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The special section „Biophotonics“ of the journal „Optics and Spectroscopy“ included 21 articles based on the results of scientific research in several modern areas of optics and biophotonics. These articles are based on materials presented at the XI Symposium on Optics and Biophotonics as part of the annual international conference Saratov Fall Meeting 2023 (SFM'23, Saratov State University named after N.G. Chernyshevsky, Saratov, Russia, September 25–29, 2023, URL: https://sfmconference.org/sfm/sfm23/). In addition, SFM'23 included a scientific school for students and young scientists in optics, laser physics and biophysics, a Chinese-Russian Workshop on Biophotonics and Biomedical Optics, as well as the 2nd BRICS Workshop on Biophotonics. All events were dedicated to the 300th Anniversary of the Russian Academy of Sciences.

The conference discussed scientific and technical achievements in the development of optical and laser technologies for medicine, biology and the environmental science. Plenary lectures were given by leading internationally recognized experts, including Paul J. Campagnola, University of Wisconsin (USA), Andrey V. Naumov, Institute of Spectroscopy RAS, MPGU, Lebedev Physical Institute of the Russian Academy of Sciences, Kirill Larin, University of Houston (USA), Andrey V. Zvyagin, Shemyakin & Ovchinnikov Institute of Bioorganic Chemistry, Alessandro Parodi, Sirius University of Science and Technology, Junle Qu, Shenzhen University (China), Yao He, Soochow University (China), and Jian Ye, Shanghai Jiao Tong University (China).

Three papers of the special section present application of optical methods for the diagnosis of socially significant diseases. To differentiate intact tissues and tumors (glioma model 101.8) in freshly excised rat brain tissue *ex vivo*, P.V. Alexandrova et al. used endoscopic optical coherence tomography in combination with methods for assessing the optical properties of tissues and wavelet analysis of speckle structures. Article of Ya.Ya. Ponurovsky et al. is devoted to the development and experimental testing of an optoelectronic software and hardware complex consisting of a multi-channel tunable high-resolution diode laser spectrometer for measuring gas content ($^{12}CO_2$, $^{13}CO_2$, CH_4, NH_3, H_2S and H_2O), as well as hydrogen and oxygen sensors, for measuring exhaled gases. This complex is designed for non-invasive measurement of the composition of biomarkers of the intestinal microbiota. The multichannel nature of the recorded components implemented in it allows one to evaluate the composition and characteristics of the enzymatic activity of the intestinal microbiota. In the article of A.S. Veselov et al. a method of using of infrared illumination for measuring the reaction of the pupil of the eye to changes in illumination, which makes it possible to separate the functions of influencing the eye and recording its reaction, is proposed.

The spectral properties (absorption and fluorescence spectra, as well as the dependence of the fluorescence quantum yield on the excitation wavelength) of dissolved organic matter in the natural waters of two parts of a reservoir, artificially separated from the White Sea–Kanda Bay — the sea and the meromictic Fedoseyevsky Reach are studied in the paper of Yu.G. Sokolovskaya et al. Differences in the spectral and optical properties of dissolved organic matter in two parts of an artificially separated reservoir and natural reservoirs were revealed. Article by O.A. Kalmatskaya et al. is devoted to monitoring the sensitivity of plants to physiologically active substances and stress factors using fluorescent methods.

Three papers are related to optics and biophotonics of the terahertz range. A terahertz optical system based on the solid-state immersion effect, using a rutile (single crystal of titanium dioxide — TiO_2) immersion hemisphere to overcome the diffraction limit of Abbe spatial resolution is developed, theoretically and experimentally studied in the article by V.A. Zhelnov and co-authors. Such an optical system is capable of providing a resolution of up to 0.06 wavelength of radiation (in free space), which is extremely important for visualizing heterogeneous biological

tissues and boundaries between tissues in normal and pathological conditions. In the paper of D.R. Ilyenkova et al. a terahertz microscope based on solid-state immersion (with an immersion hemisphere made of high-resistance silicon), equipped with a polarizer and analyzer based on free-standing metal wires for polarization-sensitive terahertz measurements of tissues is described. Article of A.S. Kucheryavenko is devoted to the development of a soft tissue phantom in the terahertz range, consisting of a gelatin matrix that strongly absorbs terahertz radiation and submillimeter spheres of silicon dioxide (SiO_2) that scatter it. This phantom simulates both strong absorption and tissue heterogeneity, respectively.

