

HISTORY AND HERITAGE

SOME REMARKS ON THE ROLE OF MARIA SKŁODOWSKA-CURIE IN THE DEVELOPMENT OF THE FIRST POLISH CENTRE FOR RADIUM TREATMENT

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Maria Skłodowska-Curie (1867–1934), after graduating from secondary school in the 1880s, left for France in 1891, as it was impossible to continue her education in Warsaw. The city was at the time occupied by tsarist Russia, as a result of the „partitions” of Poland done by Prussia, Russia and Austria at the end of the 18th century. In Paris, she studied at Sorbonne University, where from 1904 she headed the laboratory and from 1906 (after the death of her husband, Pierre Curie) she was chair of the Radioactivity Department. As result of her joint research with her husband on radioactivity emitted by the mineral uranium and thorium, in 1898, they discovered two new radioactive elements, polonium and radium. For this achievement, they received the Nobel Prize in Physics in 1903 (along with Becquerel). In 1911, Maria alone received a second Nobel Prize, this time in chemistry, for her research on the chemical and physical properties and methods of isolating, purifying and measuring the activity of polonium and radium.

During her whole life, Maria Skłodowska-Curie had very close ties to her native country Poland. She herself jokingly expressed her opinions when telling a story at the meeting of the International Committee of Intellectual Cooperation in 1921: Representatives of three countries took part in a free literary competition on the role and importance of elephant. The Englishman’s story was entitled: “My adventures while shooting elephants in South Africa”, the Frenchman was more concerned with “The sexual and erotic life of elephants”, while the Polish approach was invariably “The elephants versus Poland’s national independence”, which seemed quite understandable in the light of over 120 years of the above-mentioned partition of Poland. Maria’s story became proverbial and came to

express the unmistakably Polish tendency to see everything in terms of Polish interests.

It is not surprising then that in 1913 Maria became the official (and later honorary) director of the Radiological Laboratory at the Warsaw Scientific Society, established to do research on the properties of radium. In 1921, in an independent Poland, she not only gifted 100 mg of radium bromide to the Radiological Laboratory, as well as 1000 dollars, gathered by Polish organizations in the USA, but also wrote a detailed construction plan for the Radium Institute in Warsaw, to model the Parisian Institut du Radium. Her priority was to closely link clinical activity to research. At the time, it was a pioneer idea to suggest doctors should cooperate with representatives of the sciences: physicists, chemists, and biologists. As she wrote herself, “Radium therapy in such a novel area needs to be based on a strong foundation, which is physico-chemical research on new bodies; if this is absent, the theory becomes empirical or a routine, indiscriminately using popular methods which often contain basic errors.”

After gaining independence after World War 1 on the basis of the Versailles Treaty and as a result of victory in the Polish-Soviet war of 1920, Poland was a poor country, especially ruined by military activity that had taken place within its boundaries. Poland needed gigantic efforts to consolidate the three separate parts of the country, a division that was inherited from 127 years of partitions. This obstacle in the fields of science and medicine was overcome thanks to a special and deep understanding of the importance of radium treatments, as well as support from the most famous and popular Polish pianist of all times, Ignacy Jan Paderewski (1860-1941), who was instrumental in collecting money in the USA, as well as the then President of the Polish Republic, Stanisław Wojciechowski,

and in 1921, the Radium Institute Society was created. It was spearheaded by Maria's sister, Dr. Bronisława Dłuska, and other members included the most prominent representatives of Polish academia. A few years later, this Society, along with the newly-created Polish Committee to Fight Cancer, raised funds and material donations in order to buy the land and finance the construction of the Radium Institute in Warsaw, which exists until this day. In the declaration we read: „Poland cannot be indifferent, but should honour her brilliant Daughter in a manner worthy of a great Nation. The Polish Committee to Fight Cancer turns to the whole of Polish Society to request donations for the Polish National Gift. This gift should become the Radium Institute named after Maria Skłodowska-Curie”.



Figure 1. The opening of the clinical department of the Radium Institute in May 1932. Maria Skłodowska-Curie is seen in the centre of the picture planting a tree (with the shovel) in the front of the Institute building.

