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RESEARCH ARTICLE

Setting Radiation Protection Standards: The First Radiology Congress in 1925

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ABSTRACT

In 1925, the first International Congress of Radiology took place in London. This Congress brought together almost 500 experts from across the world. For many of the oversees participants, this was a long, difficult, and expensive journey, but the effort paid off. Concerned over the dangers of medical treatment with radium and x-rays, especially for the medical doctors administrating it, and the lack of proper standardization, the Congress gathered to solve these pressing issues. The international and scientific environment of the Congress promised that these issues could be solved, and that an international radiation standard would be settled upon. However, in the international and scientific arena of the Congress, many of the originators of radiation research like Maria Curie and the Vienne Radium Institute were left out, as new scientific centres came to prominence.

Introduction

The First International Congress of Radiology took place from 30th of June to 4th of July in 1925 in London.[1] In the view of Albert Soiland, a key figure in establishing radiology as an independent medical discipline in the US, the Congress would "go down in medical history as the greatest achievement of organized radiologists." This unique gathering, as Soiland emphasized, brought together some of "the most distinguished scientists from every civilized country in the world."[2] Indeed, the number of radiologists attending exceeded the expectations of the British organizers. Nearly 500 experts from a range of medical and scientific disciplines – including surgeons and physicists - from twenty-one countries, joined the opening of the conference at a hall that could seat a little more than a hundred.[3] Immediately following the congress, an editorial in the *British Journal of Radiology* noted with satisfaction that scientists had come from all over Europe; "from Reyjavik in Iceland, to Constantinople…from Leningrad, others from Moscow, from Cracow, from Prague, from Naples, from Milan, as well as from the great cities of France, Belgium, Holland, Germany, and Scandinavia; and on the other side of the Atlantic, every quarter of the United States, and South America."[4] Germans too were present, an indication that the post-war isolation of its scientists was receding. Internationalism was at its best.[5] Indeed, the Congress reflected the intensifying trend towards the internationalization of science, including the medical sciences, during the interwar period.

With this editorial piece, we would like to return to this remarkable event, where the first steps on the international cooperation on radiation standardization and protection began in earnest. The issues of international cooperation in medicine and science, especially in regard to radiation protection, have not dismissed in the past 100 years since the 1925 Congress, which brought together scientists and medical professionals from diverse national and societal backgrounds to try to solve the burning questions of how to improve – and protect - human health through and from radiation.

Generous hosts and troubled waters

At the 1925 Congress, unsurprisingly, as the hosts of the event, the British were the largest contingent, with 207 scientists. Next largest was the German delegation with 65 scientists. The American delegation, 63 of the most senior radiologists in the country, were scheduled to travel on the luxurious ocean liner *Mauretania*. Crossing the Atlantic on one of Britain's most expensive and fastest superliners proved challenging for the American radiologists. The American radiologist William Stewart who served on the organizing committee of the congress reported that "so much objection was made to the expense of travelling" that the Americans were forced to switch to the modest US owned *America* ocean liner.[6] Attending a conference in these days required an extended effort, logistical challenges, and long hours on trains and ships. For the Americans, getting to the 1925 radiology congress involved a week-long journey across the Atlantic Ocean by ship; Japanese and Australian colleagues faced even longer ocean transits. The financial arrangements were also complex: in 1924 and in preparation for the trip from the US to

Britain, the journal *Radiology* published estimates of travel expenses that also set out detailed terms of travel[7]: "Providing the party has a minimum number of sixty, and the travel is on the one-class cabin steamers instead of on the luxurious liners, and the traveling abroad is done in second-class railway carriages (third-class or auto buses for England)." A trip from New York to London, for example, including visits and sightseeing activities cost close to $600 - $11,000 in today's prices. Travel was part and parcel of international science. For those who undertook it, the trip certainly paid off.

The British colleagues were delightful as hosts. An editorial note in *Acta Radiologica* in July 1925 described the conference as a remarkable success, and praised the British for their hospitality, and for bringing "the ray-men from all parts of the world".[8] Indeed, at the time radiologists were almost exclusively men. Women radiologists were few in number, although the British Florence Ada Stoney, the American Edith Quimby or the German Alice Ettinger, all leading radiation experts and researchers, were brilliant exceptions to the rule during that time.[9] Gender norms were strongly in evidence: most women around the congress were the wives of scientists who spent their time on social and cultural activities laid on by the organizing committee. As Soiland noted, "The Ladies' Committee were especially gracious and kind in providing real entertainment for the visiting ladies."[10] When the congress ended, fourteen American radiologists travelled on to Scandinavia and visited radiological institutes in Oslo, Stockholm, Upsala and Copenhagen.[8] Women were just travel companions.

An international and commercial affair

In addition of being greatly international, the Congress proved to be also a commercial success. Radiology was a highly technology based and driven field. Commercial actors, for example, x-ray equipment manufacturers, and their displays were an integral part of the congress. Thirty-one European and American firms presented cutting edge "roentgen, radium, and light apparatuses" in an exhibition that included also numerous radiographs.

