Basic Science of Physics

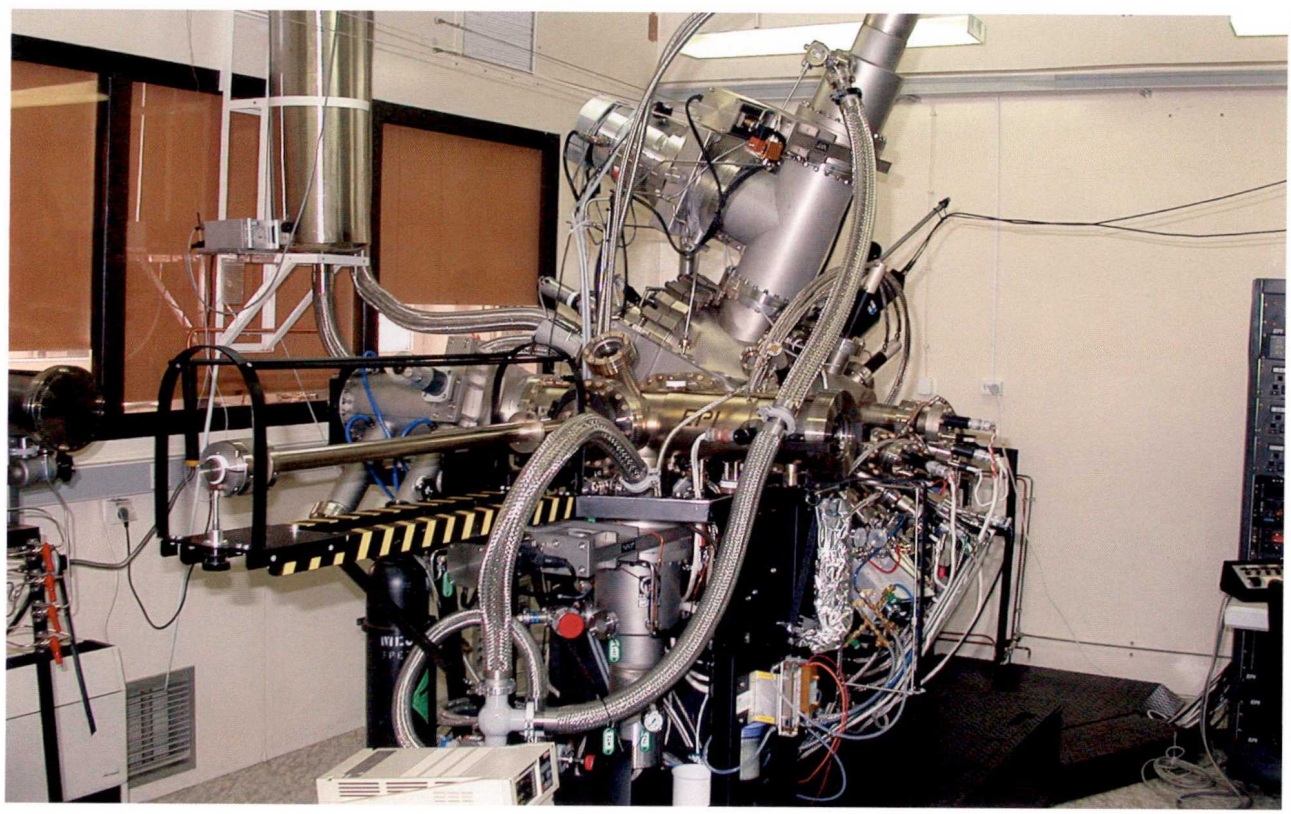
HANNA PRZYBYLIŃSKA
Institute of Physics, Warszawa
Polish Academy of Sciences
przyby@ifpan.edu.pl

For more than 50 years, the staff at the Institute of Physics have been researching matter and radiation, seeking new phenomena, materials, and applications

Having just marked the 50th anniversary of its founding in October 2003, the Institute is one of the leading research centers in Poland. The research activity pursued by its staff encompasses the fields of solid state physics (the physics and technology of semiconductors, magnetics, superconductors, and low-dimensional structures thereof) as well as atomic and molecular optics. Particular successes have been achieved by Institute employees in connection with semimagnetic semiconductors, under development since the 1970s. The Institute of Physics was one of the few research centers in the world to initiate such work. Today it focuses on low-dimensional structures of semimagnetic semiconductors (or diluted magnetic semiconductors) of the II-VI, IV-VI, and III-V types, with close attention to spintronic applications.

