

Dedicated to
Britton Chance memory



"Britton Chance lived a storied life. Eight decades of this life were unceasingly devoted to scientific research innovation, and technological invention and application. Those who came to the Johnson Foundation and were drawn by Britton Chance to share his passions had their lives changed."

Les Dutton

Director,
The Johnson Research Foundation
University of Pennsylvania

<http://www.med.upenn.edu/biocbiop/chance/>

<http://optics.sgu.ru/SFM/2011/>



**Saratov State
University
Research-Educational
Institute of Optics &
Biophotonics**

**Saratov Fall Meeting
SFM'11**

**XV International School
for Junior Scientists
and Students on
Optics, Laser Physics &
Biophotonics**

**September 27 - 30, 2011
Saratov, Russia**

Conference Chair

Valery V. Tuchin,
Saratov State University, Institute of
Precision Mechanics and Control RAS

Conference Secretary

Elina A. Genina,
Saratov State University

Workshops:

- Optical Technologies in Biophysics & Medicine XIII
- Coherent Optics of Ordered and Random Media XII
- Laser Physics and Photonics XIII
- Spectroscopy and Molecular Modeling XII
- Modern Optics X
- Electromagnetics of Microwaves, Submillimeter & Optical Waves XI
- English as a Communicative Tool in the Scientific Community X
- Workshop on Management of High Technologies Commercialization and Regional Innovation Systems VIII
- Luminescence VII
- Nanobiophotonics VII
- Nonlinear Dynamics II
- Internet Biophotonics IV
- Microscopic and Low-Coherence Methods in Biomedical and Non-Biomedical Applications IV
- History, Methodology and Philosophy of the Optical Education IV
- Telemedicine VI
- Low-Dimensional Structures I

Special events:

Special session dedicated to memory of Britton Chance

Co-chairs:

Valery V. Tuchin, Saratov State University, Institute of Precision Mechanics and Control RAS

Igor V. Meglinsky University of Otago (New Zealand), Saratov State University

SPIE/OSA SHORT COURSE SESSION

Optical Coherence Tomography: Imaging and Sensing of Tissues and Cells

Kirill V. Larin,
University of Houston (USA)

Nonlinear Morphofunctional Imaging of Tissues

Francesco Pavone,
European Laboratory for Nonlinear Spectroscopy, Italy

Presentation of P4L Saratov Medical Cluster of Photonics4Life Consortium of EC FP7: Network of Excellence for Biophotonics

Special Internet Session of European Network of Excellence for Biophotonics, WP 5: Software for Modeling and Data Analysis in Biophotonics

Special session on student reports awarded by the Russian Foundation

on Innovations U.M.N.I.K. in Optics, Laser Physics, and Biophotonics

Organized by

Saratov State University named after N.G. Chernyshevsky

Institute of Precision Mechanics and Control, Russian Academy of Sciences

Research-Educational Institute of Optics and Biophotonics at Saratov State University

Research-Educational Center of Nonlinear Dynamics & Biophysics (REC-006) of CRDF and Ministry of Education and Science of RF

International Research-Educational Center of Optical Technologies for Industry and Medicine "Photonics" at Saratov State University

Volga Region Center of New Information Technologies

Biomedical Photonics Committee of Chinese Optical Society

Saratov State Medical University

SPIE Student Chapter

OSA Student Chapter

In cooperation with

Academy of Natural Sciences, Saratov Regional Division

Russian Society for Photobiology
Saratov Science Center of the Russian Academy of Sciences

Photonics4Life Consortium of EC FP7:
Network of Excellence for Biophotonics

Wiley-VCH Verlag GmbH

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Russian Academy of Sciences

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SPIE – The International Society of Photo-Optical Instrumentation Engineers

SPE "Nanostructured Glass Technology" Ltd., Saratov

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Saratov State University

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Saratov State Technical University

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Precision Mechanics and Control RAS

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Yulia S. Skibina,
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"Nanostructured Glass Technology" Ltd.