The response from Polish society to this appeal was instantaneous and extremely generous – over 2 million zloty (the equivalent of 400, 000 dollars at the time) were collected, which was an enormous amount. This, along with help from the government, enabled the planning and construction of a modern complex by Polish engineers, with guidance from Maria Curie herself and French specialists from Paris. The complex consisted of four separate buildings: 1) A clinical building with specialist consulting-rooms and a hospital ward for radium patients, 2) X-ray therapy, (3) A biology and physics research building, and (4) preparation of radiological sources. The ceremony of laying the foundation stone under the Institute took place on June 7, 1925, while the construction itself took 6 years. It is worth mentioning the beautiful statue of Maria Skłodowska-Curie, created by well-known Polish sculptress Ludwika Nitschowa, in the park surrounding the Institute. Incredibly enough, the statue, and the Institute itself, survived the complete destruction of Warsaw during World War 2, and still stands to this day.

From the very beginning, Maria Skłodowska-Curie actively advocated for creating a Physics Department or Physics Laboratory at the Radium Institute, for instance writing to one of the most famous Polish physicists of the time, Professor Stefan Pieńkowski from the Physics Institute at Warsaw University, „We will create, in the building's laboratories, a physics and chemistry centre, strictly scientific, which will be dedicated to research on resolving the most interesting issues of biology. They would relate to the basics of metrology, which, as for now, leaves much to be desired. I expect that you will be interested in this project, which seems to me to be in harmony with the scope of research done in your Institute, and that you will want to take part in its execution, by helping to start the project by suggesting employees from among your own co-workers (Translation from Polish).

As a result, one of Professor Pieńkowski's colleagues, Dr. Cezary Pawłowski (1895-1981), became the director of the future Physics Laboratory, after undergoing a 4-year 'apprenticeship' with Maria Curie in Paris in the years 1927-1931. As he wrote: „As a future director, I was surrounded by the special care of our great scholar, who devoted much of her valuable time to discussing the results of my research.”

Dr. Franciszek Łukaszczyk (1897-1956), who was also educated in Paris as well as Berlin and Hamburg, became the Director of the Institute.

Most importantly, the Institute's activities depended on possessing radium. For that reason, as the above-mentioned Dr. Pawłowski writes: „Maria Skłodowska-Curie did not waste any time in her efforts to gain the necessary amount of radium for the Warsaw Radium Institute to be able to start research and treatment of cancer. However, acquiring this valuable element in the required amount exceeded the financial possibilities of the newly-recovering nation. In order to successfully gain radium for her native country, Maria Skłodowska-Curie turned to the well-known American journalist, Mrs. Meloney for help. Thanks to the campaign for the purchase of radium that she organised among Polish Americans and friends of Poland, enough money was collected to buy 1 gram of this element.”

Bearing in mind the experience from May 1921, when Maria along with her daughters journeyed through the USA collecting money to buy a gram of radium for the Institut du Radium in Paris, in 1929, Marie Meloney (nicknamed „Missy”) invited Marie Curie once again to the USA. With the collected funds, and with the support of the US President, Herbert Hoover (1874-1964), 1033,21 mg of radium was purchased at a specially lowered price from the Belgian company „Union Minière du Haut Katanga”. This was offered to the Radium Institute in Warsaw and marked with the code MSR (short for: Maria Skłodowska's Radium).

At the Radium Institute, the radium for clinical purposes was used only in the form of tubes and needles. The

activities and dimensions of these applicators followed the so-called Paris system of dosage adopted at the Institute.

The opening of the clinical department of the Radium Institute took place on May 29, 1932. The ceremony was attended by Maria Curie (who came especially from Paris for the event), Dr. Regaud and Prof. Marie, Director of the Chemistry Institute of Paris University. From the US, attendees included a delegation from Polish women's societies and Marie Maloney (who in the meantime received from the Polish government the Cross of Merit), and numerous Polish government officials and representatives of academia also attended the event. In her speech, Maria Curie expressed admiration for the opening of the clinical department of the Institute, but at the same time also called for quick construction of the Physics Laboratory. As she said, "Therapy should be constantly linked to research, without which it can make no progress. The search for pure knowledge is one of the essential needs of humanity. So I hope that opening the scientific laboratories foreseen for the Institute will take place soon after opening the medical section".

