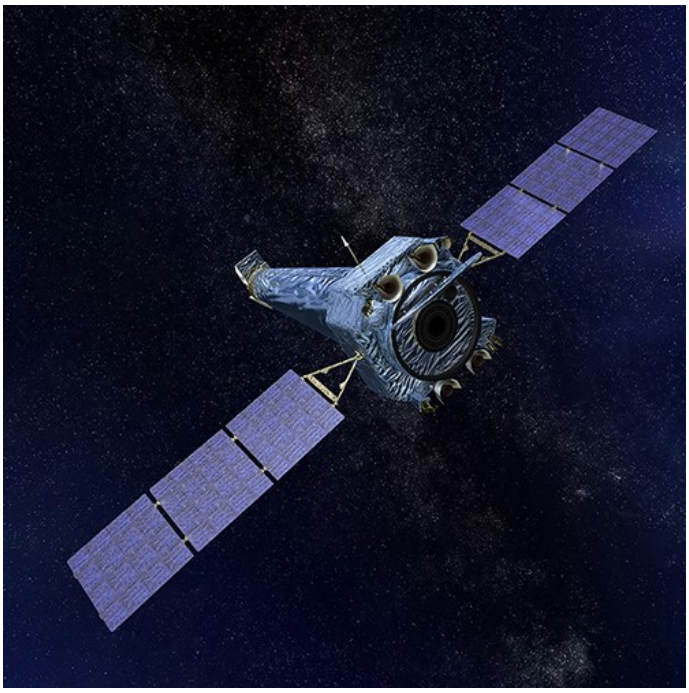
X-ray astronomy is a relatively new science

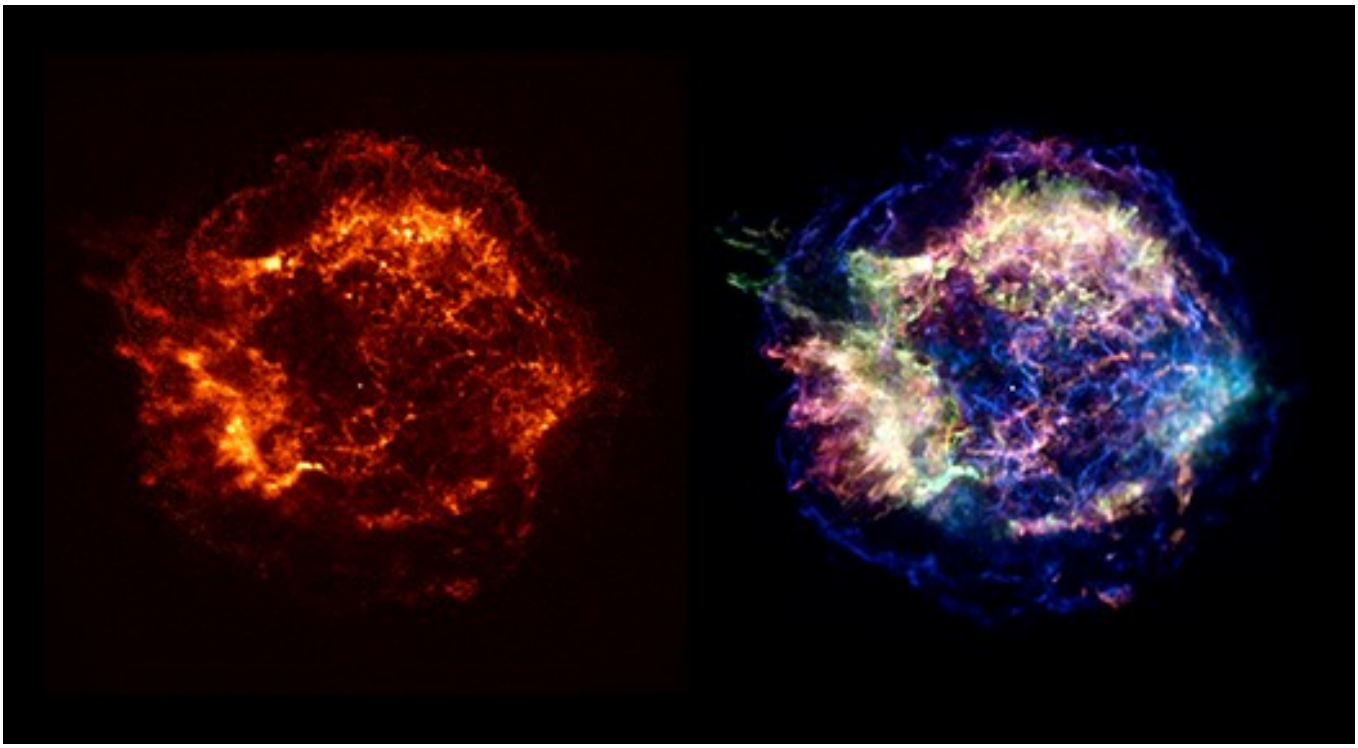
(Go to https://chandra.si.edu/blog/node/652)