At the end, interdisciplinarity won the day. Surgeons and radiologists sat around the same table to discuss probably the most pressing problem of their time: the standardization of radiation dosage in medical practice. As Arthur W. Erskine, president of the Radiological Society of North America noted, the most important decision of the congress was "to authorize the appointment of an international committee to consider the establishment of an X-ray standard of intensity and an X-ray biological unit."[11] Lauriston Taylor, the foremost US expert on radiation protection, later recalled that it was the radiologists' effort to reach a consensus on a standard system of quantities and units that led to this first international committee on radiation safety and the adoption of the roentgen as a unit of radiation dose.[12]

A dangerous field

It was the overexpose to radium throughout the 1920s and the increasing fatal incidents in the community of radiologists that prompted the first international responses to radiation hazards. The initial use of the erythema dose—the reddening of the human skin – was recognized to be imprecise as a means to

measure radiation exposure. This medical practice was highly subjective, given that it was up to the individual doctor's judgment as to how much red is "red enough". A 1924 study carried out by the German radiologists Leonhard Grebe and Heinrich Martius found that just within German radiological clinics using the erythema dose, the radiation dose administrated could vary with as much as a four-fold difference.[13] Far from a reliable medical standard. In addition, X-ray tubes varied with respect to beam intensity, and individual patients showed differing sensitivities to ionizing radiation. The radiologists gathered in London in 1925 were willing to go to the trouble of crossing the Atlantic and spend hours on ships and trains for a good reason. They perceived the need for – indeed, the necessity of – forging an international agreement on a standard system for working with radiation, a system that included instruments, units, and doses. For the very first time in a truly international setting radiologists and physicists from around the world—from the US to Japan and from Argentina to Australia— crossed paths on sessions concerning standardization. The British Nobel laureate William Bragg reported on the physical aspects and the French virologist Antoine Béclère presented the medical standpoint of radiation standards. The 1925 Congress laid the foundations for developing internationally agreed standards on radiation dosimetry and paved the way for the establishment of the first international X-Ray and Radium Protection Committee (later known as ICRP) during the Second Radiology Congress three years later in Stockholm.[5]

By the mid-1920s, the euphoria that had initially surrounded x-rays following Röntgen's discovery in 1896 and the discovery of radium two years later, had been replaced by the recognition of the dangers that ionizing radiation posed to human health.[14] At the congress, several papers indicated this shift. For example, in the physics section of the conference program, the British physicist George Kaye who worked at the country's National Physics Laboratory discussed his study on protective measures for x-ray and radium workers; he also noted a somewhat cavalier attitude on the part of some radiation professionals towards scattered radiation (always present around a radiation source) and argued for the introduction of lead shielding in these environments. Elsewhere, Frank Lloyd Hopwood, another British physicist working at the crossroads between physics and medicine, described the organization of the radium service at St. Bartholomew's Hospital, London, where he worked. Here, protective innovations included the use of long forceps, lead holders and packaging, to handle radium and to move it around. In contrast to x-rays, radium was naturally and powerfully radioactive – it could not be switched off – distance was a key principle of protection.[12]

As radiologists across the world were gathering in international congresses to define radiation units and safety standards forming new scientific international organizations, the physicists and chemists who pioneered the field of radioactivity such as the Curies in France and the Austrian group at the Vienna Radium Institute were gradually sidelined.[15] The centers of power in radiation research were shifting from the nationally based groups to international scientific organizations who used standardization to delegate radiation

safety to individual radiologists and to manage the increasing uses of radiation outside the medical clinic. To standardize doses, however, is inevitably to standardize the human body.[16] Indeed, the 1925 Radiology Congress set radiation protection on a new path.

Conclusion

Looking back at the first International Congress of Radiology highlights many areas of concern that are still relevant to this day, one of the major ones being radiation protection. In the period after the discovery of X-rays by Wilhelm Conrad Röntgen in 1895 until the first Congress in 1925, many new scientific discoveries and breakthroughs were made, several of large medical importance.[17] However, often neglected or sometimes completely ignored were the dangers of radiation, that exposed practitioners and patients to excessive amounts of radiation, with either serious injury or death as the result.[18] Many of the early pioneers of radiation research used their bare hands to carry out their experiments or medical treatments, exposing their skin to dangerous amounts of ionizing radiation. To try to contain the spread of the "radiation illness", as it was coined in these early days, the first solution was amputation of the fingers and hands. As Kevles dryly noted in her study of medical imaging in the 20th century: "A gloved or amputated hand became the emblem of X-ray workers."[17] For most, however, once these outward signs of radiation overexposure manifested themselves, it was too late, and an still unknown number of doctors and researchers died following their unprotected radiation work.

The 1925 Congress was a major step in the direction of the standardization of radiation units and the protection of workers engaged in radiological and radiation. Despite the often difficult travel conditions and the intensive work required to take part in these congresses in the first half of the 20th century, these professionals undertook them in order to solve burning questions of medical importance. In a time where global politics limit scientific exchange and international cooperation[19] and the question of radiation protection is once again a pressing issue, it is fruitful to look back at how this diverse group of scientists and medical professionals came together from all over the world to benefit medical practice and human health.

Conflicts of interests

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