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Saratov State University, Institute of
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Dmitry A. Zimnyakov,
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Institute of Precision Mechanics and
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Saratov State University

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Georgy V. Simonenko,
Saratov State University

Mikhail M. Stolnitz,

Saratov State University

Alexey V. Shabunin,
Saratov State University

Andrey V. Slepnev,
Saratov State University

The main goal of the School and the Workshops is to involve junior researchers and students in the field of recent developments and applications of laser and optical technologies in medicine and biology, coherent optics of random and ordered media, material and environmental sciences, nonlinear dynamics of laser systems, laser spectroscopy and molecular modeling. The main attention will be paid to discussion of fundamentals and general approaches of description of coherent, low-coherent, polarized, spatially and temporally modulated light interactions with inhomogeneous scattering media, photonic crystals, tissue phantoms, and various types of tissues *in vitro* and *in vivo*. Such effects as static and dynamic light scattering, Doppler effect, optoacoustic and optothermal interactions, mechanical stress, photodynamic effect, etc will be 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 tissue media will be presented.

SFM-11 will be organized as the morning

plenary sessions, afternoon lecture and oral sessions and evening poster presentations. The original oral reports and posters will be presented by the junior scientists and students. Plenary lectures will be presented by well-recognized experts in the field.

Last year plenary speakers:

Igor S. Nefedov, Aalto University, School of Science and Technology, Department of Radio Science and Engineering, Finland: *Electrodynamic waves in periodic arrays of carbon nanotubes*

Steven L Jacques, Oregon Health & Science University, Portland, Oregon, USA: *How fractal is optical scattering by biological tissues?*

Johannes F. de Boer, Vrije Universiteit, Amsterdam, the Netherlands, and MGH, USA: *Optical coherence tomography in medicine*

Last year SPIE/OSA short courses:

Steven L. Jacques, Oregon Health & Science University (USA): *Tissue Optics*

Johannes F. de Boer, Vrije Universiteit (The Netherlands) and Massachusetts General Hospital (USA): *OCT*,

Polarization and Dynamic Light Scattering Techniques in Biophotonics

The specificity of Saratov Fall Meetings is one-day Internet session. In **2010** such presentations have included plenary lectures made by

Jennifer Barton, The University of Arizona, USA: *Optical imaging for the study and early detection of cancer*

Lihong V. Wang, Washington University in St. Louis, USA: *Photoacoustic tomography: breaking through the optical diffusion limit*

Dennis L. Matthews, School of Medicine, NSF Center for Biophotonics, Cancer Center, UC Davis and LLNL, USA: *Biophotonics opportunities and challenges in point-of-care medicine*

Francesco Pavone, European Laboratory for Nonlinear Spectroscopy and Department of Physics, Italy: *Nonlinear morphofunctional imaging of tissues*

Frank Lievens, International Society for Telemedicine & eHealth, Switzerland & Med-e-Tel, Belgium and

Malina Mitkova Jordanova, Space and Solar-Terrestrial Influences Institute, Bulgarian Academy of Sciences & Med-e-Tel, Sofia, Bulgaria: *Global networking*

*in eHealth one event – one society:
Linking eHealth professionals worldwide*

Participants from 24 countries have located their papers on the meeting website: <http://optics.sgu.ru/SFM/>. Among invited Internet lecturers were well recognized experts in the fields of biomedical optics and light scattering.

Official languages of the School and the Workshops are English and Russian, translation will be provided.

The Conference fee

For foreign participants the conference fee is US \$ 200 (includes Program, two short-courses, Welcome Party, Barbecue, Volga-river voyage, and light refreshments), may be paid during the Meeting or transferred to the account number for request.

For Russian participants the Conference fee will depend on financial support from the Russian Foundation of Basic Research and other sponsors.

Lodging

Hotel "Slovakia" ashore the Volga river (US \$ 70-100 per night for single or double room)

<http://slovakia.all-hotels.ru/>

Hotel "Volga" in downtown (US \$ 70-100 per night for single or

double room).

Western style mini-hotel Bogemia (from US \$ 85 per night for single room)

<http://www.bohemiahotel.ru>

mail@bohemiahotel.ru

Student hostel "Volna" (around US \$ 30 per night)

Culture program

Visits to Conservatoire, Theaters, and Museums, 4-hour Volga-tour.

Registration

Electronic registration before **August 15, 2011**, at <http://optics.sgu.ru/SFM/> is required.

Submission of Abstracts

Each author is requested to submit a one-page abstract. Abstract must be uploaded to the Conference website <http://optics.sgu.ru/SFM/> before **August 15, 2011**.