It was pioneered in the 1960s and 70s by American astronomers with a series of rocket flights and orbiting X-ray satellites. The astounding discoveries made by X-ray astronomers — such as neutron stars and hot gas filling the space within clusters of galaxies — have revolutionized our view of the Universe.

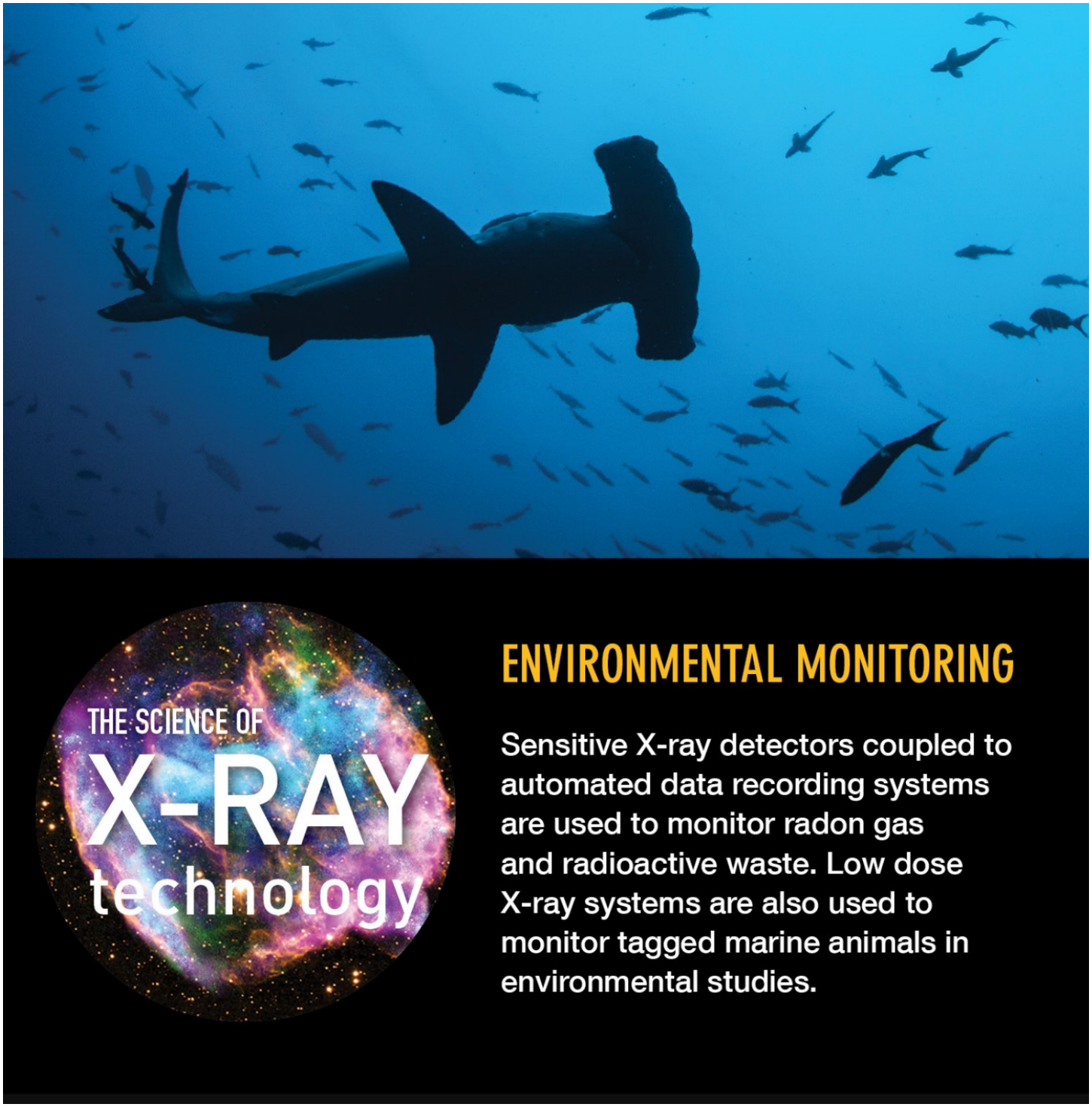
On July 23, 1999, NASA's Chandra X-ray Observatory, the most powerful X-ray telescope ever built, was launched into space. Since then, Chandra has made numerous amazing discoveries, giving us a view of the Une that is largely hidden from view through telescopes that observe in other types of light.

