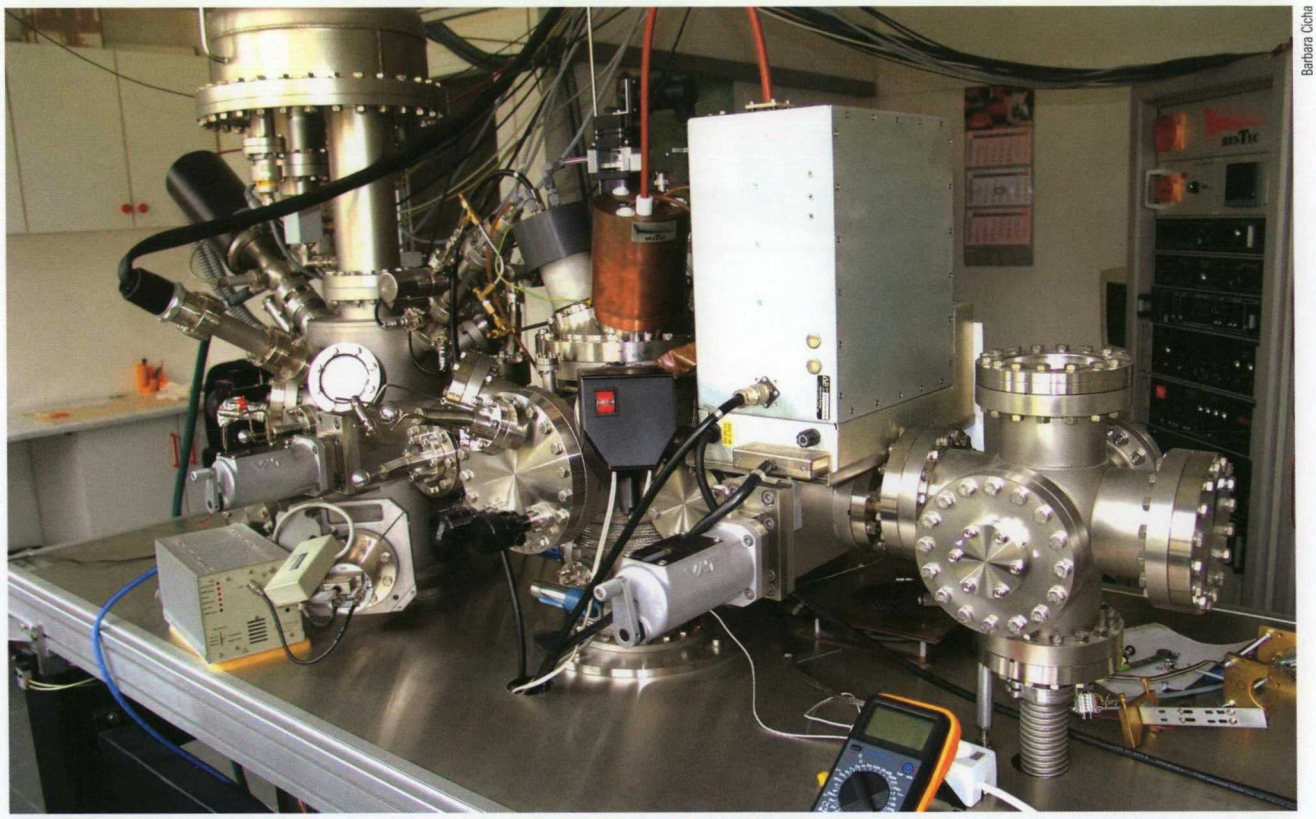

Barbara Cicha

A device for producing thin solid films

# Materials of the Future

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**PAN Institute of Molecular Physics does fundamental research in the field of condensed matter physics, studying materials with unique properties**

Our Institute's history stretches back to 1953, when the PAN Institute of Physics in Warsaw established a branch in Poznań - the Ferromagnets and Ferroelectrics Center led by Szczepan Szczeniowski. In 1956, it spun off a separate Ferromagnetics Center (under the same leadership), and a Dielectrics Center was also established under Arkadiusz Piekara. The next step forward came in 1966, with the establishment of the Radiospectroscopy Center led by Jan Stankowski. Finally, the current Institute of Molecular Physics in Poznań was established in 1975, as an autonomous establishment of the Polish Academy of Sciences. Its first director was Jan Stankowski (1975-1985), who was succeeded in the post by Janusz Morkowski (1986-1991), Bogdan Bułka (1992-1998) and Narcyz Piślewski (1998-2005). Since 2006, the post of director has been held by Andrzej Jezierski.

