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Ryszard S. Romaniuk
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Wiesław L. Woliński, Warsaw University of Technology (Poland)

Introduction

Optical Fibers and Their Applications (OFTA) is a forum for science in this branch of photonics. The symposium hosts guests from Poland and neighboring countries throughout Europe. It is organized every year and a half by two major optical-fiber technology and application centers: Białystok Univ. of Technology and Maria Curie-Skłodowska Univ. (UMCS) and the Technical Univ. of Lublin. The conference is part of a larger group of national conferences on optoelectronics, optics, photonics, sensors and laser technology, which are under the general patronage of professional community organizations, including:

- Polish Ceramic Society
- Photonics Society of Poland
- The Association of Polish Electrical Engineers' Optoelectronics Committee
- Polish Academy of Science's Committee of Electronics and Telecommunications

Forty-two years ago, fiber-optic technology came to Poland. The Department of Physical Chemistry, chaired by Prof. Andrzej Waksmundzki at the Univ. of Maria Curie-Skłodowska in Lublin, started working on a modification of the glass capillary for optical signal transmission purposes. The department successfully implemented the Modified Chemical Vapor Deposition (MCVD) technology of high-quality silica optical fibers a few years later—the only laboratory in the country to do so. Work on fiber-optic technology with soft glasses also began in other scientific institutions (such as ITME in Warsaw), and technological tests began soon afterwards at Glassworks Białystok and Białystok Technical Univ. Simultaneously, work on the active elements for fiber optics, including photo-diodes and light-emitting diodes and semiconductor lasers, were actively conducted in ITE in Warsaw. The availability of various types of optical fibers over the last 40 years played a fundamental role in the development of fiber optics and photonics research by Poland's technical community, utilizing MCVD and other modified and hybrid multi-staged methods, as well as DC, MC and RIT methods using different silica and multicomponent glasses. One can say, without any exaggeration, that the availability of such inexpensive samples, available on-demand for every laboratory, would result in much more modest developments in fiber-optic and photonics research. Did the photonics research community manage in some way to repay the developers of these technologies by developing their own photonics applications? In general, yes; because the gifted technologists often helped in the pioneering application work. Additionally, the progress provided a strong impetus for the development of new optical-fiber structures and stimulated the search for technological developments. Poland has created a positive feedback mechanism between technology, metrology, fiber-optic photonics theory and research applications, as well as some pioneering

industries. The Warsaw Univ. of Technology, the Institute of Glass and Ceramics, AGH, Silesian Univ. of Technology (and some other centers), each with significantly different research profiles involved in different types of fiber, inspired work on high-quality glasses and optical and photonics materials by other organizations.

The first national symposium on *Optical Fibers and Their Applications*, organized in February 1976 at the Polish Academy of Sciences Palace in Jabłonna, was a significant breakthrough event for the local research communities in optoelectronics, and its influence continues to this day. The initiator of the first and subsequent meetings was Prof. Adam Smoliński. Past optical-fiber symposia supported the development of photonics in Poland and created unique scientific documentation. The symposia have always gathered, and continue to do so, a large number of young people. One hundred people attended the first fiber-optic meeting. The symposium in Jabłonna turned into a constant cycle of scientific meetings that continue to today. During the first symposium, two technological attempts to manufacture optical fibers in the centers of Lublin and Warsaw were presented by attendees with a review of the manufacturing methods of optical fibers by Prof. B. Paszkowski. Other works presented at the first symposium covered several topics, such as:

- The future of new fiber-optic telecommunications, by Prof. Z. Szpigler.
- A review of the progress of integrated optics using planar optical waveguides and components.
- First tests of fiber-optic transmissions in Poland.
- Medical and instrumental applications using fiber optics developed in Poland.
- Optoelectronic components for fiber optics - sources and detectors and measurements of optoelectronic components.

