ideal setting to give the resident a balanced experience in an atmosphere of tumor pathology, surgical oncology, as well as radiation oncology, with a most fruitful and sizable follow-up of patients treated in various ways. But what I was able to get were residents in general radiology. My assistants were residents in surgery who rotated through my service to help me attend to the care of sixty-six hospitalized patients. One of these residents, William T. Moss, after one year of residence in surgery, decided to pursue training in radiation oncology. He proved ideally capable and dedicated. I arranged for him to receive a fellowship at the National Cancer Institute to supplement his experience, as well as to go to the Radium Institute in Paris and to the Holt Radium Institute in Manchester. He went on to become an outstanding teacher and author of a widely-used textbook on radiation oncology.<sup>439c</sup>

We enjoyed life in Columbia. The University of Missouri and two well-known colleges for young women enhanced the small town's cultural opportunities. Our family was occupied by the birth of our second daughter, Juanita (1943-), and of our son, John (1945-). Shortly after birth, Johnny was scheduled to receive radiotherapy for a presumed hypertrophy of the thymus. I was able to avoid it. Such routine irradiation for benign conditions across the U.S. led many such children to develop cancers of the thyroid later in life.

Mrs. Spencer Penrose, a wealthy philanthropist, visited the Ellis Fischel Cancer Hospital in 1948. She was impressed with the work of the institution in caring for the state's cancer patients. She decided to build a similar hospital in Colorado Springs in memory of her late husband. It is appropriate here to recall that the medical profession was not sympathetic to the establishment of "categorical" hospitals. A cancer hospital in New York had been allowed to disappear, and another in St. Louis had been absorbed into a university system. Cancer institutes in Wisconsin and Minnesota had also been ignored and eventually erased. The success of the Ellis Fischel, in fact, was due to the fact that it took care of indigents only.

Early in January 1949, I became director of the Penrose Cancer Hospital, for which Mrs. Penrose had architectural plans. After some persuasion she agreed to contribute instead to the building of a modern general hospital, with the Penrose Cancer Hospital to share common facilities, as well as members of the medical and surgical staff, but maintaining a certain independence with separate records, social ser-

vices, residents, and research facilities. What we proposed was in reality a community cancer center for patients of all economic levels, an idea we later presented to a national audience and which, in recent years, has gained support in many cities.<sup>687b</sup>

Arthur Purdy Stout (Chapter 16) met periodically with his former associates to discuss problems of surgical pathology, mainly in tumors. One of these meetings was held at the Ellis Fischel. I noted that the pathologists appreciated and often were influenced in their diagnoses by the clinical information and follow-up details of a given case. In 1949 I started a series of annual conferences in Colorado Springs, called "Cancer Seminars." In each instance we chose fifteen problem cases of tumors of a different system. Copies of the relevant clinical history and reproductions of pertinent roentgenograms were mailed to some three hundred radiologists. We prepared three hundred boxes with slides of the fifteen cases, cut from the same block, and mailed them to pathologists across the country and abroad. Then on one day we would meet in Colorado Springs with a guest radiologist, guest pathologist, and guest surgeon to discuss their opinions and reveal the tabulated answers from the mail survey.

The proceedings of all Cancer Seminars, from 1949 through 1973, were edited, published, and distributed free to several hundred participants. It was our view that these seminars revealed the inconsistencies of some diagnoses of tumors and the fact that morphologic diagnosis of tumors was far from an exact science. It was also obvious that a pathologist who was never challenged would fail to learn his or her own shortcomings. One of the Penrose Cancer Seminars was repeated in Mexico City in Spanish (Fig. 20-7), and another at the Institute Gustave Roussy in Paris. The recorded discussions of both these meetings abroad were incorporated in the published proceedings in the U.S. In all there were twenty-four Cancer Seminars held in Colorado Springs from 1949 to 1973. It was our firm conviction that an understanding of the multifaceted aspects of neoplasia was a primary requirement of any clinician working in the field of oncology.

