MRI HISTORICAL BACKGROUND

Marti L. McCulloch, B.S., M.B.A.
Methodist OeBakey Heart & Vascular Center, Haus ton, Texas

The clinical field of magnet resonance imaging (MRI) is comparatively new, yet ics history spans more than a century and is renowned for several Nobel Prizes and key innovations in science and technology.

The study of MRI launched in 1882 with a major breakthrough in physics: namely, the discovery of the Rotating Magnetic Field by Nikola Tesla. In his honor, the "tesla" became the international unic of magnetic flux density, which calibrates the strength of the magnetic field used in all MRI systems. Another breakthrough came more than a half century later in 1937, when Isidor Isaac Rabi from Columbia Universi$_{ty}$ successfully noted the magnetic instant of nuclei as well as the rotation of molecules, both k$_{ey}$ findings for the future of MRI. The research and development of nuclear (from spin nuclei) magnetic resonance spectroscopy was further cultivated by two scientists known as Felix Bloch of Stanford University and Edward Purcell of Harvard. In 1946, both Bloch and Purcell (Figure 1) were successful in creating devices that could measure the magnetic resonance in matcer. As a result of their accomplishment, they shared the 1952 Nobel Prize in physics for developing what is known as che foundation for nuclear magnetic resonance (NMR).

The field lagged for nearly 20 years before several advancements emerged during the early 1970s. First, Raymond Damadian of the State University of New York discovered a difference in relaxation rimes between normal and abnormal tissue (e.g., cancer).

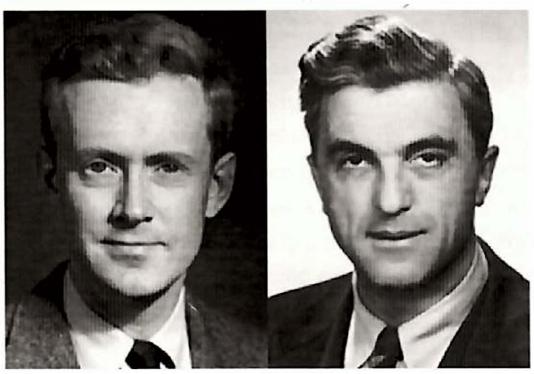

Figure 1. Edward Purcell (left) and Felix Bloch (right) shared the 1952 Nobel Prize in Physics for their work on Nuclear Magnetic Resonance (NMR).

Damadian employed the ongins of magnetic resonance developed from prior thought leaders and found a distinction in measured signals, known as spectroscopy. Around the same time, Paul Laucerbur (also of SUNY) utilized magnetic field gradients to produce the first nuclear magnetic resonance images. The technique Lauterbur developed was termed Zeugmatography when published in 1973 in ***Nature,*** which illustrated magnet-derived images of water-filled tubes. The following year, he published images of a dam, another first. While Lauterbur was creating two-dimensional images and lecturing, fellow scientist Peter Mansfield was working on improving the calculation used to process images in order to improve quality. Mansfield was successful and in 1978 presented the first cross-section images of both a finger and the abdomen.

Richard Ernst, a research scientist in Zilrich, attended a lecture by Lauterbur in Raleigh, NC, and discovered a new reconstruction method for imaging. Ernst found that by altering the magnetic field, one could produce phase and frequency encoding, which continues to be the image reconstruction standard used today. While there were a great deal of accomplishments made by many individuals in the early '70s, in 2003 the Nobel Prize in Medicine or Physiology was shared by only two individuals - Laucerbur for the invention of magnetic resonance imaging, and Mansfield for the continued improvements in imaging (Figure 2).

Figure 2. Peter Mansfield (left) and Paul Lauterbur (right) shared the 2003 Nobel Prize in Medicine or Physiology for their work in producing images and the advancement of the field.

The final step towards advancing the clinical use of MRI was to build a magnet scanner, which was accomplished in 1977 and approved for clinical use by the FDA in 1984. In addition, Gadolinium, an MRI contrast agent, was patented and approved by the FDA four years later. Since its FDA approval, clinical MRI has experienced continued global growth.

Clinical MRI is a rather young field that has yielded extraordinary achievements, most of which occurred in the United States. Additionally, there have been two

Nobel Prizes boch shared by scientists working parallel and independent of each ocher. With such an amazing past, MRI is poised to be even more enlightening in the future.

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