

At Vilnius University, physics has been taught since its founding in the 16th c. However, when Vilnius University was closed, the development of physics was suddenly cut off. The evolution of the science of physics began anew in Independent Lithuania, when the Lithuanian University was founded in Kaunas in 1923. The Physics Department was established by Vincas Čepinskis, who was also the author of the first Lithuanian physics textbook. The younger generation of experimenters in physics — Povilas Brazdžiūnas, Antanas Žvironas, Antanas Puodžiukynas, Kazimieras Baršauskas and Adolfas Jucys, who independently studied atomic quantum theory — began their scientific work at this university and defended their doctoral theses abroad. It was these physicists and Henrikas Horodničius, who worked at the Polish Vilnius University, that after the war became key in organising the teaching of physics and

physics

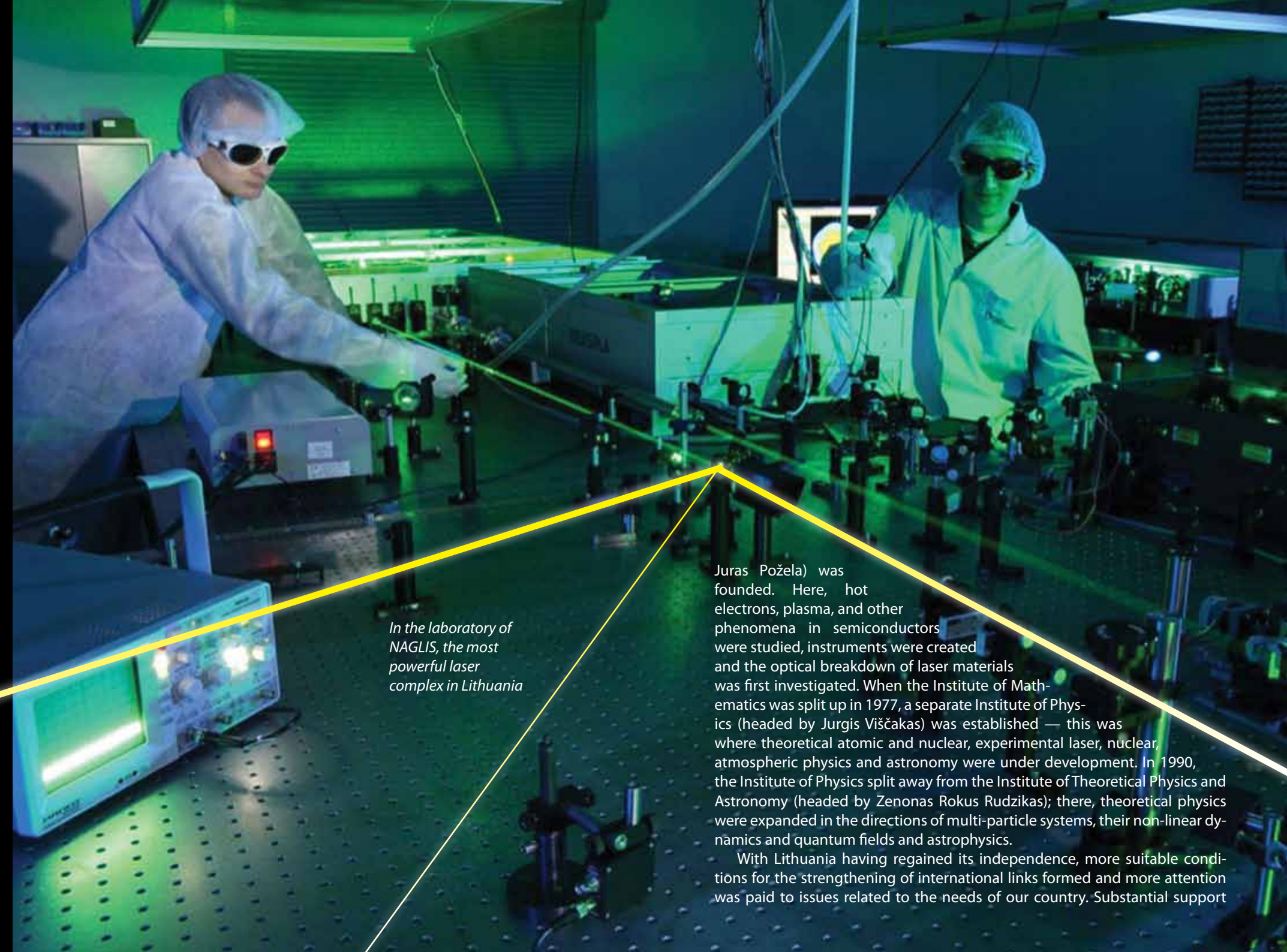
scientific work at Lithuanian schools of higher education. P. Brazdžiūnas began experimental studies of semiconductors; he initiated work on nuclear physics and supported studies of laser physics. A. Jucys developed quantum atomic theory and directed his students towards studies in the fields of solids, atomic nuclei, molecules. K. Baršauskas initiated research in ultrasound and other technical physics at the Kaunas Polytechnic Institute. The rapid expansion of modern physics in Lithuania during the post-war period was encouraged also by insightful organisational activities. In 1956, the Institute of Physics



Patriarch of Lithuanian experimental physics, the academic Povilas Brazdžiūnas (1897–1986)

and Mathematics was founded as a part of the Academy of Sciences; it was headed by A. Jucys. Under his initiative a computing centre was established at the institute; here, the first universal computer in Lithuania operated. In 1962, the scientific journal *Lithuanian Physics — Collection* was first published. For many years P. Brazdžiūnas headed the editorial board as well as the Lithuanian Physicists Society, established in 1963. He also prepared a voluminous textbook of general physics and headed the committees that published the multilingual dictionaries *Physics Terms* and *Laser Physics Terms*.