Expert representatives from leading European optical-fiber laboratories (i.e., CNET Lannion, ISPT Rome, TU Braunschweig, and the Univ. of Southampton) delivered plenary lectures. A large part of the national work, especially those provided by academics, had survey and prognostic character; however, several works given by young researchers concerned their own technological, instrumentation and transmission experiments, which are included in the published proceedings.

The second summary meeting for technological, theoretical and application works of the national fiber-optics community took place during the second national symposium on *Optical Fibers and Their Applications*, which was held 13-15 February 1979, also in the Palace of Sciences in Jabłonna. Approximately 150 people attended the meeting. During the symposium several key works were published from the optical-fiber technology centers in Lublin, Warsaw and Białystok. Several technological works were presented on the production of optical fibers by the double-crucible method, MCVD and Plasma Chemical Vapor Deposition (PCVD) methods, as well as technological works on

optoelectronic components and fiber metrology. Topical sessions during the symposium included:

- Optical fiber (technology and theory).
- Optical radiation sources and detectors.
- Surveying of optoelectronic devices and systems for telecommunications.
- Non-telecom application usage of fiber optics.
- Sensors and integrated optics components.

Symposium works were published in two volumes—one in Polish and another in English, which included extended abstracts.

The third OFTA symposium was preceded by two side meetings: *Optical Fiber Measurement Techniques* (Lublin, 1981) and *Non-telecommunications Optical Fibers* (Białowieża, 1982). These high-technology topical conferences gathered 100 participants each. The third symposium on *Optical Fibers and Their Applications* was expected to be held 16-18 February 1982; however, due to some well-known system and organizational issues, the meeting was postponed to 15-17 February 1983 in Jabłonna. The symposium gathered more than 250 people (including 20 foreign guests), which far exceeded the capacity of the small but beautiful palace in Jabłonna. In total, approximately 30 plenary papers and more than 150 contributed papers were presented, including many directly related to optical-fiber manufacturing technology. Again, all three technology centers from Lublin, Warsaw and Białystok were represented. The organizational rules of the third symposium in Jabłonna was similar to the previous events. Leading representatives of this technique delivered plenary papers in the form of invited lectures and tutorials. National presentations were displayed in a few thematic poster sessions, which were preceded by more general introductory presentations. The topical sessions of the national work were as follows:

- Optical fiber communications.
- Optical fiber technology, theory, and measurements.
- Sources and detectors for optical fibers.
- Optical fiber passive components (couplers, connectors, switches and sensors).
- Integrated optoelectronics (theory, technology, and laboratory experiments).
- Applications of fiber optics (scientific, industrial, and biomedical).

Five proceedings volumes were published in Polish and English.

The series of conferences on *Optical Fibers and Their Applications* successfully continued for the next three years. Due to a much larger number of participants, the conferences took place in the Palace of Culture and Science in Warsaw (from 1986 to 1989). After that, there was a change in the rules, and the next OFTA conferences continued with considerable organizational success by the

technological research centers in Białystok and Lublin. Initially, however, the meetings ran independently of each other, but they unified again a few years later and were organized every year and a half. The dominant theme of the meetings done by Białystok were, in the initial period, the applications of fiber optics and technology of non-telecom optical fibers. The Lublin meetings were concentrated on optical-fiber transmission technology. Currently, these two meetings are still organized every year and a half by Lublin (in September) and by Białystok (in January), and they are the most-important events periodically summarizing the achievements of the national scientific and technical optical-fiber technology community. Below is a list of conferences within the cycle of OFTA meetings:

