Magnetic Resonance Encyclopedia Article

Magnetic Resonance

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Magnetic Resonance

Magnetic resonance is an effect observed in atoms placed within a magnetic field. Electrons within atoms spin, and the spin adopts a "wobble" called precession when subjected to a magnetic pull (like the wobble of a spinning top as gravity pulls it downward). The spin rate and the rate of precession are unique for every element, and, when recorded, can be used by chemists to identify a substance, or to study the structure of an atom.

Although the concept of magnetic resonance has been accepted since the 1920s, it was not until 1937 that Isidor Isaac Rabi used radio signals to determine the magnetic strengths within the nuclei of atoms. By applying a magnetic field to a vaporized beam of silver, Rabi determined the point at which the spin of a nucleus reversed directions. Since this technique made the properties of atomic nuclei clearly visible, an effect termed nuclear magnetic resonance (NMR), it became one of the launching points for a new science, nuclear physics.

In the late 1940s Felix Bloch and Edward Purcell, working independently, simultaneously arrived upon an improvement to Rabi's method, one which did not require the sample to be vaporized. Their process (for which they shared a Nobel Prize in 1952) was also many times more precise than that of Rabi.

NMR is used to accurately determine the presence of certain elements in a sample, making the technique an invaluable tool for astronomers, chemists, and medical researchers.