Proceedings

Conference papers will be published as SPIE Proceedings (CD, SPIE Digital Library), Conference Proceedings (in Russian and English) under the title "Optical Physics and Biophotonics" and in Russian and International peer-

reviewed journals: J. of Biophotonics, Journal of Innovative Optical Health Sciences, Quantum Electronics (Russian/English), Applied Nonlinear Dynamics (Russian/English), Laser Physics (English), and Optics and Spectroscopy (Russian/English).

All papers will be subjected to the normal refereeing process for the journals. Manuscripts of papers should be submitted not later than **September 30, 2011**, the last day of the Conference.

Visa application support

To apply for visa to Russian Consulate you need an official invitation letter. Procedure for letter preparation takes two months; the following information about you and accompany persons are needed:

1. Passport number: _____
dates of issue: ___ and of expiry: _____
(copy of passport page with photo)
2. Date of birth: ____, place of birth: __
3. Living address: _____
4. Working position: _____
5. Working address: _____

Please, send this information to secretary of the SFM-11

Elina A. Genina: eagenina@yandex.ru
eagenina@optics.sgu.ru

Important deadlines

**Visa application support –
information for official invitation
letter, before
June 30, 2011**

**Submission of Abstracts – before
August 15, 2011**

**Registration – before
August 15, 2011**

**Hotel reservation – before
August 15, 2011**

**Conference fee –
September 27, 2011**

**Manuscripts submission – before
September 30, 2011**

SFM-11 webpage:

<http://optics.sgu.ru/SFM/>

We are expecting that collaborating groups from FSU and Western Countries Institutions supported by International Programs such as CRDF, INTAS, FP7, ISTC, Royal Society and others will present their papers.

On behalf of the Organizing Committee of SFM'11 I have a pleasure in inviting you to attend this Meeting

Valery V. Tuchin

Workshop: **Optical Technologies in Biophysics & Medicine XIII**

Chair

Valery V. Tuchin,
Saratov State University, Institute of
Precision Mechanics and Control RAS

Secretary

Elina A. Genina,
Saratov State University

International Program Committee

Victor N. Bagratashvili, Inst. of Laser
and Information Technologies RAN
(Russia); **Alexey N. Bashkatov**,
Saratov State Univ. (Russia); **Wei
Chen**, Univ. of Central Oklahoma (USA);
Kishan Dholakia, Univ. of St. Andrews
(UK); **Paul M.W. French**, Imperial
College of Sci., Technol. and Med. (UK);
James G. Fujimoto, MIT (USA);
Steven L. Jacques, Oregon Health
Sciences Univ. (USA); **Sean J.
Kirkpatrick**, Michigan Technological
Univ. (USA); **Kirill V. Larin**,
Univ. of Houston (USA), Saratov State
Univ.; **Juergen Lademann**, Humboldt
University (Germany); **Martin Leahy**,

National Univ. of Ireland, Galway;
Qingming Luo, Huazhong Univ. of
Sci. and Technol. (China); **Igor V.
Meglinsky**, Univ. of Otago (New
Zealand), Saratov State Univ.
(Russia); **Risto Myllyla**, Univ. of Oulu
(Finland); **Theodore G. Papazoglou**,
FORTH-IESL (Greece); **Juergen
Popp**, Inst. of Photonic Technology,
Jena (Germany); **Alexander V.
Priezzhev**, Moscow State Univ.
(Russia); **Lihong Wang**, Washington
Univ. in St. Louis (USA); **Ruikang K.
Wang**, Univ. of Washington (USA);
Dan Zhu, Huazhong Univ. of Sci. and
Technol. (China)

The main goal of the Workshop is to
involve junior researches and
students in the field of recent
developments and applications of
laser and optical technologies in
medicine and biology. The main
attention will be paid to discussion of
fundamentals and general approaches
of description of coherent, low-
coherent, polarized, spatially and
temporally modulated light interaction
with inhomogeneous absorbing
media, tissue phantoms, and various
types of tissues *in vitro* and *in vivo*.
Such effects as static and dynamic
light scattering, Doppler effect,
photoacoustic and photothermal
interactions, mechanical stress,
photodynamic effect, etc will be
considered. On this basis the variety

of laser and optical technologies for
medical diagnostics, therapy, surgery,
and light dosimetry will be analyzed.
Lasers and optical techniques for
cardiology, dermatology, ophthalmology,
gynecology, dentistry and other fields of
medicine will be presented. Light
scattering and photochemical techniques
in cell biology and microbiology will be
discussed.

