Physics Saves Lives

Medical Imaging

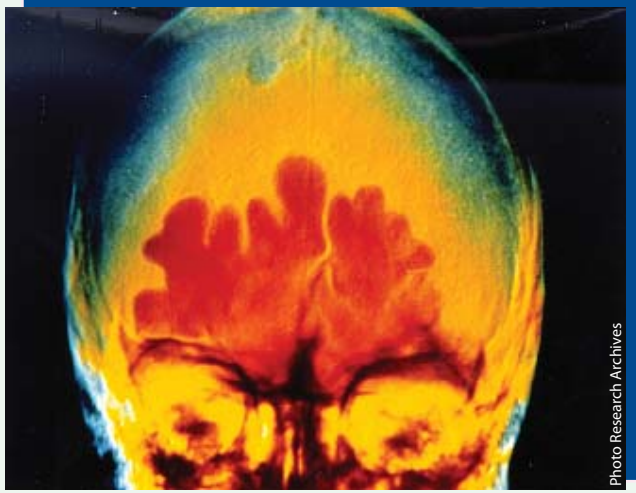
- Made possible by federal funding of physics research
- Helps save millions of lives each year
- A $6 billion industry that employs over 33,000 people in the US

CAT SCANS – REDUCING THE NEED FOR SURGERY

- A widely available and important alternative to exploratory surgery
- Provides detailed 3D imagery
- $500 million market in CAT-scan equipment

NIH funded initial research in the 1970s and 1980s

MRI – IMPROVING DIAGNOSIS



- More than 60 million non-invasive MRI scans per year
- MRI grew out of basic research on atomic nuclei

NIH, NSF, and DOE funded research from the 1970s to the 1990s

1931-2006
AMERICAN INSTITUTE OF PHYSICS
75 Years of Service

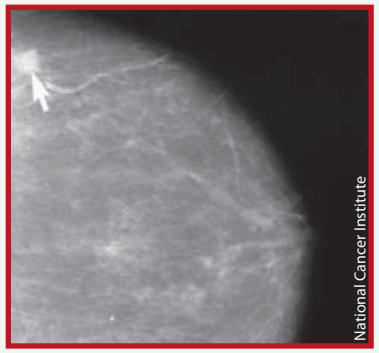
ULTRASOUND – MONITORING FETAL DEVELOPMENT

- Improvements in ultrasound resolution are giving doctors earlier and more accurate information about fetal development
- More than 100 million ultrasound scans were performed in the US in 2005

Research: The VA, Naval Medical Research Institute, National Cancer Institute, Air Force

R&D Pays Off – Support Physics Research

Medical Imaging — From Physics R&D to Widespread Use

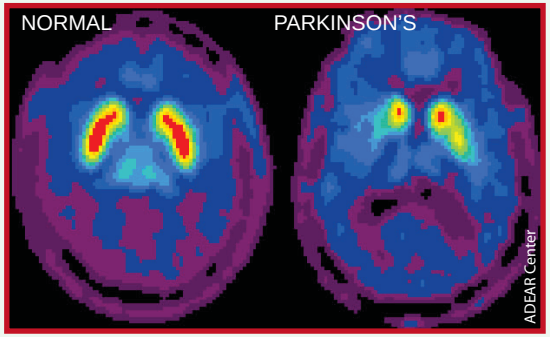


Mammography

Mammograms are low-dose X-rays for the detection of breast cancer, which affects one in eight US women.

PET Scans

Used to diagnose Parkinson's, Alzheimer's and other brain diseases, PET scans employ physics knowledge of antimatter and nuclear isotope production.

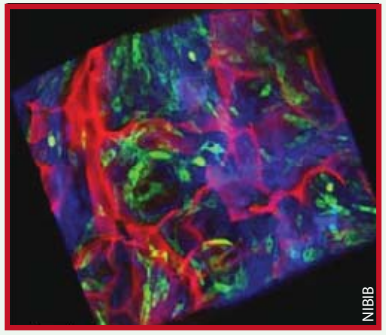


Digital X-Rays

By replacing film with digital detectors, digital X-rays allow radiologists to gather high-quality images and expose patients to lower doses of X-rays.

Molecular Imaging

Scientists can track biological processes in living animals in real time using advanced imaging tools and molecules that highlight structures inside the body. Molecular imaging is now used in drug discovery, and may soon enable even earlier detection of cancer or cardiovascular disease.



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Reaping the Rewards: A Century of R&D

MEDICAL IMAGING TIMELINE

"The abdomen, the chest and the brain will forever be shut from the intrusion of the wise and humane surgeon". (Sir J. E. Ericksen, Surgeon-Extraordinary to Queen Victoria, 1873)

1895 – Wilhelm Roentgen publishes the first medical image: an X-ray of his wife's hand (Nobel Prize, 1901).

1946 – Physicists Edward Purcell and Felix Bloch discover Nuclear Magnetic Resonance, or NMR (Nobel Prize, 1952).

1970s – Paul Lauterbur (and others) apply the NMR principle for the imaging of internal body structures. NSF and NIH are among the supporters of this work.

1972 – Godfrey Hounsfield performs the first X-ray Computed Axial Tomography (CAT) scans, and shares the Nobel Prize with Allan Cormack (1979).

1970s-80s – The first Positron Emission Tomography (PET) experiments are performed.

1980s-90s – NMR imaging evolves rapidly and becomes known as Magnetic Resonance Imaging (MRI). Superconducting magnets, faster computers, and new detectors, all improved by federally funded research, are used for MRI, leading to faster, more highly resolved scans of the body. Functional MRI is developed, capable of imaging the brain in action and locating brain-activity centers of diseases such as epilepsy.

2000s – Advances in MRI could lead to the ability to directly observer the chemical action of medication in the body. National Institute of Biomedical Imaging and Bioengineering (NIBIB) established at NIH.

2003 – The Nobel Prize for Medicine recognizes MRI pioneers Lauterbur and Peter Mansfield.

2006 – Federal funding supports new technologies, such as image-guided radiation therapy and fusion imaging, which continue to increase the precision of diagnosis and treatment.

From Today's Investment to Tomorrow's Rewards

Funding and Initial Research: NIH, DOE, NSF, NIST and DARPA, since the 1950s