



Editorial for the special issue of biophysical reviews on the 9th Congress of the Russian society for photobiology held in Shepsi, Krasnodar region, Russia, on September 12–19, 2021

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Introduction to Russian Society for Photobiology

This Special Issue is devoted to the latest conference event of the Russian Society for Photobiology (RSP)—the 9th Congress of the RSP held in Shepsi, Krasnodar region, Russia, on September 12–19, 2021. The RSP was organized in 1993 and from its very beginning the RSP has promoted activities of scientists, engineers, professors, and students in photobiology and the related fields of science. The main mission of the RSP is the organization of workshops, meetings, and congresses focused on photobiological research, particularly welcoming young researchers. A brief history of the RSP can be found in this SI of Biophysical Reviews (Koppel and Krasnovsky 2022). Notably, RSP does not levy membership fees, and its management is elected to work on a voluntary basis. The RSP plays a significant role in the organization of, and contributes significantly to, photobiological research in Russia.

The 9th Congress of the Russian Photobiological Society

The 9th Congress of the RSP was originally scheduled in 2020 but it was postponed to 2021 due to COVID-19 restrictions. The Congress has been held as a hybrid online-in-person event and it ran in 8 sections with 144 attendees, 18 of whom delivered their talks online. Including their listed coauthors, overall 314 participants joined the meeting. The Congress organization ran through several phases. First, the Program Committee suggested the title for the Congress “Actual Problems in Photobiology” and set the 8 Sessions of the Congress program. When Coordinators volunteered for each Session (Table 1), they cooperated with the Program and Organizing Committees to appoint Chairs for each Session’s meetings. The Congress was concluded by taking the joint photo (Fig. 1).

Scientific content of the Congress

The content of the key talks delivered at the Congress was shaped into invited review papers that made up this Special Issue of Biophysical Reviews. These contributions are listed, together with their outlines, and the commentary papers pertinent to each session of the Congress, in Table 2.

Young scientist competition

Forty young scientists participated in the Congress. The Award Committee evaluated their presentations, though with some difficulties in comparison of contribution coming from different levels of BSc, MSc, and PhD. Eventually, 20 young scientists were selected as winners. The winners presented

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Table 1 Sessions of the 9th Congress of the Russian Society for Photobiology (RSP)

Session	Coordinators	Chairs	Reference
Primary processes of photosynthesis	Ivan Proskuryakov and Alexey Semenov	Ivan Proskuryakov, Lyudmila Vasilieva, Mahir Mamedov, Alexander Ashikhmin, Roman Pishchalnikov, Galina Riznichenko	Proskuryakov and Semenov (2022)
Regulation of photosynthesis	Marina Kozuleva, Boris Ivanov, Olga Voitsek-hovskaja	Marina Kozuleva, Olga Voitsekhoovskaja, Vladimir Sukhov, Maria Borisova-Mubarakshina, Vasily Terentyev, Lyudmila Kabashnikova, Lada Petrovskaya	Kozuleva et al. (2022)
Photoreception	Larisa Koppel, Lada Petrovskaya	Lada Petrovskaya, Olga Voitsekhoovskaja, Larisa Koppel, Konstantin Neverov	Petrovskaya and Koppel (2022)
Basics of photodynamic, laser, and PUVA therapy	Mikhail Grin, Alexander Krasnovsky, Andrew Mironov	Vitaly Plavsky, Mikhail Grin, Damir Gvozdev, Alexander Firsov	Grin et al. (2022)
Biophotonics of molecules and nanoparticles	Viktor Nadochenko, Valery Tuchin	Polina Bikmulina, Ioanna Gorbunova	Tsygankov and Tuchin (2022)
Bioluminescence and photonics of fluorescent proteins	Evgeny Vysotsky, Anvar Ismailov, Valentina Kratasyuk	Evgeny Vysotsky, Nadezhda Kudryasheva, Svetlana Markova, Elena Nemtseva, Galina Lomakina, Elena Ereemeeva	Vysotsky, (2022)
Microalgae as converters of light energy into biofuels and high-value products	Anatoly Tsygankov, Evgeny Solovchenko	Anatoly Tsygankov, Olga Vojtsekhoovskaya, Tatyana Kozlova, Maria Sinetova	Tsygankov and Solovchenko (2022)
Ecological photobiology	Olga Koksharova, Sergey Pogosyan, Galina Riznichenko	Sergey Khrushchev, Marina Grinberg, Galina Riznichenko, Elena Senatskaya	Riznichenko et al. (2022)