U.V. Portmann of the Cleveland Clinic edited a book, *Clinical Radiation Therapy*, to which I contributed a chapter on cancer of the nasopharynx. Since my student days in Paris, I had been fascinated by the neurologic symptomatology of these tumors. I had already pointed out that the first eight cranial nerves could be reached by tumor invasion of the middle cerebral fossa, but that the IX, X, XI, and XII and cervical sympathetic were paralyzed by compression of those nerves as they emerged from the skull by first relay lymph node metastases in the Krause



group of nodes high in the jugular chain, just under the base of the skull.<sup>480d,470b</sup>

In Colorado Springs we finally had the opportunity to organize a comprehensive training program for therapeutic radiologists. It was the first such program in the U.S. and the first to be granted the support of the National Cancer Institute. In 1952, the Commission on Education of the American College of Radiology held a conference in Chicago under the chairmanship of Philip J. Hodes. At his request I presented a position paper, a plea for the creation of centers of training for radiotherapists. The text was published as an editorial in *Modern Medicine*.<sup>483</sup>

The demand for radiotherapists had increased, but even in 1960 there were only twenty-five residents in training in therapeutic radiology in the U.S., eight of these in Colorado Springs (subj. note 20.1). we take pride in the radiation oncologists we produced. They were neither framed stereotypes nor messianic followers. They were stimulated to think their own nonsense rather than repeat someone else's. The functions and obligations of the Penrose Cancer Hospital in the fields of diagnosis, treatment, education and research were met with considerable devotion by my faithful associates, Chahin M. Chahbazian and J. Frank Wilson, whose modesty should not permit the denial of their due credit for the accomplishments of the institution.

In 1953 the International Congress of Radiology took place in Copenhagen. Jens Nielsen, Director of the Radiumstation, was in charge of the section on radiotherapy. He extended a special invitation to all registered radiotherapists to a luncheon at his institution, where he made a proposal for the creation of an International Club of Radiotherapists. The idea was enthusiastically received, and a committee was elected to proceed with the project. Two days later we met again, approved a modified constitution, and elected the original members from various countries. The American and British membership was limited to fifteen members each and the total of the Club to one hundred (subj. note 20.2).

There had never been a gathering of therapeutic radiologists in the U.S. The national radiological societies had repeatedly refused to form a separate section. Not having an organization of their own, radiotherapists met at the meetings of the American Radium Society, which was predominantly led by surgeons. As secretary of the American group of members of the International Club, I took the initiative of inviting its members to a dinner during the annual meeting of the RSNA. To contract for a dining room I had to get written permission from the RSNA secretary. Once this was done, we decided to invite other radiation oncologists as guests to our dinner. We repeated this twice annually, during the meetings of

the RSNA and ARS. The gatherings represented two groups, members of the Club and their guests. As expected, the idea arose to create a single American Club to include everyone. I was ready with a one-page Founder's Agreement. In Chicago, in December of 1958, fifty-six of us approved the foundation of the American Club of Therapeutic Radiologists, with provisions to eventually "formalize the informality." As charter secretary I continued to arrange for the twice-annual meetings, the printing of a directory, and maintenance of correspondence during the years of the Club's infancy. The club was officially incorporated under the laws of Colorado, including a logos I designed: a crab surrounded by electronic orbits. By 1962 our membership had risen to 252, and by majority agreement the name was changed to the American Society of Therapeutic Radiologists. In 1970, with 308 persons in attendance, we had the first separate scientific meeting, and in 1976 the society adopted the *International Journal of Radiation Oncology, Biology, and Physics* as its official organ. In 1983 the name of the society was changed to the American Society for Therapeutic Radiology and Oncology.



Fig. 20-7. Caricature by Cabral, 1956, Mexico City.

Early attempts at telecurietherapy had been hampered by the high cost of radium, by the small amounts available, the necessity of having a short source-to-skin distance, and the resulting penumbra past the portal of entry. A spinoff of atomic research brought us Cobalt<sup>60</sup>, and provided the opportunity of irradiating at longer distances from the source. We obtained one of the earliest units produced by Atomic Energy of Canada. Cobalt<sup>60</sup> offered the additional advantages of an almost monochromatic beam of radiations. We thought that perhaps this offered some biological advantage, and decided to attack some old and abandoned subjects. It took us a short time to find out that external pelvic irradiation with this source could heal advanced ulcerations of the trigone area of the bladder, incurable by other means.<sup>484b</sup> And we also made the early discovery that inoperable carcinomas of the prostate could be controlled by external pelvic irradiation.<sup>506c</sup>

As departments of radiotherapy grew in the U.S., most of the technologists available had been trained to help radiodiagnosticians take and develop films. Some institutions imported English technologists called "radiographers" (radiography was precisely what they did *not* do). Sister Clara Vogelpohl started one of the earliest schools of radiotherapeutic technologists at the Penrose Cancer Hospital of Colorado Springs. There is still a scarcity of such technologists, and ASTRO has invested rather large amounts of money to stimulate their training at an increasing number of schools, presently one hundred and twenty institutions.

