Wilhelm Konrad Röntgen  
(1845-1923)

Introduction
In the last decade of the nineteenth century, physicists throughout Europe believed that most of the known phenomena of nature had been successfully explained. The work by scientists in that century had elucidated the properties of electricity: it could be discharged through gases at low pressure; in vacuum tubes it flowed in rays from the negative cathode wire to the positive anode wire; "cathode rays" caused glass to fluoresce. English scientist William Crookes, in his experiments from 1879-1885, demonstrated the heating effects of cathode rays which he focused on a platinum target. In 1894, German physicist Philipp Lenard proved that the cathode rays passed through an aluminum window in the glass tube and excited phosphorescence a few millimeters away. Scientific investigators were intent only on measuring what was known with greater precision.

But in the fall of 1895, during some painstaking investigations on the properties of the Crookes tube, Professor Wilhelm Konrad Röntgen recorded a new kind of rays and revolutionized the world of physics and medicine. Although many experimenters, including Crookes himself, had actually produced these "X-rays" during experiments with vacuum tubes, only Röntgen recognized that the observed manifestations which other men attributed to cathode rays were the results of a previously unknown phenomenon.

Röntgen was born on March 27, 1845, the son of a textile merchant, in the little town of Lennep in the region of the lower Rhine. He spent his youth in Holland and was educated in a technical college in Switzerland. At the age of 24, he received his Doctorate of Philosophy from the University of Zurich, presenting his dissertation, "Studies on Gases." In the years following graduation, the young physicist held several academic positions. In 1888, the University of Würzburg appointed him Professor of Physics. At Würzburg, Röntgen conducted the experiments that led to his discovery of the X-rays and the presentation of his historic preliminary communication, "On A New Kind Of Rays," which is reprinted below.

When Röntgen was appointed rector of the University of Würzburg he wrote, "...the experiment is the most powerful and most reliable lever enabling us to extract secrets from nature." He wanted to know whether cathode rays could penetrate the glass Crookes tubes, and set up an experiment to find out.

Late in the afternoon of November 8, 1895, while working alone in his laboratory with a cardboard-covered tube, he switched on the electricity and at first saw nothing, as he had expected. Then, surprised, he noticed a faint green glow
on a screen coated with barium platino-
cyanide which was resting on a bench a
yard away. Realizing that the glow was
too far from the tube to be due to
cathode rays—they could only travel a
fraction of an inch outside the tube—he
held a sheet of paper, a book, several
books and aluminum in front of the
screen and the green light still appeared.
He thought the rays must be something
new. Astounded by the discovery, he
issued no reports until he had proven
beyond all of his own doubts that the
observations were correct.

Only his wife Bertha knew of Rönt-
gen’s secret work. One day, he in-
structed her to hold up a photographic
plate which, when developed, showed
the bones of her hand and the shadows
of her two gold rings. Röntgen’s shadow
picture, which terrified his wife,
marked the beginning of pictorial and
diagnostic radiology.

After a few weeks of investigation,
he presented his report to the Physical
Society of Würzburg, and sent copies of
it to several European physicists. Soon,
he was inundated with congratulations
and appeals from cripples seeking X-ray
‘‘cures.’’ Newspapers around the world
carried the story. On January 13, 1896,
the Emperor summoned Röntgen to dem-
onstrate his X-rays at a testimonial
dinner, and decorated him with the
Prussian Order of the Crown.

Crookes tubes were common in most
laboratories, so other scientists easily
duplicated Röntgen’s X-rays and pic-
tures. But Röntgen made the first true
X-ray tube and devised a protective
zinc-walled room to prevent over-
exposure to X-rays.

The medical significance of the X-
rays was immediately recognized. For
the first time, the human eye was able to
see the structures of the living human
body, and in the months following
Röntgen’s announcement, X-rays were
used to determine fractures and dis-
locations, to study diseases of the
thorax and to diagnose calculus
disease. In Chicago, Illinois, a Crookes
tubemaker named Emil Grubbe placed
the tube over the breast cancer of Mrs.
Rose Lee, a mother of four, and initiated
X-ray therapy. Mrs. Lee’s tumor began
to shrink and her pain disappeared,
although she died soon afterwards.

Röntgen witnessed many of the de-
velopments which resulted from his
discovery, particularly the work of
Bequerel, the Curies, Thomson and
Rutherford. He was the recipient of an
honorary medical degree and numerous
medals. The Kaiser even erected a
bronze statue of him on Berlin’s Pots-
dam Bridge. But the ascetic physicist
did not enjoy the publicity he was re-
ceiving. He had pursued his investiga-
tions as a research scientist who sought
only to add to the body of scientific
knowledge. He never accepted remu-
neration for his work, and, like the
Curies after him, sought no patents. He
resented the invasion of his privacy and
told a friend, ‘‘It is almost as if I had to
apologize for discovering the rays.’’

So, when he was awarded the first
Nobel prize in physics in 1901, he
traveled alone to Stockholm. He would
not give an official Nobel lecture or take
part in any ceremonies or festivities,
and he donated his prize money to the
University of Würzburg.

Characteristically, Professor Röntgen
never entered into any contracts for
manufacturing diagnostic apparatus.
Thomas Edison expressed the view that
men should ‘‘see how to use [the X-ray]
and how to profit by it financially,’’ and
American concerns began producing
and selling X-ray machines.

Wilhelm Röntgen continued to live
modestly, and after retiring from his
professorship in 1919, went to live in a
village suburb of Munich. He died in
1923 at the age of 78. The executors of
his will followed his instructions and
burned all of his scientific writings and
correspondence.