Fig. 1 Participants of 9th Congress of the Russian Photobiological Society held in Shepsi, Krasnodar region, Russia, on September 12–19, 2021. Joint photo

short talks (3 min talks with 2 min questions) at the special session; they were awarded Winner's Certificates and souvenirs (Fig. 2).

Heroes of the Congress organization

Together with the RSP, the Institute of Basic Biological Problems Russian Academy of Sciences (The Separate Subdivision of Federal Research Center “Pushchino Center of Biological Research of the Russian Academy of Sciences”) and M.V. Lomonosov Moscow State University organized the 9th Congress of the Russian Photobiological Society. Many volunteers worked hard as Program and Organizing Committee members, organizing communication with participants of the Congress, providing registration, technical assistance, realization of smooth sessions and online talks of participants, preparation of advertisements about program changes and reminders about different events, etc. All authors of this SI bid thanks on behalf of RSP Central Committee. Particular acknowledgement should be given to Darya Vetoshkina, Tatyana Fedorchuk, Irina Sterelyukhina, Elena Korovina, Larissa Koppel, Aleksey Semenov, Sergey Khrushchev, Marina Kozuleva, Lada Petrovskaya, Olga Koksharova, Olga Voitsekhovskaya, Evgeniy Vysotsky, and Ivan Proskuryakov for their enormous contribution to the Congress preparation.

The venue of the Congress

In 2011, the Mayak lodging house in Shepsi village, Krasnodar region, Russia, has been chosen as the venue for the RSP congresses. It is located at a beach of the Black Sea shore and gives an excellent opportunity to combine comfortable meetings in conference room (more than 200 seats) and convenient accommodation as well as pleasant rest at the beach, in the park, or using sport facilities. In addition, informal meetings that take place at any scientific forums are possible almost anywhere in the park zone, recreation rooms, and other premises. The RSP has a long-standing partnership with Mayak, so we never miss an opportunity to say thanks to our hosts especially to Alexander Kovalev, the Director; Olga Yarzhinskaya, the Administrator of the hotel; Anna Zhorova, the restaurant Manager; and Elena Kovaleva, responsible for keeping and explaining rare plants in the lodging house garden, for their heartfelt kindness and hospitality for all guests of “Mayak.”

In conclusion, the 9th Congress of the RSP, in spite of COVID-19 restrictions, brought together many researchers enabling them to exchange their thoughts and share their latest results. Participants received a lot of new information from the presentations and, most importantly, exchanged new ideas, agreed to continue their cooperation, and created new connections. So, in view of what is said above, the 9th Congress of the RSP appears to be quite successful.

Table 2 Key contributions to the Special Issue of Biophysical Reviews dedicated to the 9th Congress of the Russian Society for Photobiology (RSP)