The technology developed for X-ray astronomy has evolved at a rapid pace, and has, moreover, produced numerous spinoff applications used in security monitoring, medicine and bio-medical research, materials processing, semi-conductor and microchip manufacturing, and environmental monitoring.



Cassiopeia A: [Left] 1999 (first light) [Right] 2011

What Chandra & X-ray Astronomy Give Back



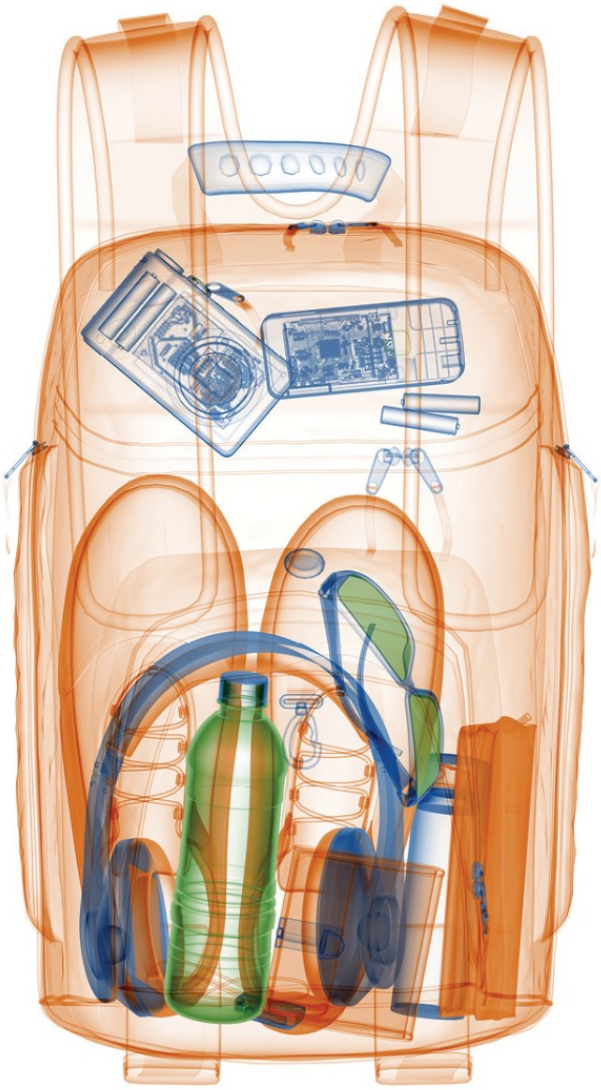
THE SCIENCE OF X-RAY technology

STRUCTURE & DYNAMICS OF MATTER

Neutron scattering is one of the most useful methods for studying the structure and dynamics of matter. Inspired by mirrors developed for X-ray astronomy, scientists have developed a new generation of neutron focusing optics for these and other applications.