We are expecting about 60 lectures
highlighting current research and recent
progress in the field, which will be done
by well-known experts, 70-75 original
oral reports and posters from junior
researchers, post-docs and PhD
students.

Topics

The education and scientific program will
include but is not restricted to the
following topic areas:

- Photon migration in tissues
- Diffusion wave and correlation
spectroscopy of tissues
- Spectrophotometry, fluorescence
and Raman spectroscopy of
tissues
- Static and dynamic light scattering
in tissues
- Coherent optical methods for
medical diagnostics
- Cell and tissue coherent

microscopy

- Optical diffusion and coherent medical topography and tomography
- Laser Doppler measuring systems for medicine and biology
- Full field speckle-correlation biomedical techniques
- Optical techniques of biovibrations measurements
- Optical polarimetric methods for study of tissues and cell structures
- Photothermal and Photoacoustic methods for tissue diagnostics
- Optical biopsy
- Optical microelastography of tissues
- Osmotic effects and optical monitoring of matter diffusion in tissues
- Tissue and blood optical clearing
- Optical glucose sensing
- Laser and optical technologies in microbiology
- Tissue phantoms designing
- Photochemical, photothermal and photobiological effects, mechanisms of phototherapy
- High energy laser interactions with cells and tissues, laser surgery techniques

- Lasers and optical technologies in dermatology, ophthalmology, gynecology, cardiology, dentistry, etc
- Microchannel and photonic crystal technologies in biology and medicine
- Biosensors

Workshop: Internet Biophotonics IV

Chair

Valery V. Tuchin,

Saratov State University, Institute of Precision Mechanics and Control RAS

Secretary

Ivan V. Fedosov,

Saratov State University

International Program Committee

Gert von Bally, University of Münster (Germany), **Alexey N. Bashkatov,** SSU (Russia); **Wei Chen,** Univ. of Central Oklahoma (USA); **Cornelia Denz,**

University of Münster (Germany); **Kishan Dholakia,** Univ. of St. Andrews (UK); **Paul M.W. French,** Imperial College of Science, Technology and Medicine (UK); **Kirill V. Larin,**

University of Houston (USA), Saratov State University; **Martin Leahy,** National Univ. of Ireland, Galway;

Qingming Luo, Huazhong Univ. of Science and Technology (China); **Igor V. Meglinsky,** Univ. of Otago (New Zealand), SSU (Russia); **Roberto Pini,**

Istituto di Fisica Applicata, Sesto Fiorentino (Italy); **Juergen Popp,**

Institute of Photonic Technology, Jena

(Germany); **Alexander V.**

Priezzhev, Moscow State Univ.

(Russia); **Katarina Svanberg,** Lund Univ. Medical Laser Centre (Sweden);

Hugo Thienpont, Vrije Univ. Brussel (Belgium); **Lihong Wang,**

Washington Univ. in St. Louis (USA);

Ruikang K. Wang, Univ. of Washington (USA)

The main goal of the Workshop is to involve international community of junior researchers and students in the field of recent developments of biophotonics via distant learning provided by the Internet facilities. SFM has a prolonged experience in organizing of Internet sessions during last 14 years. In 2010 such presentations have included plenary lectures made by

Jennifer Barton, The University of Arizona, USA: *Optical imaging for the study and early detection of cancer*

Lihong V. Wang, Washington University in St. Louis, USA: *Photoacoustic tomography: breaking through the optical diffusion limit*

Dennis L. Matthews, School of Medicine, NSF Center for Biophotonics, Cancer Center, UC Davis and LLNL, USA: *Biophotonics opportunities and challenges in point-of-care medicine*

Francesco Pavone, European Laboratory for Nonlinear Spectroscopy and Department of Physics, Italy: *Nonlinear morphofunctional imaging of tissues*

Frank Lievens, International Society for Telemedicine & eHealth, Switzerland & Med-e-Tel, Belgium and

Malina Mitkova Jordanova, Space and Solar-Terrestrial Influences Institute, Bulgarian Academy of Sciences & Med-e-Tel, Sofia, Bulgaria: *Global networking in eHealth one event – one society: Linking eHealth professionals worldwide*

Participants from 24 countries have located their papers on the meeting website: <http://optics.sgu.ru/SFM/>.

In 2011 we are expecting 3-4 Internet Plenary lectures, 20-30 Internet invited lectures highlighting current research and recent progress in Biophotonics, which will be done by well-known experts, 30-40 Internet reports from junior researchers, post-docs and PhD students all over the world.

