This and the following issues of Quantum Electronics comprise articles reflecting the state of the art of laser technologies both currently applied and promising for application in biomedical research. Rapid development of biophotonics that we witness nowadays is due to a number of factors. These include the new results in basic studies of the interaction of laser radiation with biological tissues and cells, essential progress in the field of development of means for delivery, detection and ablation and ultrasound action. Another promising direction of application of nanoparticles is a possibility of their use for imaging the distribution of nanocages in the liver both in vivo and at intravenous administration of the nanoparticles in vivo.

Detection and correlation processing of the speckle structures allow obtaining diagnostic information on the spatiotemporal entity of biological objects. Articles by V.M. Gelikonov et al. and S.G. Proskurin are focused on the development of optical coherence tomography (OCT). E.A. Genina et al. have presented the results of investigation of the feasibility of imaging the distribution of nanocages in the liver both in model experiments in vitro and at intravenous administration of the nanoparticles in vivo.

A.A. Dolmashkin et al. is devoted to the analysis of possibilities provided by the combination of the ultrasound action on the reacting mixture ‘blood and serum’ with digital detection and handling of the data obtained in the process of agglutination and sedimentation of erythrocytes. Special attention is paid to the issues of modelling the proposed method of blood typing and raising the resolution of the determination of human blood type.

The article by Yu.S. Samsonova et al. is devoted to the study of the properties of biologically active nanocompound materials aiming at their further use in diagnostics of and treatment from various diseases. The article by A.A. Dolmashkin et al. is devoted to the study of interactions of albumin protein molecules with diamond nanoparticles in aqueous solutions.

The papers presented in the special issue were discussed at the XV Annual International Interdisciplinary School for Young Scientists and Students on Optics, Laser Physics and Biophotonics, held in Saratov from 27 to 30 September 2011, which was attended by more than 500 people from 22 countries of the world. The guest-editors of this issue are deeply grateful to all authors and express their hope that the presented articles will be interesting to a wide range of readership.