1800
Herschel discovers infrared radiation.

1801
Ritter discovers ultraviolet radiation.

1869
Maxwell proposes laws of electromagnetism.

1888
Hertz produces first radio waves.

1889
Rutherford discovers alpha rays and beta rays.

1895
Roentgen discovers x-rays.

1897
X-rays first used for medical diagnosis.

ADVANCED PHOTON SOURCE

X-RAYS REVEAL SECRETS BEYOND ROENTGEN'S IMAGINATION

On March 26, 1995, at 7:13 a.m., scientists and engineers at Argonne's Advanced Photon Source (APS) entered a new era in x-ray research with the production of "first light" in the facility. After nearly a decade of planning and building, APS produced x-ray beams for the first time. The x-rays came as the huge doughnut-shaped machine, large enough to encircle Chicago's Comiskey Park or Wrigley Field, entered a final phase of testing. When the APS revs up to full power early in 1996, it will produce the brightest x-rays available for scientific research in the world.

For 100 years, x-rays have been ideal for revealing what visible light can't, for seeing past "impossible" barriers. One of the first x-ray photographs allowed humans to see the image of a living skeleton for the first time. That photograph was taken in 1895 by William Roentgen, the physicist who had just discovered the strange new form of radiation. In the process of characterizing the rays, Roentgen found he could photograph balance-weights in a closed box, the chamber of a shotgun, and the bones in his wife's hand. In the last century, scientists have come to depend on x-rays to reveal hidden details of the world around and within us. Within a few months of Roentgen's discovery, x-rays were being used as a powerful new tool in medical diagnosis. Scientists have since learned how to use the radiation to probe amazing intricacies: the atomic structure of biological molecules such as proteins or DNA, the chemical reactions and processes that occur as polymers and ceramics form, and even the atomic structure of some elements. One hundred years after Roentgen's discovery the APS will give the scientific community the most powerful x-ray beams ever created for these kinds of research, allowing scientists to probe more deeply and reveal more detail than ever before.

WILLIAM ROENTGEN, PHYSICIST
Discovered x-rays in 1895.

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Roentgen called his radiation "x-rays" because he understood so little about it. X-rays are no longer so mysterious. They are a form of electromagnetic radiation, very similar to the light that our eyes can see. All electromagnetic radiation, including radio waves, microwaves, visible light and x-rays, is made up of discrete packets of energy called photons. The photons travel (by definition) at the speed of light with different wavelengths and energies that characterize different kinds of radiation. X-rays have wavelengths much shorter than visible light. These shorter wavelengths can penetrate