Maria Curie's efforts to connect clinical practice with research were greatly supported by earlier-mentioned Bronisława Dłuska (1865-1939), as well as, of course, Dr. Cezary Pawłowski. Construction of the laboratory building was finished in 1934, the year Maria Curie died, but even at the beginning of the year Dr. Pawłowski wrote in a letter to Maria: „The approaching opening of the laboratories in the Radium Institute gives me the courage to write a letter in which I plan to give the general outlines of the state of the current preparations, as well as indicate the direction of future works. At the same time, I kindly request your comments on this plan.” In this same letter, Dr. Pawłowski writes: „ Research in the Physics Institute of the RI will mainly concern the effect of radioactivity on matter. The whole body of work will go in three directions: (1) research close to the biological direction, which aims to analyse the effect of radioactivity on matter in a state close to those which are in the [human] organism, and especially in the colloidal state, (2) research of a purely physical character will be related to the forced transformation the nucleus of atoms, (3) research of a measurement nature will be done at the Institute at the request of different public and private institutions and would be the analysis of the radioactivity of minerals, mineral waters, radioactive materials' standardization, etc.

The building of the research laboratories, with the section dedicated to the Physics Laboratory, was opened in its final shape at the end of 1934, while the Laboratory itself did not become active until February 1936. Following the suggestions of Maria Skłodowska-Curie, the Physics Laboratory was to be dedicated to research on physics issues in the area of Roentgen radiation and atomic radiation, which have their application in biology and medicine.

Within the Physics Laboratory in 1937, also following the suggestions of Maria Curie, the Measurement Laboratory was created. It consisted of the X-ray Showroom and the Laboratory of Measurements of Radioactive Bodies. The research scope of these Laboratories included (according to the later published memories of Dr. C. Pawłowski):

- (1) Determination of the efficiency and the radiation distribution of X-ray tubes;
- (2) Investigation of phantom scattered radiation;
- (3) Radiation exposure (determination of current and total doses);
- (4) Investigation of X-ray tube shielding properties;
- (5) Determination of scattered radiation in X-ray, research and clinical departments;
- (6) Investigation of X-ray and radium radiation shielding materials and curtains;
- (7) Investigation of X-ray radiation quality and that of X-ray filters;
- (8) Determination of dose equivalents of radium, thorium and other radioactive elements;
- (9) Calibration and service of X-ray dosimeters;
- (10) Determination of leak-tightness of radium tubes and needles;
- (11) Radiation contamination monitoring;
- (12) Design and investigation of radiation protection devices in radiological laboratories;
- (13) Investigation of shielding devices; and
- (14) Search for lost radium tubes.

In the Laboratory, there was also a mechanical workshop and glass workshop, since much of the equipment was to be constructed within the institute itself. The Physics Laboratory had its own optical darkroom, because in research on ionizing radiation, the photographic method was the most frequently used.

Unfortunately, the premature death of Maria Skłodowska-Curie did not permit her to follow the development of the Radium Institute in Warsaw. Shortly after her last visit to Poland at the beginning of 1934, she died at the Sancellemoz Sanatorium in Passy, in Haute-Savoie, from aplastic anaemia contracted from her long-term exposure to radiation, on July 4 1934. She was buried in Sceaux, next to her husband Pierre. Sixty years later, in 1995, as a token of appreciation for their merit, Pierre and Maria were placed in the Panthéon in Paris. In this way, Maria Skłodowska-Curie became the only woman scholar to gain this honour.

There is no doubt that thanks to the unfailing dedication to the creation and development of the Radium Institute, Maria Skłodowska-Curie played a dominant role in the history of radium treatment in Poland, especially in its beginning phases.

At the end, it should be said that unfortunately the brilliant development of the Physics Laboratory, and also

the Radium Institute itself, was interrupted by World War 2. It should be mentioned here that immediately preceding the war, Dr. Pawłowski, who was concerned about the fate of radium, buried all equipment with radium in the garden of the institute, hiding at the same time in a safe place the research and measurement equipment of the Physics Laboratory.

After the war, the Radium Institute was rebuilt, and Dr. Cezary Pawłowski headed the Physics Laboratory until 1953, raising a new generation of medical physicists, the most famous of whom was the recently deceased Prof. Barbara Gwiazdowska (1928-2011). For many years, she headed the Department of Medical Physics at the Maria Skłodowska-Curie Oncology Centre in Warsaw, which

Department was the direct descendant, or rather continuation, of the historical Physics Laboratory of the Radium Institute.

This article is based in a large part on the publication entitled *Historia Zakładu Fizyki Instytutu Onkologii w Warszawie w okresie kierownictwa Prof. Cezarego Pawłowskiego* [History of the Physics Department of the Oncology Institute in Warsaw under Professor Cezary Pawłowski], written by B. Gwiazdowska and others, included in *Pol J Med. Phys Eng* 2007; 13(4) 183-238).

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