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Foreword to the Special Issue

Biophotonics for blood studies:

the 75th anniversary of the scholar and teacher Alexander Priezzhev

With this special issue, we are pleased to commemorate the 75th anniversary of Prof. Alexander V. Priezzhev and honor his contribution to the field of biophotonics and, in particular, to optics of blood.

Being born on April, 3, 1947, Alexander V. Priezzhev graduated and received his PhD degree from the Department of Physics, M.V. Lomonosov Moscow State University (Moscow, Russia) further connecting his entire scientific activity with this institution. Currently he is the head of the Biomedical Photonics Laboratory at M.V. Lomonosov Moscow State University. Through his career, he participated in numerous national and international research projects in the area of medical physics and biomedical optics, co-authored more than 400 peer-reviewed papers, books and book chapters, and edited many conference proceedings volumes.

Alexander V. Priezzhev was awarded by the Ministry of Healthcare of Russian Federation for his long lasting activities in the development of novel optical techniques for medical applications and by the Ministry of Science and Education of Russian Federation for his achievements in research and education activities. Also, he received several awards for his contribution to the Program of Development of M.V. Lomonosov Moscow State University. His areas of expertise cover biophotonics, laser medicine, nanobiophotonics, physics of biological fluids, biophysics, and optical and laser measurement techniques.

This issue presents a collection of state-of-the-art research papers in the field of biophotonics closely related to the scientific interests of Prof. A.V. Priezzhev.

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The paper by Alexander Pushkarev and co-authors from Bauman Moscow State Technical University discusses the development of novel probes employed for tissue cryoablation. The topic of tissue modulation is continued by the paper by Elena Perevedentseva from P.N. Lebedev Physical Institute of Russian Academy of Sciences reviewing the effect of nanodiamonds on blood and the paper by Andrei Belikov and co-authors from ITMO University analyzing the effect of irradiation on optical properties of modern photosensitizers. The studies of blood properties with optical techniques at cellular and ensembles of cells level are presented in the papers by Sergey Nikitin and co-authors (M.V. Lomonosov Moscow State University) reporting the improvement of laser ektacytometry technique and Herbert Schneckenburger (Aalen University, Germany) discussing the cell viability problem when applying optical tweezers. The issues connected with blood oxygen saturation are discussed in papers by Alexander Yusipovich (M.V. Lomonosov Moscow State University) and co-authors reporting on hemoglobin heme conformation depending on oxygen saturation and Valeria Perekatova and co-authors (Institute of Applied Physics RAS) presenting a numerical study on the blood saturation mapping using the photoacoustics technique. Two papers of the special issue contribute to the blood flowmetry area: the paper by Juergen Lademann and co-authors (Charité-Universitätsmedizin, Germany) analyzes the correlation between blood flow and human skin physiological parameters while Konstantin Mashkov (Saratov National Research State University) and co-authors compare laser Doppler flowmetry with Doppler ultrasound measurements. The paper by Dmitry Zimnyakov (Yury Gagarin State Technical University of Saratov) proposes the usage of the principles polarization analysis widely employed in polarization imaging for gene sequence processing.

The issue also features papers by Elena Nikonova (M.V. Lomonosov Moscow State University) and co-authors reporting on application of diffuse optical spectroscopy in dentistry and by Boris Yakimov and co-authors (M.V. Lomonosov Moscow State University) describing speckle-correlation based approach on tissue optical properties extraction.

Some of papers of this special issue were already published in Vol 8, No 3 (2022) (ssau.ru) by Alexey Selifonov and co-authors from Saratov State University on the ex vivo study of the diffusion ability of the antibiotic tetracycline in human dentin and the assessment of the saturation time of the dentin when it is delivered from the pulp through the blood supply (DOI: 10.18287/JBPE22.08.030303) and by Denis G. Lapitan and co-authors from the Moscow Regional Research and Clinical Institute (“MONIKI”) on the Monte Carlo modeling of the pulse waveform for design of the optimal configuration of the photoplethysmography sensor (DOI: 10.18287/JBPE22.08.030306).

The last portion of this paper collection will be presented in the next issue of the journal and will feature the study of whole blood thermography in course of laser heating performed by Ignatieva (M.V. Lomonosov Moscow State University) and co-authors and analysis of the effect of hydrated fullerene C60 on low-level photon emission from undiluted human blood reported by Yablonskaya (Emanuel Institute of Biochemical Physics of RAS) et al. The study by Vadim Astashov (Peoples' Friendship University of Russia) and co-authors will continue the topic of photobiostimulation with accent on blue light irradiation. The paper by Mikhail Kirillin (Institute of Applied Physics RAS) and

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co-authors reporting on application of statistical modelling widely employed in biophotonics to simulate the spreading of COVID-19 pandemic finalizes the special issue.

The paper collection presented in this special issue demonstrates the progress of optical techniques in blood related studies and a strong potential of biophotonics in biomedicine.

On behalf of all authors, we would like to deliver congratulations to Alexander Vasilyevich on his 75th birthday, and wish him good health, many new ideas and projects, and new achievements in all kinds of activities!

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