AIRPORT SECURITY

A system was developed that can simultaneously image, on two separate screens, materials of high atomic weight (e.g. metal hand guns) and materials of low atomic weight (e.g. plastic explosives) that pass through other systems undetected.

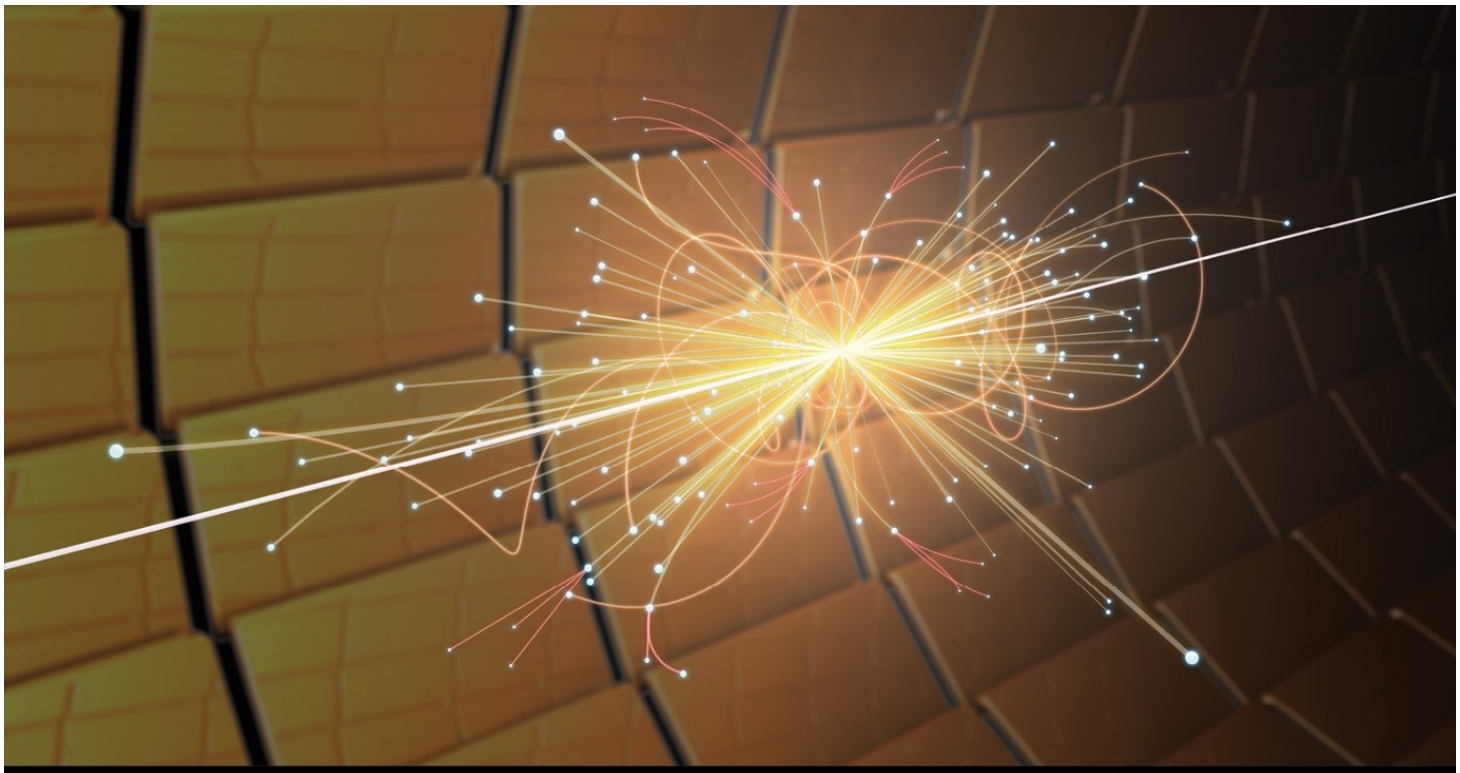


THE SCIENCE OF

X-RAY technology

BIOMEDICAL ENGINEERING

X-ray diffraction— a technique where X-ray light changes its direction by amounts dependent on the X-ray energy—is used in biomedical and pharmaceutical research to study complex molecular structures.