Title	Outline of the content	Reference
Commentaries		
Thirty years of the Russian Society for photobiology (1992 to 2022)	A historical overview of the development of RSP is given from its conception to its current state. The key influencers and their roles are highlighted, the mission of RSP is presented	Koppel and Krasnovsky (2022)
Commentaries on Sect. 1 “Primary processes of photosynthesis”	In each commentary, a brief summary of the topic of the session is presented together with a short overview of the key talks delivered at that session. For detailed information, please see corresponding commentary papers in this special issue	Proskuryakov and Semenov (2022) Grin (2022)
“Fundamental principles of photodynamic, laser and PUVA therapy”: a session of the Russian Photobiology Society 9th Congress (Shepsi, Krasnodar region, Russia; September, 12–19, 2021)	Commentary to “Biophotonics of molecules and nanoparticles”: a session of the Russian Photobiology Society 9th Congress Shepsi, Krasnodar region, Russia; September 12–19, 2021	Tsygankov and Tuchin (2022)
“Microalgae as converters of light energy into biofuels and high-value products”: a session of the Russian Photobiology Society 9th Congress (Shepsi, Krasnodar region, Russia; September, 12–19, 2021)	“Bioluminescence and Photonics of Fluorescent Proteins” session at the 9th Congress of the Russian Photobiology Society (Shepsi, Krasnodar region, Russia; September 12–19, 2021)	Tsygankov and Solovchenko (2022)
Overview of the “Photoreception” session at the 9th Congress of the Russian Photobiological Society: understanding structure and function of photoreceptors	“Regulation of photosynthesis” session of the Russian Photobiology Society 9th Congress (Shepsi, September 12–19, 2021)	Vysotsky (2022)
“Ecological photobiology” session of the Russian Photobiology Society 9th Congress (Shepsi, September 12–19, 2021)	Scientific reviews	Petrovskaya and Koppel (2022)
Current state of the primary charge separation mechanism in photosystem I of cyanobacteria	Current state of the primary charge separation mechanism in photosystem I of cyanobacteria	Kozuleva et al. (2022)
Macromolecular conformational changes in photosystem II: interaction between structure and function	Measurements of the light-induced steady state electric potential generation by photosynthetic pigment-protein complexes	Khrushchev et al. (2022a, b)
Light quality as a driver of photosynthetic apparatus development	Light quality as a driver of photosynthetic apparatus development	Cherepanov et al. (2022)
Cooperative pathway of O ₂ reduction to H ₂ O ₂ in chloroplast thylakoid membrane: new insight into the Mehler reaction	Cooperative pathway of O ₂ reduction to H ₂ O ₂ in chloroplast thylakoid membrane: new insight into the Mehler reaction	Terentyev (2022)
Molecular, Brownian, kinetic and stochastic models of the processes in photosynthetic membrane of green plants and microalgae	Molecular, Brownian, kinetic and stochastic models of the processes in photosynthetic membrane of green plants and microalgae	Mamedov et al. (2022)
Application of direct electrochrometry in studies of microbial rhodopsins reconstituted in proteoliposomes	Application of direct electrochrometry in studies of microbial rhodopsins reconstituted in proteoliposomes	Kochetova et al. (2022)
		Ivanov et al. (2022)
		Riznichenko et al. (2022)
		Petrovskaya et al. (2022)

Table 2 (continued)

