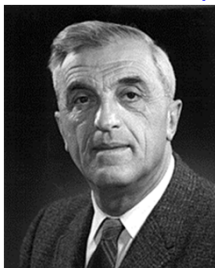


Brief History of Magnetic Resonance in Leipzig

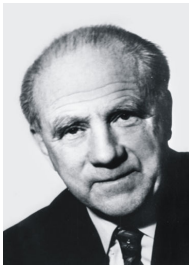
Felix Bloch (1905-1983)



F. Bloch

Bloch came from the ETH Zurich to Leipzig and received his Ph.D. with Werner Heisenberg in 1928. His most famous work was on the motion of electrons in solids, which also coined the term Bloch waves. He left Germany in 1933. In 1952, he received the Nobel Prize with Edward Purcell for his groundbreaking work in NMR

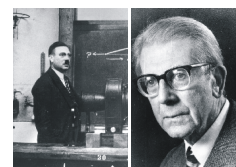
Werner Heisenberg (1901-1976)



W. Heisenberg

Heisenberg was one of the leading theoretical physicists of the 20th century. He worked in Leipzig from 1928 to 1942, which also meant many difficult years under Nazi rule. In 1932, he received the Nobel Prize in Physics for developing the theory of quantum mechanics.

Peter Debye (1885-1966) Friedrich Hund (1896-1997)



P. Debye F. Hund

Two other well-known physicists that worked in Leipzig during the early days of NMR were Debye, 1952 Nobel laureate in Chemistry, and Hund.

Early NMR work in Europe

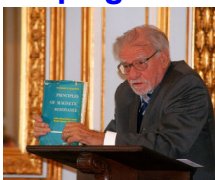


S. A. Altschuler, E. K. Zavoisky, B. M. Kozyrev

Among the relevant works were the demonstration of paramagnetic relaxation in 1936 by C. J. Gorter, Netherlands, and the discovery of electron paramagnetic resonance in 1944 by E. K. Zavoisky in Kazan, USSR. First experiments were performed by B. V. Rollin and J. Hatton in Oxford in 1946. In 1949, H. G. Dehmelt, 1989 Nobel laureate, and H. Krüger discovered the pure nuclear quadrupole resonance in Göttingen. First NMR experiments in Leipzig were carried out in 1951 by A. Lösche and H. Pfeifer.

Research into NMR and EPR was started in Zurich by H. Günthard (1952) and H. Primas followed by K. A. Müller (1987 Nobel Prize), R. Ernst (1991 Nobel Prize), K. Wüthrich (2002 Nobel Prize), A. Schweiger and others. In Stuttgart, early work was conducted by G. Laukien (1952) and later by H. C. Wolf, M. Mehring and others. Key researchers in Heidelberg were H. Kopfermann and H. Krüger followed by K. H. Hausser and U. Haebleren. In Nottingham, the pioneers were E. R. Andrew (1954) and Sir Peter Mansfield (2003 Nobel Prize). Other German contributions were made by B. Elschner and G. Scheler (1954) in Jena and W. Müller-Warmuth (1955) in Frankfurt.

Leipzig Honorary Doctors with NMR expertise



K. A. Müller in Leipzig in 2010

2000

Karl Alex Müller (born 1927)
Nobel Prize 1987



E. R. Andrew in Leipzig in 1990

1990

Edward R. Andrew (1921-2001)



T. Kahn, C. P. Slichter and Sir P. Mansfield in Leipzig in 2006

2010

Charles P. Slichter (born 1924)

2006

Sir Peter Mansfield (born 1933)
Nobel Prize 2003

Magnetic resonance in Leipzig today

Leipzig has an outstanding infrastructure in the field of magnetic resonance. The University Departments of Chemistry, Physics and Medicine feature commercial spectrometers up to a resonance frequency of 750 MHz, the equivalent of 17.6 Tesla. The Max Planck Institute for Human Cognitive and Brain Sciences currently houses three 3-T and one 7-T whole body systems and the University Hospital is equipped with four whole-body scanners for both patient care and research. September 2011 saw the inauguration of an integrated PET-MRI unit, one of the first of its kind in the world. Research comprises structural studies of small and large molecules, biomolecules, polymers, cells, heterogeneous materials, solids, but also the electronic quantum structure in various materials. There is an ongoing progress in imaging techniques for medical applications and functional brain science, and some research groups have gained worldwide acclaim in their areas. Leipzig also maintains its reputation for cutting-edge NMR research in areas like high-field (62 Tesla) and high-pressure (>100,000 bar) methods.

Magnetic Resonance Center MRZ Leipzig

All magnetic resonance practitioners are connected to each other within the Magnetic Resonance Center, a virtual institution that provides access to shared equipment, facilitates the exchange of ideas as well as students, and also engages in a broader teaching effort.

First NMR experiments in Leipzig



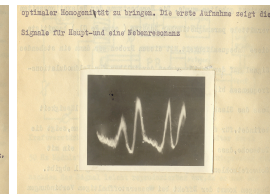
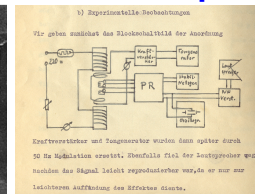
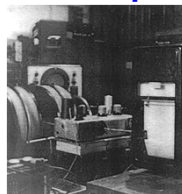
A. Lösche

In 1951, **Artur Lösche (1921-1995)** performed the first NMR experiments in Leipzig. Hund, who was still in Leipzig, also showed his interest in NMR. Under the direction of Lösche and later together with **Harry Pfeifer (1929-2008)**, various MR methods were developed and applied to problems in condensed matter physics. Lösche published the first German monograph "Kerninduktion" in 1957, a book by which many German students studied NMR. From 1972 to 1974, Lösche also served as President of the "Groupement AMPERE" in Zurich.



H. Pfeifer

1951 experimental setup and results



NMR spectrometer in 1951 with feedback receiver

Early spectrometers in Leipzig

- 1954 wide-line NMR spectrometer
- various NMR pulse spectrometers
- 1957 continuous wave EPR spectrometer
- DNP spectrometer
- NMR in the earth's field
- 1965 ENDOR spectrometer
- 1968 EPR pulse spectrometer
- NMR multiple pulse techniques for solids
- NMR pulsed field gradient spectrometer
- 1971 NMR double resonance / MAS

