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High-pressure liquid chromatography (HPLC) is used to identify, clean, and analyze samples of chemical substances

Modern Organic Chemistry

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The history of modern research in the field of organic chemistry in Poland began at the Institute of Organic Chemistry

The Institute of Organic Chemistry, Polish Academy of Sciences, was established in 1964, after the Academy's Department of Organic Synthesis, founded ten years earlier, was elevated to the status of an institute. The process of detaching branch laboratories started in the 1960s and finished in 1986 – thus we can say that the Institute played a historical role in developing organic chemistry in Poland through the creation of such important Polish Academy

of Sciences research units as the Center for Molecular and Macromolecular Studies in Łódź and the Institute of Bioorganic Chemistry in Poznań.

Polish specialty

Initially, the Institute's research interests focused on two trends associated with its founding fathers, Prof. Osman Achmatowicz and Prof. Tadeusz Urbański: the chemistry of natural products and the chemistry of heterocyclic and heteroorganic compounds used in producing drugs and pesticides. A less significant role was played by heterogeneous catalysis and carbon chemistry, focusing mainly on the needs of the petrochemical industry. In the 1960s and 1970s, the Institute's methodological work was based on the synthesis of natural products: steroid compounds and carbohydrates. They are still significant in the armory of methods used for total synthesis of natural products. In the

late 1970s, the Institute began to work on applying high static pressures in organic synthesis, which soon became a world-renowned Polish specialty. Moreover, over 40 years ago the Institute initiated pioneering research in the field of nitrogen magnetic nuclear resonance spectroscopy.

In the 1980s the Institute focused on a new research area – known as vicarious nucleophilic substitution of hydrogen in aromatic compounds, associated with the name of Prof. Mieczysław Mąkosza, for many years the Director of the Institute. With time the concept developed into a general theory of nucleophilic substitution, proving its complementarity with classic reactions taking place according to the electrophilic substitution mechanism. It can be applied in many areas, especially in industrial drug synthesis. Institute scholars were also interested in the synthesis of bacterial oligosaccharides and higher saccharides, hormones, and antibiotics. The purchase of a high-field 500 MHz NMR facility accelerated spectroscopic work and studies on dynamic processes and organic compound electron structure.

Flagship research

Currently, the Institute's major research area is the methodology of organic synthesis. This scientific field is associated with the problem of molecular catalysis, two branches of which the Institute presently focuses on: phase-transfer catalysis, Polish chemistry's greatest post-war achievement, and the reactions of olefin metathesis. Another important aspect of the Institute's activity is asymmetric synthesis – not only one of the most significant world trends in organic chemistry, but also an anticipated major direction for the Institute's own development, since modern medicine increasingly requires enantiomerically pure drugs. Another field of research is the targeted synthesis of natural products or products with complex biological properties. The main subjects of interest here are isoprenoids, hormones, and antibiotics, but a special role is played by saccharides, which attract a lot of interest around the world as a low-cost renewable material. Their attractiveness is confirmed by the establishment of the EU Centre of Excellence "CEDNETS" at our Institute, investigating the use of sugars as substrates in drug synthesis.

Other new research directions worthy of mention in supramolecular chemistry include porphyrinoid chemistry and the construction of molecular apparatuses based on so-called catenanes. A solid foundation for these studies is provided by macrocyclic compound synthesis methodology, one of the Institute's flagship fields.

The Institute boasts modern, efficient laboratories for nuclear magnetic resonance (NMR), mass spectrometry (MS), and circular dichroism (CD), which function as informal national consultation centers.

The high-caliber fundamental research carried out at the Institute has also stimulated applied research. The Institute

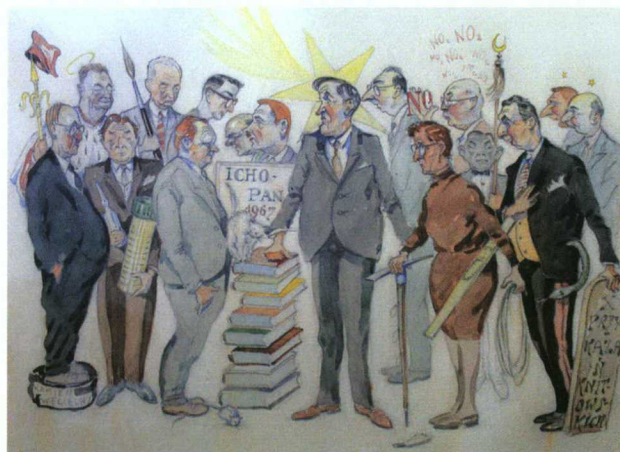
invented DEBELIZYNA, a plant-based drug produced by *Herbapol Pruszków*, successfully used in treating renal lithiasis for over 25 years now. In 1985–1995, in cooperation with *Zakłady Farmaceutyczne "Polfa" S.A.* in Tarchomin, the Institute developed a technology for producing the generic cephalosporin TARCEFOKSYM and a new original cephalosporin TARCEVIS. Recently, the Institute has finished work on large laboratory scale synthesis of "paclitaxel" – a highly efficient anti-cancer drug.

The Institute prides itself on its doctoral program established in 1966 – the oldest such program in Poland. So far the title of Doctor of Chemical Sciences has been granted to almost 300 individuals, being awarded to 8–12 more every year.

For many years, the Institute has followed a policy of promoting young people interested in chemistry. Students from faculties of chemistry at Warsaw's universities can obtain scientific training and write their degree theses here. With the support of the Committee of Chemistry, Polish Academy of Sciences, the Institute organizes an annual Modern Organic Chemistry School. For many years numerous high school pupils recommended by the Polish Children's Fund have participated in scientific workshops.

At the moment, the Institute employs 150 individuals, including 13 professors, associate professors, 37 employees holding PhD or DSc degrees, and 50 doctoral students.

Under the rating system introduced by Poland's Committee for Scientific Research (KBN), the Institute is ranked as one of the top A-category scientific units. The Institute's research findings are published in international journals and are the subject of many patents. Their high scientific merit is proved by the fact that the Institute's employees are often invited to sit on editorial boards and committees of the highest-impact journals dealing with organic chemistry, and the Institute is entrusted with the organization of prestigious scientific conferences. ■



Archives of the Institute of Organic Chemistry

Members of the first Scientific Council of the Institute of Organic Chemistry as caricatured by Prof. Zdzisław Tomasik