Three papers are devoted to the use of optical methods for monitoring and optimizing the drug delivery process. In the work of Yu.I. Svenskaya et al., for comprehensive studies of drug delivery systems to the site of the inflammatory process (including the use of carrier containers for encapsulating water-insoluble glucocorticosteroids), a wide range of spectroscopy and tissue imaging methods are used, including Raman spectroscopy, UV-visible spectroscopy, scanning electron microscopy and energy-dispersive X-ray spectroscopy. Methods of fluorescence tomography and laser speckle contrast imaging were used to optimize dosing when administering drugs (in the form of suspensions of drug carriers) in the article by O.I. Guslyakova et al. A developed model that allows the mass formation and cultivation of cell spheroids, and fluorescence microscopy methods used to assess the cytotoxicity of antitumor drugs introduced into the spheroids were used in the work of A.S. Soghomonyan et al.

Attention was also paid to the use of density functional theory methods for modeling various high-molecular compounds and predicting their measured infrared absorption spectra, which carry information about the vibrational modes of molecules and molecular complexes. E.V. Nazar'ev et al. studied the complex formation of nitrogen-containing amino acids when one of them is enriched with maleimide; P.A. Zhulidin et al. studied interaction of glycine and carboxylated nanodiamond; P.D. Filin et al. studied interaction of bacteriochlorophylls with various solvents. Investigation the properties of oxidized borophene and van der Waals heterostructures based on it using analytical methods of quantum physics, and also demonstration of the possibility of controlling the optical and optoelectronic properties of such materials are demonstrated in the work of M.M. Slepchenkov and co-authors.

A significant part of the work is devoted to the study and optimization of the electrodynamic properties of new materials in optics, biophotonics, electronics and medicine. The change in the structure of carbon dots during their hydrothermal synthesis from ethylenediamine and citric acid is studied in the work of A.M. Verwald et al. The relationship between the structure of nanoparticles and the intensity of their photoluminescence has been established. It has been shown that the formation of a high quantum yield of photoluminescence of carbon dots occurs mainly at the second stage of synthesis. A.A. Korepanova and others showed a significant dependence of the quantum yield of photoluminescence of carbon dots on the acidity of the solvent using infrared Fourier spectroscopy, spectrophotometry and spectrofluorimetry. Paper of P.E. Timchenko et al. demonstrates the ability to analyze the composition of collagen materials using Raman spectroscopy and Fourier transform infrared spectroscopy. A.A. Zhiltsova et al. studied the extinction coefficients of bacteriochlorophylls in various solvents using spectrophotometry. A.Yu. Frolova et al. assessed the prospects of using a multichromophoric compound consisting of eight BODIPY chromophores connected through an aliphatic spacer with a siloxane core for monitoring membrane parameters in living eukaryotic cells. The possibility of using this compound to monitor the parameters of cell membrane structures using microscopy with visualization of the fluorescence lifetime has been demonstrated. E.A. Ryabov et al. used numerical modeling to study the extinction spectra of silver nanoparticles of different diameters, both for single nanoparticles in a colloidal solution and for a pair of nanoparticles on the surface of a nonwoven material with specified gaps between the nanoparticles. It has been shown that the resonance peak of particle extinction shifts towards longer wavelengths with increasing diameter.

The editors of the special section thank all the authors for providing the results of their research, the staff of the journal Optics and Spectroscopy for their permanent assistance in organizing this special section, and also hope that the presented works will be of interest to a wide range of readers.

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