Topics

The education and scientific program will include but is not restricted to the following topic areas:

- New photonic technologies for the

analysis of cell and tissue
processes

- Photonics for non- and minimally-invasive diagnosis and therapy
- Nanobiophotonics
- Optical micromanipulation of cells and particles
- Biosensors
- Modeling and data analysis in Biophotonics
- Clinical applications



Special Internet Session of European Network of Excellence for Biophotonics

WP 5: Software for Modeling and Data Analysis in Biophotonics II

Co-Chairs

Valery V. Tuchin,

Saratov State Univ., Inst. of Precision Mechanics and Control RAS (Russia)

Mark Neil,

Imperial College London, UK

Secretary

Alexey N. Bashkatov, Saratov State Univ. (Russia)

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Yurii A. Avetisyan, Inst. of Precision Mechanics and Control RAS (Russia);

Kishan Dholakia, Univ. of St. Andrews

(UK); **Paul M.W. French,** Imperial College of Sci., Technol. and Medicine (UK); **Olga E. Glukhova,** Saratov State Univ. (Russia); **Irina L. Maksimova,** Saratov State Univ. (Russia); **Juergen Popp,** Institute of Photonic Technology, Jena (Germany); **Hugo Thienpont,** Vrije Univ. Brussel (Belgium); **Alexander N. Yakunin,** Institute of Precision Mechanics and Control RAS (Russia)

The main goal of the Internet Session is to involve Photonics4life members of EC Consortium, their partners and International community of junior researches and students in the field of recent developments of software for modeling and data analysis in biophotonics via distant learning Internet facilities.

We are expecting 5 Internet Invited lectures from IPHT, VUB, USTAN, IMPERIAL, and SSU, highlighting current research and recent progress in software designed for Biophotonics, which will be done by world-recognized experts from P4L Consortium, 10-20 Internet reports from junior researchers, post-docs and PhD students of P4L and all over the world.

Topics

- Multi-parameter, multi-dimensional or multi-modal data

analysis

- Parallel processing – hardware and software
- Data management (Omero – Open Microscopy environment)
- Optical modeling (stochastic, predictive and inverse problem solutions)
- Artificial neural networks
- Robust and precise registration techniques, 4-5D
- Segmentation and pattern recognition
- Image mosaicing and stitching
- Finite element time- and frequency-domain techniques
- Monte Carlo modelling
- Algorithms based on Mie theory

VIRTUAL INSTITUTE:

On-line discussion forum

- Well understood and used already by programmers
- Open internally initially and externally later?

Conference papers will be published as SPIE Proceedings (SPIE Digital Library), and International peer-reviewed journals: *J. of Biophotonics* and *J. of Innovative Optical Health Sciences*.

All papers will be subjected to the normal refereeing process for the journals.

Workshop: **Nanobiophotonics VII**

Chair

Nikolai G. Khlebtsov,
Institute of Biochemistry and Physiology
of Plants and Microorganisms of RAS,
Saratov State University

Secretaries

Lev A. Dykman,
Institute of Biochemistry and Physiology
of Plants and Microorganisms of RAS,
Saratov State University

Boris N. Khlebtsov,
Institute of Biochemistry and Physiology
of Plants and Microorganisms of RAS,
Saratov State University

The term “nanotechnology” designates a new field of science and technology that operates with structures possessing characteristic sizes about of one billion part of meter. During last years, a new branch of the nanotechnology has been created. It is the so-called “nanobiotechnology” that uses biomolecular structures and processes to produce new functional materials for applications in biosensorics, bioelectronics, and biomedicine.

The Workshop is aimed at discussion of

basic and applied problems related to the fabrication and application of various nanostructures and nanoparticles (NPs). It is expected that the Workshop will be a multitopical forum involving experts of different scientific fields. The workshop program will include the following **topics**:

- Fabrication of plasmon-resonant NPs and nanostructures
- Composite nanostructured materials
- Optical properties of plasmon resonant NPs and nanostructures
- Physicochemical characterization of NPs and nanostructures
- Functionalization of NPs with biospecific macromolecules
- Nanoscale biosensors
- Quantum dots and its application
- Chemical technologies based on nanoparticles
- Cell imaging based on NPs bioconjugates
- Photothermal therapy using plasmon-resonant NPs
- Application of nanoparticles to the targeted drug delivery

Workshop:

Management of High Technologies Commercialization and Regional Innovation Systems VIII

Chair

Valery V. Tuchin,

Saratov State University, Institute of Precision Mechanics and Control RAS

Secretary

Yulia S. Skibina,

Saratov State University, SPE
"Nanostructured Glass Technology" Ltd.