History of the Institute

The Institute of Physics of the Polish Academy of Sciences (PAN) was founded in 1953 with the aim of fostering research and training specialists in the areas of nuclear, solid state, atomic and molecular physics. The Institute grew out of the physics faculties of seven universities: Warsaw University and Warsaw University of Technology, Jagiellonian University in Kraków, Adam Mickiewicz



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A Molecular Beam Epitaxy apparatus. The MBE growth technique makes it possible to study the intriguing ways reduced dimensionality influences the electrical, optical and magnetic properties of materials of the IV-VI type. Research being carried out at the Institute of Physics could lead to the creation of faster transistors, more efficient lasers and even quantum computers

University in Poznań, Nicolaus Copernicus University in Toruń, as well as Wrocław University and Wrocław University of Technology. It was based on their research staff, premises and laboratory facilities. Following the establishment of the National Agency for Nuclear Energy in 1955, nuclear physics ceased to constitute part of the Institute's research program. The Institute of Physics' close ties to the universities determined its initial research activities.

Atomic and molecular optics were originally studied at the Institute's Department of Optics and X-rays, as a continuation of the earlier work directed by Prof. Stefan Pieńkowski (the first director of the Institute of Physics) at Warsaw University. Research in this field is now conducted in the Division of Radiation and Spectroscopy. Structural research is carried out in the Central Laboratory of X-Ray and Electron Microscopy.

Solid state physics has been developed in three main areas:

- the physics of semiconductors - research in this field was initiated at Warsaw University as early as in 1947 by Prof. Leonard Sosnowski (director of the Institute in 1954-66), and at present constitutes the main activity of three of the Institute's divisions (the Division of Semiconductor Physics, the Division of Solid State Spectroscopy, and the Central Laboratory of Cryogenic Research),
- the physics of magnetics - the subject was first introduced by Prof. Szczepan Szczeniowski, at the Institute's Department of Ferromagnetics created in 1953 in Poznań; research on this subject was initiated at the main branch of the Institute in Warsaw in 1970, when two groups of specialists in magnetism were transferred to the Institute of Physics from the Institute of Electron Technology of the Polish Academy of Sciences, which was at that time turned over from the Academy to the semiconductor industry. Such studies are now being continued at the Division of Magnetism Physics.
- the physics of dielectrics - research in this field was initiated by Prof. Arkadiusz Piekara (director of the Institute in 1966-68), at the Department of Dielectrics established in Poznań in 1954.

The Institute of Physics took on its current structure and moved to its present location under the directorship of Prof. Jerzy Kołodziejczak (1970-1981). The Institute's fast pace of development has led, over the years, to the formation of independent research units established on its basis. In 1975 the Department of Ferromagnetics and the Department of Dielectrics, together with the Radiospectroscopy Laboratory created in 1966 in Poznań, become incorporated into the Institute of Molecular Physics of the Polish Academy of Sciences. The Wrocław branch of the Institute become a part of the Academy's Institute of Low Temperature and Structural Research. The Institute of Physics was also the founder of the Department of Solid State Physics in Zabrze. The origins of the industrial, high-tech centers of the Polish Academy of Sciences, such as "UNIPAN" (specializing in scientific electronic instruments) and "WILMER" (humidity meters), as well as the High Pressure Center "UNIPRESS," also go back to the Institute of Physics.

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In the laboratories of the Institute of Physics, research is being done on two-and one-dimensional quantum structures with possible spintronic applications

Present activities

Over the past 10 years, the scientific activity of Institute staff has produced 3,000 publications in the best scientific journals of worldwide scope. The Institute cooperates with many world research centers, especially European, American, and Japanese institutions. Over the past 3 years, more than 20 international research projects have been carried out at the Institute - most of them with funding from the European Commission. As a result of extensive international cooperation, a European Center of Excellence entitled CELDIS (Centre of Excellence for Low Dimensional Structures) was set up at the Institute in 2000. Two more Centers of Excellence were established in 2003. In recognition of these achievements, the Institute received the "Crystal Brussels" award from the Minister of Scientific Research and Information Technology.

Educational undertakings constitute an important part of the Institute's activity. These chiefly involve doctoral studies carried out at the Institute. Since 1958, 446 individuals have gained the title of doctor of physics from the Institute. Moreover, the PAN Institute of Physics has participated in the creation and further development of the School of Sciences, a private institution of higher education in the years 1992-2001, now part of Cardinal Stefan Wyszyński University. The Institute also organizes series of lectures and demonstrations for high school students, organizes the International Tournament of Young Physicists, co-organizes the *First Step to the Nobel Prize in Physics* competition, and the Academic Olympics in Physics. ■