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Special Section Guest Editorial: Terahertz and Infrared Optics: Towards Biophotonics

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Terahertz (THz) and infrared (IR) science and technology have been developing rapidly over the past decades. Novel materials, components, instruments, and methods are widely applied in various fields, and one of them is biophotonics. Development of THz and IR methods of label-free medical diagnosis, implementation of advanced techniques of laser treatment, progress of laboratory THz and IR imaging systems, spectroscopic and microscopic equipment nowadays are of great interest. Recently, considerable achievements were made in the field of study of malignant neoplasms thanks to a specificity of interactions of electromagnetic wave with biological tissues in the THz and IR ranges. The THz and IR dosimetry of living organisms is intensively studied, including biomodulation and therapeutic treatments. In addition, a constant increase in the efficiency of radiation sources, the sensitivity of detectors, and resolution in imaging and spectroscopic studies opens up new possibilities for the use of THz and IR technologies in biology and medicine.

This special section aims to give an overview of the recent stages and advances of THz and IR technologies with prospects for biophotonics. The papers included in this section cover a wide range of topics. Some of them consider novel and promising types of devices and optical components, such as graphene-based structures, photoconductive elements, and pyroelectric detectors. A number of papers are dedicated to the study of biological tissues and processes using functional near-infrared (NIR) spectroscopy, polarization-sensitive THz and IR spectroscopy, IR thermography, and NIR autofluorescence spectroscopy. The technical aspects of IR optical coherence tomography angiography, fabrication of tissue-engineered composite structures, THz solid immersion microscopy, and THz imaging are also covered. This special section includes 26 regular papers and 2 review papers by [A. Yachmenev et al.](#) on metasurfaces in photoconductive THz devices and by [K. Ahi et al.](#) on THz photonics and biophotonics.

The content of the special section includes selected papers presented at the Annual International Conference Saratov Fall Meeting (SFM) in 2018 and 2019, which brings together researchers from different countries. SFM was organized by Saratov State University and several other leading research organizations of Russia, including Bauman Moscow State Technical University (BMSTU). Each year SFM is supported by SPIE.

This conference provides a platform for scientific cooperation and gives an opportunity for students and young researchers to meet world-class scientists.

With great pleasure and appreciation, the guest editors dedicate this special section to Prof. Valery E. Karasik, who has made a huge contribution to the development of photonics in Russia.

Valery E. Karasik, PhD, DSc, was born in 1939, graduated from BMSTU in 1963, when started his scientific career in the field of optics and laser systems. In 1972 he received PhD in the field of technical science, in 2002 he became a Doctor of Science. He has successfully combined research and academic work in BMSTU, leading in the last decade the Research and



Fig. 1 Prof. Valery E. Karasik.

Educational Center “Photonics and Infrared Technologies” in BMSTU. He is an author of several courses in the Laser Systems Department and despite being in his 80s he lectures and leads graduate students.

Prof. Karasik is an author of more than 200 research papers, reviews, and tutorials. He is known to a wide range of specialists as a leading scientist in the fields of IR imaging, laser vision in turbid media, remote sensing, and fiber optics. He developed systems for laser location of hidden optical and optoelectronic devices. In the last decade he also worked on the development of THz technologies and applications, particularly THz imaging systems. Prof. Karasik was awarded the title “Honored Worker of Higher School of the Russian Federation.”

Finally, the guest editors would like to thank the reviewers and the *Optical Engineering* editorial staff for their contribution and help during the preparation of this special section, as well as all authors of the published papers.

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