In the early 1950s, linear accelerators became available first in England and later in the U.S. These more complicated and expensive units expanded the role of medical physicists in departments of radiotherapy. To avoid wasting valuable time in treatment rooms, the simulating room was created. Simulation has become an important preliminary step in treatment planning, requiring the cooperation and coordination of radiation oncologists, physicists, and technologists. A new professional, the dosimetrist, has been added to the planning team, responsible for calculating doses under any of the various anatomical approaches for the irradiation of a tumor. Commercial simulators also provide radiodiagnostic possibilities to aid in planning. Moreover, computerized axial tomography (CAT) and magnetic resonance imaging (MRI) are also useful in the assessment of treatment possibilities in many cases. Thus a modern treatment planning team is composed of radiation oncologists, physicists, dosimetrists, imaging experts, and radiation oncology technologists.

I served on the Council of the American College of Radiology as a delegate of the American Radium Society. There were no radiotherapists on the Council,

as delegates were elected at the local level and represented a constituency overwhelmingly composed of radiodiagnosticians. The ARS also nominated me to serve on the Board of Chancellors of the College, where I was assigned to the Commission on Cancer. While on the Board I persuaded the Committee on Administration to propose the creation of a Committee on Radiation Therapy. Not without difficulty this was done in 1973. After the brief tenures of two appointees who resigned, I was offered the chair of the Commission on Radiation Therapy. I introduced a policy of dividing the work into five divisions with five committees each, covering education, training, research, commercial equipment, academic concerns, etc. In this way a contingent of radiation oncologists became concerned with the College and its committees. I also appointed an ad hoc committee to apply for a grant for a thorough study of patterns of radiotherapy practice in the U.S. I chaired the Commission for the last two years of my term on the Board, after which I was replaced by Dr. Luther Brady of Philadelphia. But before he could apply his capable powers to the task, the Chairman of the Board, revealing the prejudices of many radiodiagnosticians, decimated the Commission and reduced it to a few committees of his choice. This insensibility to the needs of radiotherapy and the right of radiation oncologists to be part of the operation of the College resulted in frustration and discouragement. It took years for the Commission to regain some authority under the subsequent able chairmanships of Dr. William Moss and Dr. James Cox. But discontentment lingered among radiation oncologists.

In the late 1950s the National Cancer Institute created a Clinical Studies Panel of which I became a member. The purpose was to investigate the usefulness of new chemotherapeutic agents through clinical trials. At one of the Panel's sessions I presented a position paper on radiotherapy as a surgical adjuvant, and suggested it be included in the cooperative clinical trials.<sup>483c</sup> Professor Rudolph Noer, director of an ongoing breast cancer study, asked me to form a committee and to submit a protocol for post-operative radiotherapy, which we did. He proceeded to have all operable patients receive radical mastectomies and, on a randomized basis, to be administered Thio-Tepa, placebo, or post-operative radiotherapy. This study was underway when Dr. Noer was obliged to resign. Bernard Fisher was chosen to replace him and, although not enough time had elapsed and insufficient patients had been entered, he undertook to analyze the already-known failures. He found that patients who received Thio-Tepa had 8.5% of their failures from regional recurrences, those with placebo had 3.4%, and those who had received radiotherapy only 0.6%. Since most of the failures of patients who had

radiotherapy were due to distant metastases, he concluded that radiation therapy was harmful. He published this interpretation, and we argued it editorially.<sup>489b</sup> Later results of Fisher's cooperative studies have shown the advantages of post-operative radiotherapy in patients who were found to have axillary metastases, yet the fact was not emphasized or heralded.<sup>504b</sup>

In Colorado Springs I belonged to the Round Table, a town-and-gown group of Colorado College professors and local professionals. We met for a monthly dinner at the home of one of the members, who would then serve as the after-dinner speaker. Discussions were lively and interesting. On my nights as host I spoke on Carlos Finlay and the transmission of yellow fever by the mosquito, on Jesse Lazear, and on the contrasts of slavery in the British and Spanish colonies of the New World. In Colorado Springs our three children completed high school and went on to college.