- 1976:** OFTA I: Optical Fibers and Their Applications, Jabłonna II
- 1979:** OFTA II, Jabłonna II
- 1981:** Optical Fiber Measurement Technology, National Symposium, Lublin
- 1982:** Non-Telecommunications Optical Fibers, National Symposium, Białystok-Białowieża
- 1983:** OFTA III, Jabłonna II
- 1986:** OFTA IV, *Optical Fibers and Their Applications IV*, Proc. of SPIE 670, Warszawa PKiN
- 1989:** OFTA V, *Optical Fibers and Their Applications V*, Proc. of SPIE 1085, Warszawa PKiN
- 1996:** TAL, *Technology and Applications of Lightguides*, Proc. of SPIE 3189 Krasnobród
- 1998:** Non-telecommunications Optical Fibers, *Optical Fibers and Their Applications VI*, Proc. of SPIE 3731, Białystok-Białowieża
- 1999:** *Lightguides and their Applications*, Proc. of SPIE 4239, Krasnobród
- 2002:** OFTA VIII, *Optical Fibers and Their Applications VIII*, Proc. of SPIE 5028, Białystok-Białowieża
- 2003:** *Lightguides and Their Applications II*, Proc. of SPIE 5576, Krasnobród
- 2005:** SPIE Congress on Optoelectronics: *Photonic Crystals and Fibers*, Proc. of SPIE 5950; *Optical Fibers: Technology*, Proc. of SPIE 5951, Warszawa
- 2006:** *Lightguides and Their Applications III*, Proc. of SPIE 6608, Krasnobród
- 2008:** OFTA XI, *Optical Fibers and Their Applications 2008*, Proc. of SPIE 7120, Białystok and Białowieża
- 2009:** OFTA XII, Lublin and Krasnobród
- 2011:** OFTA XIII, *Optical Fibers and Their Applications 2010*, Proc. of SPIE 8010, Białystok and Białowieża
- 2012:** OFTA XIV, *Optical Fibers and Their Applications 2012*, Proc. of SPIE 8698, Lublin and Nałęczów
- 2013:** EWOFs, *Fifth European Workshop on Optical Fiber Sensors*, Proc. of SPIE 8794, Kraków
- 2014:** OFTA XV, *Optical Fibers and Their Applications 2014*, Proc. of SPIE 9228, Białystok and Lipowy Most
- 2015:** OFTA XVI, *Optical Fibers and Their Applications 2015*, Proc. of SPIE 9816, Lublin and Nałęczów

- 2017:** OFTA XVII, *Optical Fibers and Their Applications 2017*, Proc. of SPIE 10325, Białystok and Supraśl
- 2018:** OFTA XVIII, Lublin and Nałęczów, planned in September 2018.

Additional important events dedicated to fiber-optic technology were also part of the cycle: the Congress on Optoelectronics by SPIE (Warsaw, 2005); European Conference-Workshop of Optical Fiber Sensors EWOFs (Krakow, 2013); WILGA annual meetings on Photonics Applications; and the Laser Technology Symposium.

Nałęczów hosted the sixteenth conference and school on *Optical Fibers and Their Applications* (<http://www.opticalf.idl.pl>) on 22-25 September 2015. The conference was part of a worldwide series of events celebrating the International Year of Light (<http://www.light2015.org>). OFTA 2015 was organized by the Department of Technology of Fiber Optics in the Faculty of Chemistry of Maria Curie-Skłodowska Univ. in Lublin and the Faculty of Electrical Engineering and Computer Science, Technical Univ. of Lublin. The traditional aim of the conference was to enable direct discussions of relevant research and technical groups that are actively involved in the main areas of optical-fiber photonics. An additional element of the conference was the fourth workshop on fiber-optic technology for students working in the technological laboratories in the Optical-Fiber Technology Department of UMCS in Lublin. This action allowed young scientists to understand the opportunities and limitations of practical laboratories and application work with optical-fiber devices and photonic components. OFTA 2015 was held exactly 40 years after the start of the country's work on fiber-optic technology. There was an opportunity to organize the Jubilee Session and introduce attendees with some facts, institutions, and (above all) the people associated with the origins of this field of photonics in Poland. The 2015 Nałęczów conference gathered around 120 participants. Over 80 papers and posters were presented. Most papers originated from such university centers active in optoelectronics as the Silesian Univ. of Technology in Gliwice, Białystok, Warsaw, and Lublin as well as UMCS in Lublin. The symposium's topics included:

- Materials for optoelectronics, in particular materials for optical-fiber technology.
- Fabrication of optical fibers.
- Components and sub-assemblies for optoelectronics.
- Metrology of optical fibers.
- Metrology of optoelectronic components and devices.
- Applications of optical fibers.
- Education in optoelectronics and photonics.