ENERGY RESEARCH

Researchers studying fusion as a potential source of energy use methods similar to those used by X-ray astronomers studying space plasmas. Very sensitive detector systems record the amount and location of the energy released by the fusion reaction in narrow slices of time.

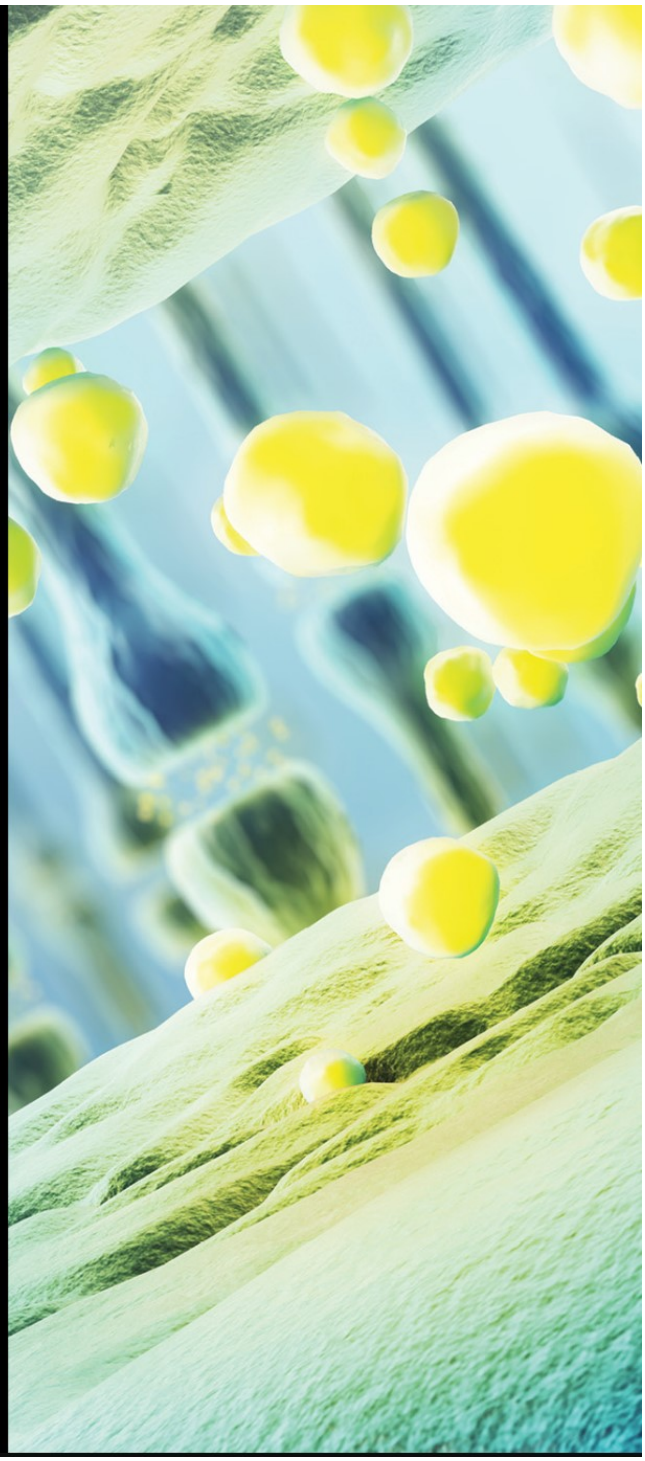
THE SCIENCE OF
X-RAY
technology

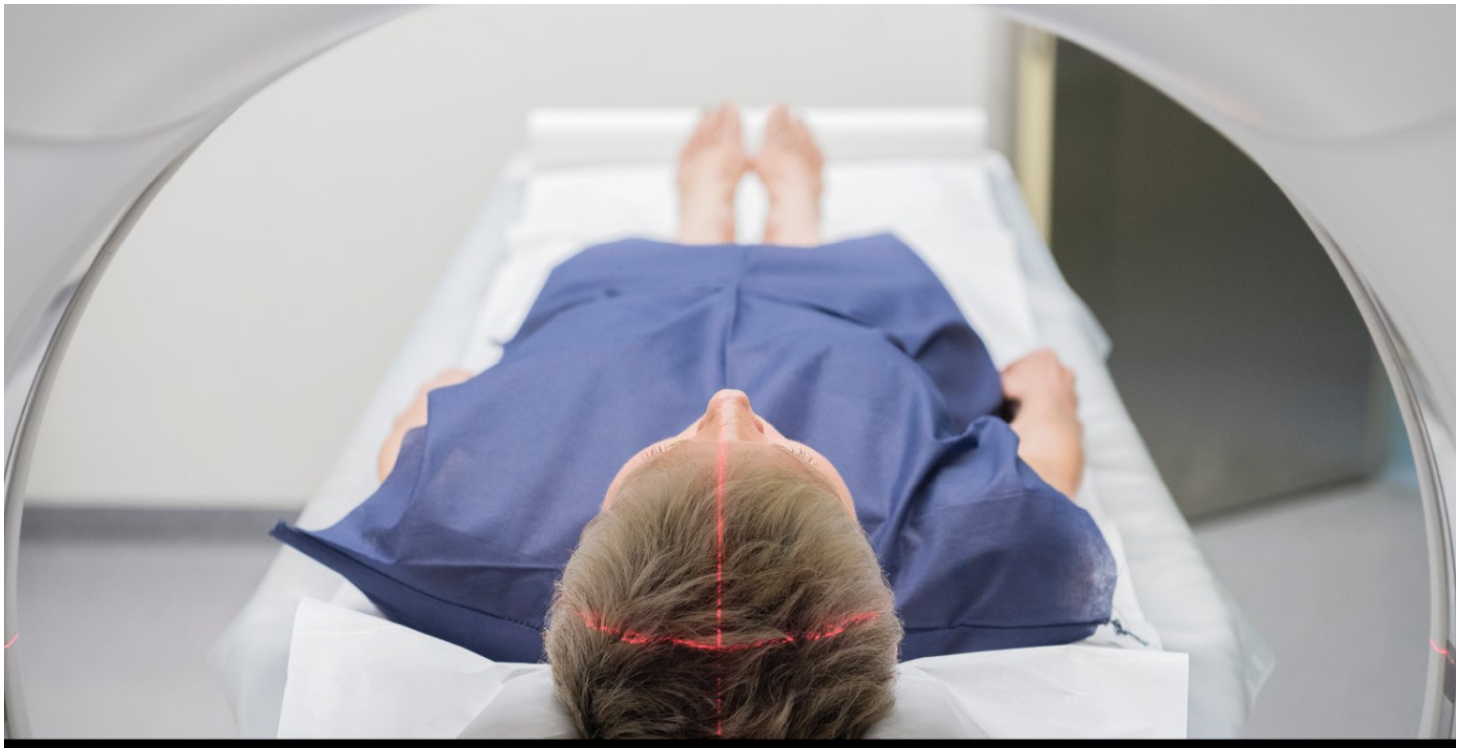
MEDICINE

The two major developments influenced by X-ray astronomy are the use of sensitive detectors to provide low dose but high-resolution images, and the linkage with digitizing and image processing systems.

