

Foreword to the Special Issue on Laser and optical technologies in biomedicine and ecology

Dear Colleagues,

We are glad to present you the Special Issue of the [Journal of Biomedical Photonics & Engineering](#) (J-BPE) with selected papers of the Biophotonics Workshop of the XIX [All-Russian Youth Conference-Contest on Optics and Laser Physics](#) (Samara, November 9-12, 2021). The conference-contest was organized by P.N. Lebedev Physical Institute (Samara Branch) and Samara National Research University and supported by Administration of Samara Region and Samara SPIE Student Chapter.

The program of the Biophotonics Workshop 2021 included lectures by leading scientists, invited reports as well as competitive oral and poster reports of young scientists from Samara, Moscow, Nizhny Novgorod, Saratov, Orel, and Astrakhan.

The lectures and invited reports aroused great interest. For example, in his lecture “*Light as a factor in plant development control*”, **Academician** of the RAS **Yu. N. Kulchin** (Institute of Automation and Control Processes FEB of RAS, Vladivostok) spoke about the study on the effect of a change in the spectral composition and intensity of polychromatic radiation on the development of plants and their production of primary and secondary metabolites. **Dr. A. A. Fronya** presented topical results of research on the effect of ultraviolet radiation in the UVA wavelength range on the infectious properties of coronavirus conducted by the Lebedev Physical Institute together with the Gamaleya National Research Center.

The materials of the invited report of **Ekaterina M. Kasianenko** (Institute of Photonic Technologies Federal State Institution “Research Center “Crystallography and Photonics” RAS) “*Laser action on a pathologically altered capsule of the lens of the eye*” and coauthors are presented in the Special Issue of J-BPE. In the paper **Olga I. Baum** et al., the biomechanics of the lens - capsular bag system and the influence of various parameters of laser exposure on it were studied.

In the paper **Ekaterina M. Kasianenko** et al., the possibilities of phase-sensitive optical coherent elastography to register laser-induced microdeformations of the cornea under various mechanical stresses are demonstrated.

Anastasiya D. Mironova (Phys-Bio Institute, National Research Nuclear University “MEPhI”, Moscow, Russia) et al. demonstrated the capability to use mesoporous silicon nanoparticles (MSP NPs) doped with gadolinium as contrast agents for MRI, and MSP NPs doped with europium as luminescent probes for bioimaging. The results were obtained on the base of measurements of proton relaxation in aqueous suspensions of nanoparticles with embedded ions of rare earth and study of the photoluminescence spectra of the samples.

Note, that Anastasia became the winner of the Biophotonics section in the Oral Presentations nomination.

The international group of authors (Samara branch of Lebedev Physical Institute, Samara University and Florida International University) in the publication by **Lubov Krikunova** et al. studied the reaction of the methylidyne radical with the hydrogen cyanide molecule in cold molecular clouds and Planetary Atmospheres. The reaction under study can be considered as the first stage of chemical evolution, as a result of which organic compounds are formed from the simplest molecules. These organic compositions can generate polycyclic organic compounds, which can be considered as an initial stage of abiogenesis leading to the synthesis of the most basic amino acids.

Ekaterina N. Lazareva (Saratov State University and Tomsk State University) compares the optical properties of glycated (HbA1c) and non-glycated (Hb) hemoglobin using Surface-enhanced Raman spectroscopy (SERS), spectrofluorimetry, and refractometry. Good discrimination between two hemoglobins indicating differences in their molecular structure was demonstrated by means of SERS and fluorescence spectra. Also, for the first time refractive index temperature increments were measured for HbA1c in a wide wavelength range in the visible and NIR.

Agafonov et al. from Samara University in their article proposed to use the porous silicon-hydroxyapatite system as an effective matrix for creating nanocomposites for osteoplasty. They studied the change in the structure of the aqueous suspension of the porous silicon+hydroxyapatite nanocomposite powder over time to assess the possibility of its dissolution in physiological fluids.

Thus, the articles collected in this special issue highlight the potential of optical and laser technologies in modern medical, biological and environmental applications, and even touch upon the origin of organic compounds in the Universe.

We invite everyone to take part in the XX All-Russian competition-conference in optics and laser physics, dedicated to the 100th anniversary of the birth of N. G. Basov, which will be held in Samara on November 8-12, 2022.

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