A few plenary papers covering very current and widespread problems in optoelectronics were also presented.

The faculty of Electrical Engineering of Białystok Univ. of Technology, in co-operation with the Polish Society of Theoretical and Applied Electrical Engineering, organized OFTA 2017 in Supraśl on 23-27 January 2017. Traditionally, the patrons of these serial meetings are:

- The Polish Academy of Science's Committee of Electronics and Telecommunications.
- The Association of Polish Electrical Engineers' Optoelectronics Committee.
- Photonics Society of Poland.
- Polish Ceramics Society.

The conference gathered over 100 participants from leading photonics technology centers in Poland. Over 50 plenary papers and around 40 posters were presented. The topical sessions were concentrated around:

- Hot topics of optical-fiber photonics.
- Materials for optical fibers and photonics, including new glass synthesis for IR fibers.
- Nonlinear and active glasses for optical fibers.
- Polymer optical fibers.
- Special optical fibers for functional components and sensors.
- Optical fiber sensors solutions.
- Optical fiber communications and networks, including PON-WDM.
- Photonic integrated circuits.

In particular, the detailed conference subjects embraced:

- Technology development and manufacturing of optical fibers (classical, telecom, sensory and microstructural); optical-fiber cables; planar optical waveguides and components; integrated optics and micro-optics; and optical, optoelectronic, photonic and optical fiber sensors.
- Fiber-optic components (passive and active), such as couplers, power dividers, connectors, optical insulators, fiber circulators, nonreciprocal devices, optical amplifiers, optical and optoelectronic devices for connecting optical fibers with light sources and receivers, optical fiber and planar multiplexers and demultiplexers, etc.
- Fiber applications, especially those that require close cooperation with specialists producing optical fibers, optical cables, transmission channels, and elements of fiber optics, optoelectronics and photonics.
- Fiber-optic industries and professional training in the field of photonics.

The proceedings of the seventeenth OFTA conference are published in the *Proceedings of SPIE*. OFTA 2017 summarized in a vivid way the current technological achievements of the three major fiber-optic technology centers in Lublin, Białystok and Warsaw. Also included is the work of other technological centers active in research on materials for photonics and optoelectronics (e.g.,

glasses, polymers, semiconductors) and numerous academic and industrial centers of photonics and fiber-optic applications. Photonics and fiber-optics technology and application centers are numerous and active across the country today; for example:

- AGH Univ. of Science and Technology
- Warsaw Univ. of Technology (IMiO, ISE, and ITele at the Faculties of Electronics, Mechatronics, and Physics)
- The Military University of Technology campuses in Wrocław, Poznań, Gdansk, Katowice and Gliwice
- Other Institutes like ITE, ITR, ITME, and at a growing number of research companies and high-tech industries, like Fibrain, InPhoTech and others.

The symposium organizers provided very favorable participation conditions for Ph.D. and M.Sc. students, who took part in the symposium in a large numbers. Young researchers presented the majority of the papers, which supports the belief that this branch of technology is vivid and provides high hopes for future development. Optical and photonics sciences and technologies are developing very intensely locally and globally, with the local developments significantly adding to the global initiatives. OFTA 2017 was a great success by the local research and technical communities. The conference gathered many optical-fiber technology leaders from Poland and the surrounding geographical region as well as young researchers, which shows how this vivid research area constantly attracts young, gifted minds. The conference has shown that the fields of optics and photonics, and specifically optical-fiber technology, are in great shape in Poland and throughout Europe. The editors thank every participant in the OFTA series of national symposia, especially those who participated in the early years of these meetings, for their remarks and constant input for the development of these meetings.

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