The National Advisory Cancer Council consisted of twelve chosen specialists charged with advising and helping the NCI director, Kenneth Endicott. I served on the Council for four years (1967–1971). While there I was asked to provide a protocol for pre-operative radiotherapy on a project dealing with cancer of the bladder. Responding to this we formed a committee and offered a simple plan: a moderate dose (since the purpose was only to enhance the surgery), fractionation over six weeks to minimize radiation effects on normal tissues, and an interval of six weeks before surgery. Although those conducting the survey did not capitalize on it, we learned later that one out of three of the patients who received pre-operative radiotherapy had shown no tumor when operated on, and that fifty percent of all patients were living and well five years later.<sup>571b</sup>

The National Cancer Institute also created a Committee on Radiotherapy Studies (CRTS), which later changed its name to Radiation Therapy Oncology Group (RTOG). The CRTS was chaired by Dr. Gilbert Fletcher,<sup>B</sup> and I took charge of organizing a cooperative clinical trial of radiotherapy for inoperable cases of carcinoma of the prostate (stage C). After a few years (1967–1973), the study was discontinued because of an insufficient number of cases entered. However, 372 cases received radiotherapy under a very strict protocol, with the same total dose and the same fractionation over six to seven weeks. I have followed up on this study and recently reported that more than half of these patients (on average sixty years old when treated) did not die of prostatic cancer, and twenty-four were still living twenty years later.<sup>506b</sup> Currently RTOG, under the leadership of James Cox, is conducting cooperative clinical research on thirty-nine different protocols with the par-

ticipation of over 120 institutions and thousands of patients.

For forty years after its inception, the membership of the Trustees of the American Board of Radiology was made up of three representatives from each of the five constituent societies: the ACR, RSNA, ARRS, ARS, and the AMA. These fifteen individuals were also the examiners. For years, examinations in radiotherapy were conducted by physicists or surgeons on the Board. Later, the ARS appointed radiotherapists, and the ARRS also nominated William T. Moss. They contributed to building a proper preliminary written examination in the field. Some radiological groups, aspiring to representation on the Board, had failed to obtain the required unanimous consent of all governing bodies of the five constituent societies. In 1974, Luther Brady obtained such approval for ASTRO, quietly and almost single-handedly. Luther Brady, Lowell Miller, and myself were the first ASTRO trustees on the Board. Certification in General Radiology was discontinued, and gradually examination of candidates in therapeutic radiology was extended from one to eight examiners.

For thirty years, from 1949 to 1979, I was the U.S. delegate to the Inter-American College of Radiology. We had a congress every four years in one of the member countries. In 1955 the congress was held in Washington, with James T. Case<sup>B</sup> as president. I was elected president in 1967. We had numerous working committees, but infrequent meetings made the organization unwieldy, and cooperation across frontiers was difficult. Nevertheless, we had the opportunity to meet the true pioneers of radiation oncology in Latin America: Leonardo Guzmán (1889–)<sup>B</sup> of Chile, Luis M. Pons (1899–1958) of Argentina, Felix Leborgne (1904–1978)<sup>B</sup> of Uruguay, Osolando Machado (1914–1990)<sup>B</sup> and Mathias Roxo-Nobre (1904–1979)<sup>B</sup> of Brazil, Luis Pinillos-Ganosa of Peru, Mario Gaitán-Yanguas (1919–) of Colombia, and Manuel Riebeling (1904–1983)<sup>B</sup> of Mexico City.

There had been separate departments of radiotherapy in private institutions such as the Mayo Clinic and the Cleveland Clinic, but medical schools held long to single departments of radiology. There were a few strong divisions of therapeutic radiology, but their heads were not represented in faculty meetings. Their needs and points of view were secondary to those of the chairmen, who were diagnostic radiologists. In 1965 the Medical School of the University of Oregon was the first to create a position of Professor and Chairman of Therapeutic Radiology, which was occupied by Clifford V. Allen and later by William T. Moss. Tufts University Medical School followed shortly and Fernando Bloedorn<sup>B</sup> was its first Professor and Chairman. Gradually other faculties have understood the need for a separate department



Fig. 20-8. Juan A. del Regato, M.D., D.Sc., Professor Emeritus of Radiology, University of South Florida, Distinguished Physician of the Veterans Administration, 1993.

of radiation oncology and there are now over fifty such departments in the United States.