Title	Outline of the content	Reference
Phytochrome A in plants comprises two structurally and functionally distinct populations — water-soluble phyA' and amphiphilic phyA"	A concept is presented that the complex picture of the phyA action is due to the existence of two phyA types in the cell differing by the structure of the N-terminus, probably, by its serine phosphorylation. Functional interaction between phyA and the defense-related hormone jasmonic acid is also considered	Sineshchekov and Koppel (2022)
Photobiology of lipofuscin granules in the retinal pigment epithelium cells of the eye: norm, pathology, age	Lipofuscin granules (LGs) are accumulated in the retinal pigment epithelium (RPE) cells. The progressive LG accumulation can somehow lead to pathology and accelerate the aging process. The review examines composition, spectral properties and photoactivity of LGs isolated from the human cadaver eyes	Feldman et al. (2022)
Advantages of combined photodynamic therapy in the treatment of oncological diseases	Photodynamic therapy is depicted as an approved medical technology for the treatment of various malignant neoplasms, and several precancerous and non-cancer diseases. The evidence on the advantages of combined use of PDT with traditional and innovative methods of treatment are reviewed	Grin et al. (2022)
Optical clearing and testing of lung tissue using inhalation aerosols: prospects for monitoring the action of viral infections	Optical clearing of the lung tissue aims to make it more transparent to light thus allowing reconstruction of the three-dimensional structure with better resolution. This review presents general principles and advances in the field of tissue optical clearing technology and analyses the impact of microbial and viral infections on tissue response	Bucharskaya et al. (2022)
Cardiovascular biomarkers in body fluids: Progress and Prospects in Optical Sensors	The biomarker detection plays a crucial role in the early diagnosis of several non-infectious and life-threatening diseases like cardiovascular diseases and many cancers, which in turn will help in more successful therapy, reducing the mortality rate. The current progress and prospects in biomarker research for the diagnosis of cardiovascular diseases are reviewed	John et al. (2022)
Bioluminescent test systems based on firefly luciferase for studying stress effects on living cells	State of art of the studies on and application of the bioluminescent luciferin-luciferase reaction is presented. The possibilities of using this reaction to study the effects of temperature, drugs, membrane-active compounds, etc. on living cells are considered	Lomakina and Ugarova (2022)
The effects of secondary bacterial metabolites on photosynthesis in microalgae cells	Secondary metabolites of bacteria are regulatory molecules that act as "infochemicals" that control some metabolic processes in the cells of microorganisms. The main purpose of this review is to highlight recent experimental results that demonstrate the impact of several types of common bacterial metabolites (volatile organic compounds, non-protein amino acids, and peptides) on photosynthetic activity in cells of microalgae	Koksharova and Safronov (2022)
Chlorophyll fluorescence as a valuable multitool for microalgal biotechnology	Variable fluorescence of chlorophyll (CF-PAM) of the photosynthetic apparatus is presented as an ample source of valuable information on physiological condition of photosynthetic organisms. Applications and limitations of the CF-PAM technique in microalgal biotechnology are discussed	Solovchenko et al. (2022)
The relationship between photosystem II regulation and light-dependent hydrogen production by microalgae	An overview of the functional link between the photosynthetic machinery and light-dependent hydrogen production is presented along with physiological significance of this process. The light-dependent hydrogen production is suggested to form a part and parcel of the sophisticated regulatory network for stress adaptation of microalgae	Grechanik and Tsygankov (2022)
Machine learning methods for assessing photosynthetic activity: environmental monitoring applications	Machine learning methods proposed for determining the functional parameters of photosynthesis based on local and remote optical measurements (hyperspectral imaging, solar-induced chlorophyll fluorescence, local chlorophyll fluorescence imaging, and various techniques of fast and delayed chlorophyll fluorescence induction) are reviewed	Khrushchev et al. (2022a, b)
Structural organization, evolution, and distribution of viral pyrimidine dimer-DNA glycosylases	An outline of the current evidence on the structure and mechanism of operation of best-known viral glycosylase Den V and its homologs. The biological importance and distribution of the enzyme and its homologs among viruses are considered	Karmanova et al. (2022)



Fig. 2 Young scientists — awardees of Young Scientists Competition at 9th Congress of Russian Photobiological Society (from left to right; from up to down). Aleksandr Ashikhmin, Konstantin Chekanov, Anna Vishnevskaya (primary processes of photosynthesis); Valeria Dmitrieva, Anna Shukshina, Darya Vetoshkina (regulation of photosynthesis); Artemiy Sukhanov (photoreception); Anton Benditkis, Ioanna Gorbunova, Daniil Gvozdev, Dmitriy Pritmov,

Natalya Shilyagina, Polina Starygina (basics of photodynamic, laser, and PUVA therapy); Marina Larionova, Pavel Natashin (bioluminescence and photonics of fluorescent proteins); David Gabrielyan, Makhmadyusuf Khasimov, Darya Zharova (microalgae as converters of light energy into biofuels and high-value products); Ekaterina Gromova, Alexander Khmarik (ecological photobiology)

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Declarations

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