

Radium, Radon and the Search for Radium Substitutes

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- Following the discovery of radium by the Curies in 1898, the production of radium in Europe was a carefully controlled monopoly. The Curies could not obtain enough radium to conduct their research.
- Almost no radium was available for export and the outbreak of WWI meant mining was at a standstill.

- Dr. James Douglas, a mining engineer and industrialist, was dedicated to investigating the effects of radiation on cancer following the treatment of his daughter in England. He and Dr. Howard Kelly, a Baltimore gynecologist and philanthropist, joined forces to supply radium in the US. In partnership with the US Bureau of Mines, they formed the National Radium Institute.
- They leased land in Colorado and began to mine uranium ore. In 1914 and again in 1917, the Douglas family donated the refined radium to the Memorial Hospital. At that time, this was the largest supply of radium anywhere in the world. The donated radium was estimated to have a value of \$300,000 [in 1920 dollars].

Dr. William Duane studied with Marie Curie in Paris and became interested in the daughter products of radium. He used the term "radium milk" to describe the radon gas emanations.

In 1915, he built the first radon plant in the US at the MGH in Boston.

Dr. Duane was asked by the Board of Managers of the hospital to build a radon plant in New York. A portion of the donated radium was placed in solution in a plant designed by Duane.

Henry Harrington Janeway, M.D., first chief of cancer surgery at Memorial Hospital



The use of radium was totally under the control of surgeons at the hospital.

- In 1915, at the suggestion of Dr. Duane, Gioacchino Failla was hired by Dr. Janeway to operate and improve the radon plant.
- In 1917, Failla, Janeway and Barringer, a urologist, authored a report, "Radium Therapy in Cancer at the Memorial Hospital, New York City, First Report, 1915-1916" in which Failla described the decay series of radium and the physicians presented case reports of patients treated.
- Failla was listed in 1923 as the head of the "Radium Department", formed under Dr. James Ewing, director of the hospital.

G. Failla, first chair of Medical Physics [the Radium Department] at Memorial Hospital, inventor of calorimetry and the semi-automatic radon plant, an improvement on the original Duane model.



- Failla developed a teletherapy machine using a so-called "radium bomb" containing about 2 grams of radium.
- He also improved the method of extracting radon gas from the plant, a "semi-automatic" method.
- In 1921, during her visit to the US, Marie Curie visited Memorial Hospital to view the radon plant. She was presented with 1 gram of radium as a gift from the women of the US in a ceremony held at the White House.



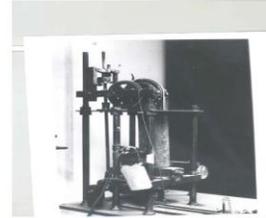
- In 1921, Failla and Quimby published their work on filtration and depth doses. The Quimby tables became the standard for single plane implants and remained in use until the publication of tables by Paterson and Parker.
- Dr. Quimby was a remarkable educator and taught an entire generation of physicians and physicists.

- In 1939, the hospital was moved to a new building at 68th Street on land donated by the Rockefeller family.
- The “radium pack” was moved in a truck with Failla as passenger and with a police escort.
- The radon plant was transferred in Failla’s private car with no police escort.

Memorial Radon Plant
Two Sides to the Actual Plant



- Radium and radon tubes were previously placed in glass tubing. Failla replaced glass with gold, thereby reducing the beta radiation doses which had caused inflammatory reactions.
- In 1919, Failla hired Edith Quimby to work with him on the use of radium for radiation therapy.
- By 1926, Memorial owned 9 grams of radium, the largest supply anywhere in the world.



- In 1941, both Failla and Quimby moved their laboratories to Columbia University to continue their research there.
- In 1951, John Laughlin was recruited from the University of Illinois to head the revived Physics Department and bring beta-ray treatment to the hospital.
- He added the sliding doors seen on the plant to reduce the doses to the plant operators.
- All of the implantations of radon seeds were still being done by surgeons. Sites implanted included lung, head and neck and superficial lesions.

- In the mid-1960's, there was a serious attempt to find a substitute for radium and radon as it was recognized that there were significant radiation exposures to physicians and staff.
- Cesium-137 had become available and was recognized as a substitute for Ra-226 in the treatment of gyn disease.
- Holt and Hilaris were awarded a USPHS grant to find a substitute for radon seeds. I joined this project as a fellow.

- In 1961, Failla was killed in a car crash in Illinois.
- The first I-125 seed implant was performed at Memorial Hospital in 1965. There was only one implant during that year.
- Pd-103 seeds became available in the 1980's, again initially very expensive.

- In the late 1960's, Cs-131 and I-125 were investigated as possible substitute isotopes.
- I-125 seeds were initially manufactured by Lawrence Soft-Ray which was later acquired by Medi-Physics. These seeds eventually became widely available although initially, they were quite expensive.
- In 1971, the Memorial Hospital plant was removed, leaving only one operating plant at Radium Chemical Co. in Queens, NY. That site was eventually designated as a "superfund" site.