Prior to the restoration of Lithuania's independence, two main centres of physics studies in Lithuania were formed — at Vilnius University and at the Academy of Sciences. In 1965, the University founded a separate Department of Physics (dean — Viktoras Kybartas) where, alongside the former directions of physics — theoretical physics, spectroscopy, semiconductor physics — radiophysics and solid-state electronics were gradually established. In 1969, under the support of P. Brazdžiūnas, a modern quantum electronics laboratory (headed by Algis Petras Piskarskas) was founded here and research in physics and non-linear optics began. In 1967, the basis of an experimental division at the Institute of Physics and Mathematics, the Semiconductor Physics Institute (headed by



In the laboratory of NAGLIS, the most powerful laser complex in Lithuania

Juras Požela) was founded. Here, hot electrons, plasma, and other phenomena in semiconductors were studied, instruments were created and the optical breakdown of laser materials was first investigated. When the Institute of Mathematics was split up in 1977, a separate Institute of Physics (headed by Jurgis Višćakas) was established — this was where theoretical atomic and nuclear, experimental laser, nuclear, atmospheric physics and astronomy were under development. In 1990, the Institute of Physics split away from the Institute of Theoretical Physics and Astronomy (headed by Zenonas Rokus Rudzikas); there, theoretical physics were expanded in the directions of multi-particle systems, their non-linear dynamics and quantum fields and astrophysics.

With Lithuania having regained its independence, more suitable conditions for the strengthening of international links formed and more attention was paid to issues related to the needs of our country. Substantial support

from the European Union, once Lithuania became a member, helped develop research at an international level. Seeking deeper interaction between various scientific fields and stronger ties between research and studies, the Institutes of Semiconductor Physics, Physics, and Chemistry in 2010 were integrated into the new Centre for Physical Sciences and Technology, while the Institute of Theoretical Physics and Astronomy joined Vilnius University.

The branches of modern physics in Lithuania and its founders are described in detail in Volume XII of the Universal Lithuanian Encyclopaedia ("Lithuania"). Meanwhile, this brochure presents one of the most moderns and broadly internationally-recognised branches of physics — laser physics — to which the coin is dedicated to (on its reverse we can see a star lit by a powerful laser beam — the symbol of laser physics).

The potential of laser physics and technology in Lithuania began to sprout up more than five decades ago, i.e. not long after the US physicist Theodore Harold Maiman created the first laser in 1960. While developing this new direction of physics in Lithuania, tuneable wavelength picosecond and femtosecond optical parametric amplifiers and oscillators as well as original ultrafast spectroscopy methods and devices were developed, and the revolutionary optical parametric chirped-pulse amplification technology (called OPCPA), which is now widely recognised and used around the world for creating laser facilities of hundreds petawatt power, was created. In recent years, Lithuania has actively promoted the following directions in laser physics and technology:

- development of innovative diode-pumped solid state nanosecond, picosecond and femtosecond tuneable lasers for science, medicine and industry;
- laser material processing, laser optical damage testing and modification of the material optical properties for the building of a new generation of photonics and optoelectronic components;
- research of non-linear optical phenomena in crystals, liquids and gases;

- investigation of ultrafast processes in semiconductor structures and molecular complexes;
- functional three-dimensional micro- and nano-structure fabrication by femtosecond lasers;
- elaboration of new medical diagnostic and therapeutic methods using new-generation of laser technologies.

The strongest laser science and technology laboratories in Lithuania operate at the Vilnius University Laser Research Center (VULRC) and Center for Physical and Technological Sciences. The VULRC belongs to the consortium of the strongest European laser research centers providing transnational access — *LASERLAB-EUROPE*. Lithuania's most powerful 4 TW (terawatt) laser facility *NAGLIS* was created by the VULRC for attosecond science and high intensity light technology.

The laser industry is being successfully developed in Lithuania. There are currently 25 companies with a combined annual turnover of EUR 70 million and their products are exported to all economically developed countries. Lithuania's laser industry takes up 10 per cent of the global scientific laser market. Over 600 employees work in Lithuania's laser industry, with 10 per cent of them being doctors of science. This branch of high-tech industry grows, on average, 20 per cent annually. The most efficiently operating and the world's best-known Lithuanian laser industry companies are *Light Conversion* (director A. Juozapavičius), *EKSPLA* (director K. Jasiūnas) and *STANDA* (director M. Berba). The institutions of the laser industry and science sector are united under the Lithuanian Laser Association.

The reason for the successful breakthrough of Lithuanian lasers into global markets is a close collaboration between research, scientific and industry institutions; as a result, the lasers sector is exceptionally productive. Lithuanian laser achievements are lauded not only by national science prizes and high-level Lithuanian government decorations but with international awards as well.

Prof. Habil. Dr. Algis Petras Piskarskas

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