

Wilhelm Conrad Röntgen – the discoverer of x-rays

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Wilhelm Conrad Röntgen is a name familiar to most of us for his discovery of x-rays and 2023 is the centenary year of his death. The momentous discovery on November 8, 1895 is now celebrated worldwide, with that day now being designated the International Day of Radiology/World Radiography Day.

Röntgen was born in Lennep in the borough of Remscheid, Germany, on March 27, 1845. His father was a relatively prosperous cloth merchant.

Aged three, Röntgen moved with his family to Appeldoorn in Holland and he had his early schooling there. In 1862 he entered the technical school in Utrecht but failed to gain entrance to the university in Utrecht. Instead, in 1865, he entered the polytechnic in Zürich where he studied engineering. Here he met professor of physics August Kundt, who became his mentor. Professor Kundt's interests included sound and light. In 1869 Röntgen obtained his PhD for his study on gases and in 1870 he followed Professor Kundt to Würzburg, becoming his assistant. That year his first paper was published. He moved to Strasbourg following Professor Kundt and then in 1874 obtained his first chair at Hohenheim in Germany. He also held the chair at Giessen before settling in Würzburg in 1888 as professor of physics. In 1888 Professor Kundt succeeded Hermann von Helmholtz as physics professor in Berlin where he became director of the Berlin Physics Institute.

In Würzburg the 50-year-old Röntgen made his important discovery on a Friday afternoon in 1895. Röntgen had long been interested in vacuum tubes and what happens when you pass an electrical current through them. Other scientists interested in this field included William Crookes, Philip Lenard and Nikolai Tesla, to name but a few. On that day he passed cathode rays through the Lenard tube with a thin aluminium window with a cardboard covering that would prevent light from passing through. Röntgen noted that a distally placed screen painted with barium platinocyanide started to fluoresce. As light could not have caused this, it must have been due to another type of ray – so called x-rays named after the unknown. Initially he did not believe his results and repeated his experiments. Röntgen was a meticulous experimenter all his life but that evening he sensed the importance of his discovery. His preliminary findings were conveyed in the now classical paper 'On a new kind of x-rays.' The English translation was published in the journal *Nature* in January 1896. He sent many prominent physicists of his day copies of his manuscript and radiographs, including Lord Kelvin who wrote back congratulating him on his findings. Röntgen gave a public lecture on x-rays in Würzburg and his work appeared in the local newspapers, including *Die Presse* in Vienna, before the findings began to generate publicity worldwide. Medical practice would be changed forever. People began to realise that this technique had opened up new ways of seeing inside the body and thus would be helpful to doctors in making diagnoses.



Figure 1
Wilhelm Conrad Röntgen.



Figure 2
Röntgen Memorial (image courtesy Dr A K Banerjee).

Röntgen published a total of three papers on x-rays. He was showered with numerous honours including the Rumford Medal of the Royal Society of London in 1896, as well as honorary memberships of numerous learned societies and institutions. He became the first recipient of the Nobel Prize in Physics in 1901, the year he took up the chair in physics in Munich. Röntgen did not patent his finding, believing that the discovery should benefit humanity.

In addition to his work on x-rays Röntgen made many other contributions in the field of structural analysis, metallurgy, and the newly evolving subject of crystallography, publishing more than 50 papers on topics other than x-rays.

Röntgen married Anna Bertha Ludwig in 1872. She was six years older than him. They had no children of their own but adopted Anna's niece. After Röntgen x-rayed his wife's

hand (it required a 15 minute exposure) Anna Bertha is claimed to have said “I have seen my death”.

Just before the outbreak of World War I he thought about migrating to the USA where he had been offered a job at Columbia University but decided against this and stayed on in Munich. Röntgen regularly holidayed in the mountains, especially the Alps. He was essentially a shy man who was not fond of the company of his fellow physicists. He retired from Munich in 1920 and passed away February 10, 1923. The rampant inflation of the early 1920s had left him bankrupt.

Röntgen could not have imagined how his discovery changed the way medicine would be practised in the 20th century and beyond. Today his name has been given to numerous prizes and medals in the field of radiology and physics by learned societies worldwide.

The house where he was born in Lennep is now being looked after by the German Radiological Society and can be visited by the public. The ground floor hosts an exhibition and on the top floor is an apartment where guests can stay. Not far from this house is the German Röntgen Museum, which opened in 1932 and is still the only museum in the world dedicated to the life and work of this great scientist. Röntgen’s laboratory at the University of Würzburg has been preserved as a museum called the Röntgen Memorial, in the newly named University of Applied Sciences at Würzburg. The lecture theatre where Röntgen demonstrated x-rays in the presence of Professor Albert Kolliker (professor of physiology and anatomy at Würzburg) can also be visited. Röntgen took an x-ray of Professor Kolliker’s hand here on January 23, 1896.

About the author

Dr Banerjee has visited the house where Röntgen was born and the German Röntgen Museum in Lennep and the Röntgen Memorial in Würzburg. He has also helped with the translation of the book *Röntgen – A Shining Life for Science* by Uwe Busch from German to English. This article is a longer version of short pieces on Röntgen written by the author to celebrate the centenary of his death.



Figure 3
Röntgen’s laboratory, Röntgen Memorial, Würzburg.
(Image courtesy Wikipedia CC SA 4).

Further reading

- 1, Busch U. *Wilhelm Conrad Rontgen: A Shining Life for Science*. Springer. 2021
- 2, Rosenbusch G, de Knecht-van Eekelen A. *Wilhelm Conrad Röntgen: The Birth of Radiology*. Springer. 2019
- 3, Banerjee A K, Thomas A M K. *The History of Radiology*. Oxford University Press. 2003
- 4, Glasser O. *Dr W C Rontgen*. Charles C Thomas. Second edition 1958
- 5, Mould R F. *Rontgen and the discovery of x-rays*. *Br J Radiol* 1995; 68(815):1145-76
- 6, Banerjee A K. *W C Rontgen and the 125th anniversary of x-rays*. *RCR Newsletter*. 2020