As a greater number of training programs developed, the NCI issued a statement of its own requirements for granting operating funds. These guidelines included a training requirement in research. Some academic centers started to send freshmen residents to spend a year in the laboratory. The CRTS was consulted, and we issued the following: "A distinct quality research content of the program is mandatory .... However, while it should be insisted that all trainees

under the present training program in *academic* radiotherapy should participate in all parts of the teaching aspects of the program ... that all trainees actually undertake a full-time research project should not be required."

In 1974, after twenty-five years in Colorado Springs, I accepted retirement and, to protect my wife's health, moved to a warmer climate in Tampa. The University of South Florida offered me a position as Professor of Radiology. Thus for the past nineteen years I have lectured three times a week to medical students in a senior year elective on radiation oncology. In the past fifteen years there have been twenty-four USF students who have gone on to train in radiation oncology, and I have assisted them (Fig. 20-8).

Our daughter, Ann, a graduate of Middlebury College, teaches Spanish. She married Don Th. Jaeger, a symphony orchestra conductor. Juanita, a graduate of the Lexington school, teaches deaf children. She married Nathaniel Peters III, Ph.D., a psychologist. John, a University of Wisconsin Ph.D. in education, and his wife, Mary Gilfeather, have founded an institute concerned with innovations in mathematics teaching.

Half a century ago no one could have predicted the progress which has taken place in the use of ionizing radiations. Patients with forms of cancer once considered incurable are now being saved in surprising numbers thanks to the skilled practice of radiation oncology. The specialty has gained professional authority and academic respectability. The extent of the transfiguration may not be apparent to those entering the field today, nor is it appreciated by the much-benefited public; but it is real. There are yet numerous vistas for fruitful research and further progress. Some of the present concerns may be abandoned, but there will be new ones. The use of particle acceleration has only been touched. And there are great possibilities in trials of further protraction of treatments and greater fractionation to increase margins of safety in radiotherapy of tumors.

### Subject Notes

20.1 From 1949 to 1974, the following radiation oncologists received their training at the Penrose Cancer Hospital: Ildefonso Arenas-Bueno, Carl R. Bogardus, Gerald Stephen Brown, Roger Warren Byhardt, Jose Luis Campos, Patrick Joseph Cavanaugh, Chahin Movses Chahbazian, Francisco V. Comas, Basil Considine Jr., Douglas Carrizo, James D. Cox, James Raymond Dolan, Donald Raymon Eisert, Juan V. Fayos, Leopold E. Genest, Alvin Greenberg, Anthony J. Grueninger, Walter G. Gunn, Augusto Elio Gutierrez, Ralph Emil Johnson, Arthur Robert Kagan, Dudley H. Kersey, Larry E. Kun, Robert Deri Lindberg, Winona Rosa Mackey, Victor A. Marcial, John Frederick Marshall, Eitan Medini, Joaquin Gómez Mira, Emanuel Nava, Vinicio Perez, Ruheri Perez-Tamayo, Bryan L. Redd Jr., Merle Weston Reynolds, Graciela M. Serna, Santiago Neftali Sallaberry, John Edward Schiller, Charles Harper Taggart, George W. Taylor, Jeanne Ubiñas, Jerome Maurice Vaeth, Mario Vuksanovic, and J. Frank Wilson.

20.2 The American charter members of the International Club of Radiotherapists were: Franz J. Buschke (1902–1983), Simeon T. Cantril (1908–1959), James W. J. Carpender (1911–1982), Ralph M. Caulk (1909–1989), Theodore Eberhard (1904–1960), Gilbert H. Fletcher (1911–1992), Milton Friedman (1903–1983), Manuel Garcia (1904–1973), Harold W. Jacox (1904–1990), Isadore Lampe (1906–1982), Maurice Lenz (1890–1974), Bertram LowBeer (1900–1955), James J. Nickson (1915–1985), Juan A. del Regato (1909–), and Milford D. Schulz (1909–).

In addition to the above, the following radiologists received training in radiotherapy for periods of six months to one year: James W. Barber, Genine Baker, Jorge Ceballos, Klaus Dehlinger, Robert A. Elliott, Joanna Keleki, John C. Lemon, Rukan Lin, Patrick Lynch, Robert McCarver, Harold Phelps, Germaine Ratelle, and Orles Wildermuth.