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## Front Matter: Volume 11457

, "Front Matter: Volume 11457," Proc. SPIE 11457, Saratov Fall Meeting 2019: Optical and Nano-Technologies for Biology and Medicine, 1145701 (9 April 2020); doi: 10.1117/12.2570909

**SPIE.**

Event: Saratov Fall Meeting 2019: VII International Symposium on Optics and Biophotonics, 2019, Saratov, Russian Federation

*Saratov Fall Meeting 2019*

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# **Optical and Nano-Technologies for Biology and Medicine**

**Valery V. Tuchin**

**Elina A. Genina**

*Editors*

**23–27 September 2019**

**Saratov, Russian Federation**

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SPIE

**Volume 11457**

Proceedings of SPIE, 1605-7422, V. 11457

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Saratov Fall Meeting 2019: Optical and Nano-Technologies for Biology and Medicine, edited by

Valery V. Tuchin, Elina A. Genina, Proc. of SPIE Vol. 11457, 1145701 · © 2020 SPIE

CCC code: 1605-7422/20/\$21 · doi: 10.1117/12.2570909

Proc. of SPIE Vol. 11457 1145701-1

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Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Saratov Fall Meeting 2019: Optical and Nano-Technologies for Biology and Medicine*, edited by Valery V. Tuchin, Elina A. Genina, Proceedings of SPIE Vol. 11457 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

ISSN: 1605-7422  
ISSN: 2410-9045 (electronic)

ISBN: 9781510637184  
ISBN: 9781510637191 (electronic)

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA  
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

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**Rinat O. Esenaliev**, University of Texas Medical Branch (United States)

- 3 Plenary Session III  
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**Alexei K. Fedorov**, Russian Quantum Center, Skolkovo  
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- 5 Plenary Session V  
**Kirill I. Zaytsev**, A.M. Prokhorov Institute of General Physics RAS  
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- 6 Internet Plenary Session  
**Valery V. Tuchin**, Saratov State University (Russian Federation) and  
Tomsk State University, (Russian Federation) and Institute of Precision  
Mechanics and Control, RAS (Russian Federation)
- 7 Invited Lecture/Oral Session I  
**Vladislav Toronov**, Ryerson University (Canada)
- 8 Invited Lecture/Oral Session II  
**Valery P. Zakharov**, Samara State University (Russian Federation)
- 9 Invited Lecture/Oral Session III  
**Ronald Sroka**, LIFE-Center at Department of Urology at Hospital of  
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- 10 Poster/Internet Session  
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# Introduction

The Seventh International Symposium on Optics and Biophotonics (Saratov Fall Meeting, SFM19) was held in Saratov, Russia, 23–27 September 2019 with more than 500 participants from Russian Federation, United States, Canada, Europe, Asia and Pacific Ocean countries. It covered a wide range of modern problems of fundamental and applied optics, laser physics, photonics, and biomedical optics.

This volume includes selected papers of the following conferences and workshops organized in the framework of the symposium:

**Optical Technologies in Biophysics & Medicine XXI**

Elina A. Genina and Valery V. Tuchin (*Chairs*)

**Nanobiophotonics XVI**

Nikolai G. Khlebtsov (*Chair*)

**Microscopic and Low-Coherence Methods in Biomedical and Non-Biomedical Applications XII**

Kirill Larin (*Chair*)

**Internet Biophotonics XII**

Alexey N. Bashkatov, Ivan V. Fedosov, and Valery V. Tuchin (*Chairs*)

**Low-Dimensional Structures X**

Olga E. Glukhova (*Chair*)

**Advanced Polarization and Correlation Technologies in Biomedicine and Material Science V**

Dmitry A. Zimnyakov (*Chair*)

**Biomedical Spectroscopy V**

Vyacheslav I. Kochubey and Alexander B. Pravdin (*Chairs*)

**Terahertz Optics and Biotechnologies II**

Valeriy E. Karasik (*Chair*)

The main attention was paid to the discussion of fundamentals and general approaches of description of coherent, low-coherent, polarized, spatially and temporally modulated light interactions with inhomogeneous absorbing media, low-dimensional structures, tissues, and tissue phantoms in a wide spectral range from x-ray to terahertz. Optical properties of various tissues measured in vitro, ex vivo, and in vivo as well as optical biopsy techniques were under consideration. Static and dynamic light scattering in tissues, Doppler, photo-acoustic and photo-thermal laser-tissue interactions, including nanoparticle doped tissues and cells, light induced mechanical stress, photodynamic effects also were considered. On this basis the variety of laser and optical technologies for medical diagnostics, therapy, surgery, and light dosimetry, as well as for spectroscopy of random and ordered media were presented.

SFM19 was organized as the morning plenary sessions, afternoon lectures and oral sessions, evening poster presentations and Internet discussion. Plenary lectures delivered by leading experts in urgent fields of optical and laser life sciences were received by the attendees with great interest and discussed by the audience.

Plenary and invited lectures, oral ,and poster presentations covered a wide area of tissue optics, spectroscopy and imaging, controlling of optical properties of tissues, problems of interaction of terahertz radiation with tissues and tissue-like materials, as well as biophysical and photochemical aspects of photo- and laser therapy.

In the framework of the symposium, a competition for the Best Student Poster Award was organized and supported by the SPIE FOCUS Program. Some papers of the winners are included in the volume.

The traditional specific feature of Saratov Fall Meetings is the Internet Session and one-day online discussion. In 2019, this Internet Session included 2 plenary lectures, 18 invited lectures, and 22 reports. The papers by the participants from United States, Canada, Russian Federation, Germany, France, Finland, Poland, Bulgaria, Israel, India, China, Taiwan etc., located at the meeting website: <http://sfm.eventry.org/IB19/preliminary>, were available during the meeting and will be available for a whole year till the next meeting.

This is a great pleasure and privilege for editors to thank all of the authors for their contributions to the symposium, especially to the plenary, invited, and Internet lecturers for their exciting presentations.

The organizers of SFM19 are grateful to all the sponsoring organizations and programs that efficiently supported this meeting, especially: Saratov State University (Russian Federation); Research Center of Biotechnology of the Russian Academy of Sciences (Russian Federation); SPIE – The International Society for Optical Engineering; The Optical Society; LLC SPE "Nanostructured Glass Technology" (Russian Federation); RME "INJECT" LLC (Russian Federation); AVESTA, Ltd. (Russian Federation); art photonics GmbH (Germany); and Becker & Hickl GmbH (Germany).

**Elina A. Genina**  
**Valery V. Tuchin**

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Saratov State University (Russian Federation) and  
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