MICROSCOPY

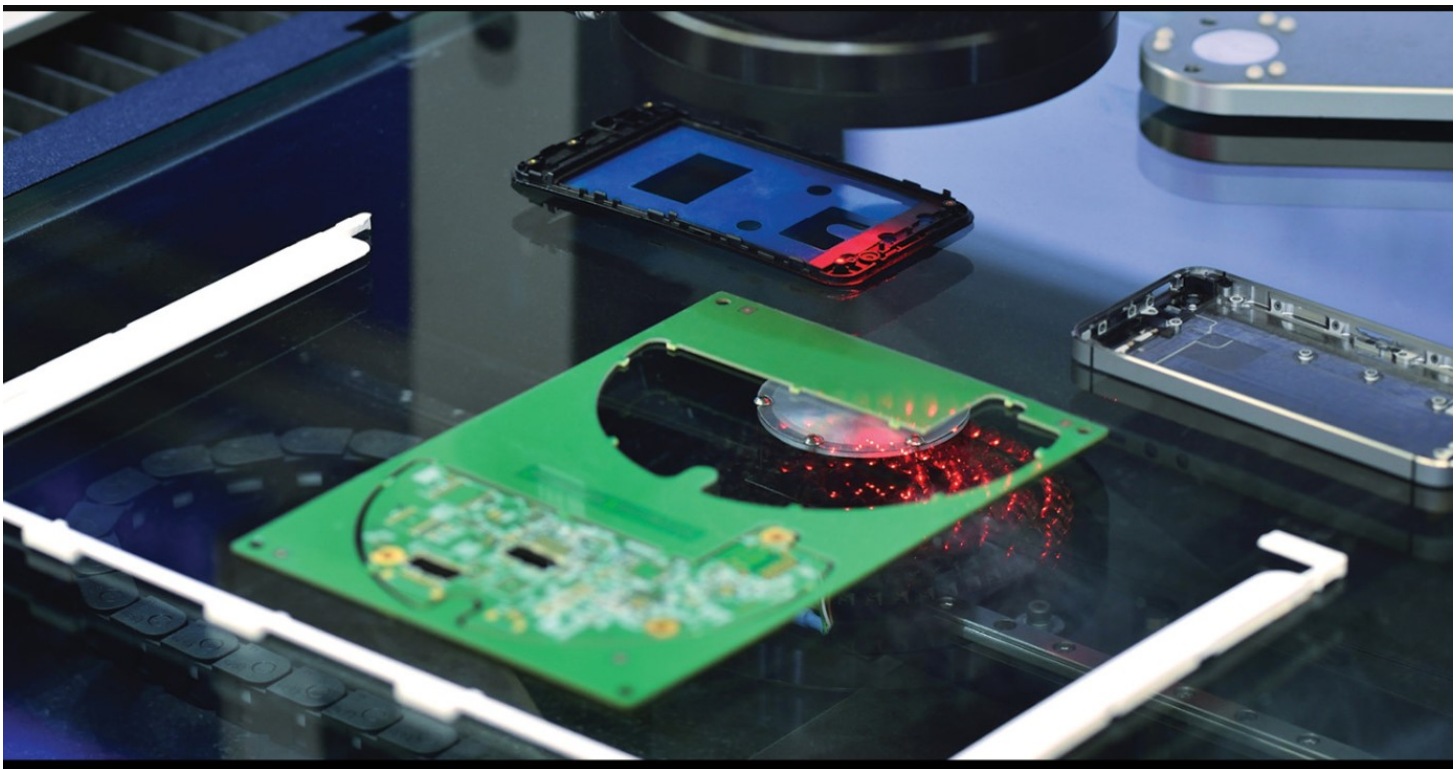
X-ray microscopy is a developing application. The microscope is, in effect, a miniature X-ray telescope. These microscopes have very high spatial resolution over small fields of view and they can be used to directly image very small images and fine details.





LOW CURRENT MAGNETS

Researchers at the Goddard Space Flight Center developed an innovative magnet that could achieve very cold temperatures thus extending the lifetime of the instrument's use in space. On Earth, these advancements had benefits for MRI systems, making them safer and allowing for less maintenance.



THE SCIENCE OF

X-RAY technology

QUALITY CONTROL AND MANUFACTURING

Combining advanced X-ray detectors with image displays has resulted in a number of systems that can be used to inspect the quality of goods being produced on a production line.