Remembering an MRI Giant

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Sir Peter Mansfield made key contributions that led to the development of modern magnetic resonance imaging.

THE FIRST MAGNETIC RESONANCE SCAN of the entire human body was accomplished about 40 years ago. Since then, its use has steadily increased, and now U.S. physicians order more than 28 million scans per year.

Many people worked for decades to produce the first MR scanners, and no one had a greater influence on the technology's development than Sir Peter Mansfield, Ph.D. For his contributions to the development of MR, he shared the Nobel Prize in Physiology or Medicine in 2003 with Peter Lauterbur, Ph.D.

Born in Lambeth, England, on Oct. 9, 1933, the evacuation of London during World War II disrupted Dr. Mansfield's early education. When he left school at age 15, he had no formal qualifications but a strong interest in science. Although his career counselor suggested he might not be suited for science, Dr. Mansfield pursued an education in science nonetheless.

While working as a printer's apprentice, he took classes five evenings a week to complete his secondary education. At age 18, the Rocket Propulsion Department in Wescott, Buckinghamshire, hired him as a scientific assistant. At 23, he entered Queen Mary College at the University of London. He earned his undergraduate degree in 1959 and a doctorate in physics in 1962. It was during his education at Queen Mary College that he developed an interest in nuclear magnetic resonance, a field of study that would prove vital in the development of MR scanners.

To understand how Dr. Mansfield contributed to the field, it's important to explain some of the theory behind MR, which uses the magnetic properties of hydrogen nuclei.

When placed in a static magnetic field, hydrogen atom protons align with or against this main magnetic field. To induce resonance, a radiofrequency pulse deposits energy into the protons. A radiofrequency coil measures how long it takes these resonating protons to release energy and return to their normal energy state.

IMAGES: The University of Nottingham

From relatively early on, scientists were able to sample data from protons in liquids, which release deposited energy in milliseconds. It was far more challenging to sample data from solids, such as the human body, where deposited energy is released in microseconds.

Many scientists believed that using nuclear magnetic resonance to collect data from solid material was not possible; therefore, there wasn't a lot of research on the subject.

Recognizing the need for additional research, Dr. Mansfield developed an apparatus capable of sampling solid materials within four microseconds. The breakthrough would prove integral in the development of MR's use today.

Dr. Mansfield and his researchers built on that work to develop a machine capable of producing a human anatomy image. The first MR scan of living anatomy — the finger of Dr. Mansfield's Ph.D. student — happened in the late 1970s using a computer with just four kilobytes of memory. Each finger image required about 10 minutes to scan.

In 1978, Dr. Mansfield produced the first image of an entire human body. Being his own guinea pig, he lay in the scanner for 50 minutes and emerged from the machine happy to have achieved the first full-body scan, but not satisfied. He knew that for the modality to become a viable option, he would have to reduce scanning times.

He would go on to achieve that goal. His work with gradients made MR scanners a clinical reality. Dr. Mansfield's echo planar imaging technique used mathematical analysis of signals to shorten scanning times. His work became the cornerstone for more advanced applications, including functional magnetic resonance imaging.

Dr. Mansfield, a man with a dogged determination to succeed, died on Feb. 8, 2017, at age 83. S

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SIDE NOTE

To learn more about the invention of MRI and Dr. Mansfield's life, read *The Long Road to Stockholm: The Story of M.R.I.*