

## Wilhelm Conrad Roentgen And The Discovery Of X-Ray Beams

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X-rays are a form of electromagnetic radiations which emitted when matter is bombarded with fast electrons.



The banner features the Explorable logo at the top center, with the text "EXPLORABLE" in a large, bold, sans-serif font and "Quiz Time!" in a smaller, cursive font below it. Below the logo are three square images, each with a quiz title underneath. The first image shows a pair of red roller skates on a wooden deck, with the quiz title "Quiz: Psychology 101 Part 2". The second image shows a fan of colorful pens, also with the quiz title "Quiz: Psychology 101 Part 2". The third image shows a Ferris wheel at sunset, with the quiz title "Quiz: Flags in Europe". To the right of these images is a link that says "See all quizzes =>".

### Wilhelm Conrad Roentgen

Wilhelm Roentgen, a German professor of physics, was the first person to discover electromagnetic radiation in a wavelength range commonly known as X-rays today. Although, many people had observed the effects of X-ray beams before, but Roentgen was the first one to study them systematically. To highlight the unknown nature of his discovery, he called them X-rays though they are still known as Roentgen-rays as well. For his remarkable achievement he was honored with the first he first Nobel Prize in Physics in 1901.

### His Early Life and Education

Born on March 27, 1845 in the small town of Lennep (Rhine Province) in Germany; Wilhelm Conrad Roentgen was the only child of a cloth merchant. He was raised in the Netherlands because his family moved to Apeldoorn when he was still three. For his early education he went to a boarding school in Apeldoorn named, Institute of Martinus Herman van Doorn. He was not a sparkling student rather he was keenly interested in nature during his young years. In 1862, he joined Ambachtsschool; a technical school in Utrecht. There he got involved in a

contrivance against one of his teachers and was expelled subsequently.

In 1865, he studied mechanical engineering at the Federal Polytechnic Institute in Zurich having failed to get admission in University of Utrecht lacking required credentials. There he flourished greatly under the influence of the teachers like Kundt and Clausius. He graduated from the University of Zurich and received his Ph.D. in 1869. In the same year, he assisted Kundt and followed him to Wurzburg and then to the University of Strasburg in 1873.

## His Professional Career

Year	Position	Institution
1874	Lecturer	University of Strasburg
1875	Professor	Academy of Agriculture at Hohenheim, Wurttemberg
1876	Professor of Physics	University of Strasburg
1879	Chair of Physics	University of Giessen
1888	Chair of Physics	University of Wurzburg
1900	Chair of Physics	University of Munich

It is important to mention that he declined invitations for the chair of physics from the Universities of Jena and Utrecht in 1886 and 1888 respectively. In 1899, he also declined a similar offer from University of Leipzig as well. In later years, he was offered the Presidency of the Physikalisch-Technische Reichsanstalt at Berlin which he did not take and also refused to take the Chair of Physics of the Berlin Academy.

## Discovery of X-ray Beams

Wilhelm Roentgen was already working on the effects of cathode rays during 1895, before he actually discovered X-rays. His experiments involved the passing of electric current through gases at extremely low pressure. On November 8, 1895 while he was experimenting, he observed that certain rays were emitted during the passing of the current through discharge tube. His experiment that involved working in a totally dark room with a well covered discharge tube resulted in the emission of rays which illuminated a barium platinocyanide covered screen. The screen became fluorescent even though it was placed in the path of the rays, two meters away from discharge tube.

He continued his experiments using photographic plate to capture the image of various objects of random thickness placed in the path of the rays. He generated the very first "roentgenogram" by developing the image of his wife's hand and analyzed the variable transparency as showed by her bones, flesh and her wedding ring. Based on his subsequent research and experiments, he declared that X-ray beams are produced by the impact of cathode rays on material objects.

## The Nobel Prize

His discovery revolutionized the entire medical profession and set foundation for diagnostic

radiology. In 1901, Roentgen received the first ever Nobel Prize in Physics. This was a true acknowledgement of his remarkable discovery which was going to be highly beneficial for mankind in the coming years.

Wilhelm Roentgen died on February 10, 1923 in Munich at the age of 77.

## X-radiation (x-ray)

They have extremely short wavelength and high frequency with wavelengths ranging from about  $10^{-8}$  to  $10^{-12}$  meter and corresponding frequencies from about  $10^{16}$  to  $10^{20}$  hertz (Hz).

The frequency of X-rays is higher than the frequency of ultraviolet light but less than that of a gamma ray. X-rays are extensively used in medicine and industry to produce images of internal structures because they are absorbed by many forms of matter, including body tissues.

## History of X-rays

A few of the many important people who have been involved in the research and study of X-rays are listed below:

<b>Johan Hittorf</b>	1824 - 1914	A German physicist who co-invented the Crookes tube
<b>Ivan Pulyui</b>	1845 - 1918	A Ukrainian physicist & lecturer who assembled several designs of vacuum discharge tube
<b>Nikola Tesla</b>	1856 - 1943	He studied X-rays using specially designed single-electrode tube (Bremsstrahlung process)
<b>Fernando Sanford</b>	1854 - 1948	A Professor of Physics who generated and detected X-rays in vacuum tubes
<b>Philipp Lenard</b>	1862 - 1947	He won the Nobel Prize for Physics for discovering many properties of the cathode rays
<b>Wilhelm Röntgen</b>	1845 - 1923	The first person who discovered and systematically studied X-rays
<b>Thomas Edison</b>	1847 - 1931	He examined calcium tungstate against X-rays & developed medically effective fluoroscope

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