At present the Institute employs a staff of 142, including 63 research personnel (20 professors, 14 associate professors, and 29 doctors), 15 doctorate students, 32 engineers, 2 librarians, and 30 administrative and technical support employees. The Institute's research work chiefly involves fundamental investigations in condensed matter physics, with 14 research laboratories employing both ex-

perimental and theoretical methods. Further details about the Institute's organizational structure and research activities are available at http://www.ifmpan.poznan.pl/.

## Avenues of research

The institute boasts numerous achievements in radiospectroscopic research, as it undertakes intensive experimentation using electron paramagnetic resonance (EPR) techniques (high-quality results being guaranteed by an EPR BRUKER ESP 380 E/CW impulse spectrometer). The method of nuclear magnetic resonance (NMR) is likewise studied, especially NMR microimaging using a modern NMR AVANCE 300 spectrometer with superconducting magnet. The Institute's considerable achievements in the field of nuclear quadrupole resonance (NQR) are also worthy of mention here.

Another very important field of activity involves experimental and theoretical research on magnetics, employing a BESTEC ultra-high-vacuum apparatus to obtain and analyze thin films of magnetic materials. There is also great interest in magnetic alloys which show structural and chemical irregularity, exhibiting unique magnetic properties; such measurements are taken with a MAGLAB 2000 magnetometer and other apparatus. Theoretical methods, harnessing modern computer techniques, are used to calculate the electron structure of magnetic materials and to model meso- and nanoscopic systems. The Institute's staff members are likewise very active in research related to the state-of-the-art field of spintronics.

The Institute of Molecular Physics has also chalked up extensive achievements in studying the physics of ferroelectrics, electrets, and piezopolymers. One promising avenue of research here involves superproton conductors with potential applications in fuel cells. Other intensive work is being pursued on the dielectric, optical, and electro-optical properties of liquid crystals; the most interesting of these are liquid crystals which exhibit ferro/antiferroelectric phenomena. The methods of infrared and Raman spectroscopy, in turn, are used to study materials for use in molecular electronics, employing an FT-IR BRUKER EQUINOX 55 infrared spectrometer coupled with a unique HYPERION 1000 microscope for investigation of micro-objects. Theoretical and experimental studies are carried out on carbon materials (nanotubes, fullerenes); many such measurements are performed under very low temperatures (even as low as T=0.3K). Computer simulations of auxetic materials and colloids are another interesting avenue of research.

## Open doors

Each year the Institute's staff members publish some 140 articles in international journals and present some 200 papers at domestic and international conferences. More or less half of these are developed in cooperation with foreign partners. The Institute's Scientific Council, which includes its own independent research employees as well as eminent scientists from various Polish research centers, possesses the right to confer doctorate (PhD) and doctor of science (DSc) degrees. The years 1990–2006 saw a total of 85 conferrals at the Institute, including 36 PhDs, 33 DSc degrees, plus 16 professorships in the physical sciences awarded at the Scientific Council's behest.

In tandem with its research work, the Institute is enthusiastically involved in popular-science and promotional efforts. It organizes various types of scientific events, ranging from "physics schools" and seminars bringing together a relatively small circle of participants, to large-scale international conferences addressed to a broad range of world specialists. The fact that the Institute has been entrusted to organize or co-organize world-renowned conferences (such as the International Conference on Magnetism, ICM'94) witnesses the respect its achievements enjoy among the international community. Over its 30-year history, the Institute has organized more than 70 schools,

**The staff of the PAN Institute of Molecular Physics have for years been involved in educating physics students from Poznań University of Technology**

symposia, and conferences. The most important regular research meetings include: *the Conference on Modern Magnetic Resonance (RAMIS), the Physics of Magnetism, the Polish-Czech Seminar on Ferroelectric and Structural Phase Transitions*, and *the International Seminar on Highly Conducting Materials for Molecular Electronics*.

In 2002–2005, the Institute hosted the EU Centre of Excellence for Magnetic and Molecular Materials for Future Electronics (MMMFE). Its chief objective was to uncover new avenues of research and to integrate the top research institutions in Europe. At present the Institute is coordinating a national research network on "New Materials for Magnetoelectronics" (MAG-EL-MAT), whose activities are chiefly related to spintronics.

The Institute devotes much attention to the education of both university students and secondary school pupils. There are presently 14 individuals preparing PhD dissertations on condensed matter physics under the Institute's doctorate program. Every year, more than a dozen students from Poznań University of Technology carry out their master's theses research at the Institute, many of them subsequently going on to participate in our doctorate program. Additionally, the Institute annually hosts a "Summer with Helium" event at its branch center in Odolanów, geared for university students and gifted secondary school students interested in physics. ■