

# X-rays and Medical Physics in Denmark in a Historical Perspective

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## Introduction

The first diagnostic X-ray image in Denmark was taken on February the 12th 1896 of a fractura cruris at the Technical University in Copenhagen by a physicist M. Knudsen and already in March 1896 the pioneer radiologist L.J. Mygge took the first X-ray pictures in a hospital environment. The first permanent X-Ray installation was taken into clinical use at Kommunehospitalet in Copenhagen on October 30th 1896. In the same year two private X-ray clinics were started, one in Copenhagen and one in Aarhus. In 1899 Mygge published a book entitled: "The exploitation of Roentgen Rays in the Field of Medicine" in order to "correct the erroneous conviction that Denmark had not entered upon this matter until late". In 1902 he detected as the first in Scandinavia a renal calculus and in 1903 he treated with succes a recurrence of breast cancer.

## Medical Physics into Healthcare

The founder of Radiotherapy in Denmark was, however, Niels Ryberg Finsen who already in 1892 initiated his scientific studies of the influence of light on the human skin and presented his first publication in 1893 dealing with the harmful effect of light. For these studies he received the Nobel Prize in 1903. In 1912 the Radiumfoundation was established to collect funds for buying radium for cancer treatment. Also in 1912 the first radiumcenter for treatment of cancer patients was established in Copenhagen followed by centers in Odense and Aarhus in 1914.

The fairly large amounts of radium at these centers and the increasing use of X-Rays for treatments necessitated closer collaboration with physicists and in particular the Niels Bohr Institute in Copenhagen which was very active in this field. The first physicist to be appointed to a Danish hospital came from this Institute. Prof. I.C. Jacobsen was in 1921 appointed as a consultant to the Radiumcenter in Copenhagen.

From 1920 the Nobel Prize winner (1943) Georg von Hevesy was also working at the Niels Bohr Institute for a number of years and introduced the use of radioactive isotopes and tracers into biological research.

Only in 1954 a permanent hospital physicist position was offered to J.A. Ambrosen as head of the new radiophysics laboratory in Copenhagen and a year later C.B. Madsen became leader of the radiophysics laboratory in Aarhus. The main responsibilities were dosimetry, dose calculations, the clinical use of isotopes and the registration of occupational exposures.

## The first Legislation for Radiation Protection

The Danish Radiation Protection Legislation goes back to the late 1920's. At that time X-ray installations had open high tension circuits, and in December 1926 a medical doctor touch<sup>ed</sup> one of the uninsulated high

tension wires and was electrocuted. That event made the Danish authorities aware of the dangers of X-ray installations and a fast working committee produced a report about the electrical risks but mentioned also the radiation hazard. An act was passed by the Danish Parliament in 1930 and in the same year an order was issued by the government concerning the use of X-rays. The act is still in force and forms the basis for today's legislation.

### Hospital Physicists and Medical Physics Departments

The introduction of megavoltage therapy and more complex treatment planning have demanded more physicists and technicians to support Radiation Therapy. The developments in Nuclear Medicine have also led to more specialised positions for physicists in this field, whereas few physicists have been involved in Diagnostic Radiology in recent years.

All hospital physicists in Denmark are employed within hospitals under the National Health Care system either in departments of Medical Physics/Radiophysics or as individuals in different clinical departments. All Physics departments are integrated into a department of Oncology and only the largest departments are functioning with some autonomy but none are fully independent.

The education in medical physics is based on on-the-job training on top of a University degree corresponding to a masters degree. However, this leads to an unbalance in the number of qualified hospital physicists in the different subjects as shown below, and paralyses the efforts for further academic education and training to a Ph.D. level in medical physics.

Table 1. Number of Hospital Physicists.

Subject	1: Qualified Hospital Physicists	2: As 1 + 5 years experience
Radiotherapy	25	20
Diagnostic Radiology	3	3
Nuclear Medicine	9	6
Total	37	29

### Danish Society for Medical Physics

The Danish Society for Medical Physics was founded in 1981 and accepted as a member of EFOMP and IOMP in 1982. Today (1995) it has 65 ordinary members. The major work of the Society has concentrated on improving the educational situation in Medical Physics in Denmark. The Danish Health authorities have finally accepted a national training scheme in Medical Physics and an educational structure is full agreement with the EFOMP recommendations. This training scheme will be officially in force from July 1, 1995.

### Reference

Møller, F.P., History and Development of Radiology in Denmark 1896 - 1950. Nyt Nordisk Forlag - Arnold Busck. Copenhagen 1968.