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Gregory B. Altshuler,

Palomar Medical Technologies Inc. (USA)

Robert Breault,

Breault Research Organization, Arizona Optics Industry Association (USA)

Boris Reznik, BioRASI, Inc. (USA)

Natalya V. Romanova,

Saratov State University (Russia)

Sergey N. Sokolov,

INJECT Enterprise (Russia)

Alexander Serov,

Switzerland

Stoyan Tanev,

University of Southern Denmark, Denmark

The workshop program will include the following **topics**:

- High technology's commercialization, innovation management, high technologies and business, technologies of opening of the innovative companies, innovative business, transfer of technologies, financing of innovative activity, management of innovation risks, venture financing, education in the field of management in biophotonics and biotechnologies
- Development and monitoring of branch "road maps" as the base of planning of regional branch clusters and innovation zones.
- Actual priorities of the regional innovation policy
- Experience of IP commercialization and actual problems of Academy of Sciences, high schools, chambers of commerce and regional industrial companies interaction.

- Special session on student reports awarded by the Russian Foundation on Innovations U.M.N.I.K. in Optics, Laser Physics, and Biophotonics will be provided

Workshop:

Microscopic and Low-Coherence Methods in Biomedical and Non-Biomedical Applications II

Chair

Kirill V. Larin,
University of Houston (USA)

Secretary

Georgy G. Akchurin,
Saratov State University

International Program Committee

Shoude Chang,
National Research Council (Canada)

Mary Dickinson,
Baylor College of Medicine (USA)

Christoph K. Hitzenberger,
University of Vienna (Austria)

Igor V. Meglinski,
University of Otago (New Zealand),
Saratov State University (Russia)

Valery V. Tuchin,
Saratov State University (Russia)

Ruikang K. Wang,

Univ. of Washington (USA)

Development of non- or minimally-invasive methods for imaging, monitoring, and quantification of different materials and processes are extremely important for many biomedical (including therapy, diagnostics, management, and advanced imaging of various devastating diseases) and non-biomedical applications (dimensional metrology, material research and non-destructive testing, art diagnostics, botany, microfluidics, data storage, and security applications). This workshop will put emphasis on two aspects of optical imaging: microscopy and low coherence interferometry.

Topics

The education and scientific program will include but is not restricted to the following topic areas:

- Optical microscopy
- Methods of Low Coherence Interferometry
- Optical Coherence Tomography
- Combinations of LCI/OCT with microscopy
- Biomedical applications of optical microscopy and LCI
- Non-biomedical applications of

optical microscopy and LCI

Workshop: **Nonlinear Dynamics II**

Chair

Vadim S. Anishchenko, Saratov State University

Secretaries

Galina I. Strelkova, Saratov State University

Svetlana Yu. Malova, Saratov State University

International Program Committee

Lutz Schimansky-Geier, Jürgen Kurths, Humboldt University, Berlin (Germany); **Alexander Neiman**, Ohio University (USA); **Igor Khovanov**, Warwick University (UK); **Alexander Balanov, Natalia Janson**, Loughborough University (UK); **Olga Sosnovtseva**, University of Copenhagen (Denmark); **Alexander P. Chetverikov, Alexey N. Pavlov, Tatjana E. Vadivasova, Alexey V. Shabunin**, Saratov State University (Russia)

The main goal of the Workshop is to attract young scientists and students to

the discussion of topical problems and results in the field of nonlinear dynamics. The special attention will be given to the review of contemporary achievements in the field of research of dynamics of complex nonlinear systems, both deterministic and stochastic. It is planned to invite some leading experts on nonlinear dynamics for delivering plenary lectures and to present oral and poster contributions of young researchers, PhD students and graduate students.

Topics

The scientific program will include but is not restricted to the following topic areas:

- Nonlinear Dynamics of Deterministic Finite-Dimensional and Distributed Systems
- Stability and Bifurcations
- Synchronization of Complex Processes
- Role of Fluctuations in Nonlinear Dynamics
- Applications of Nonlinear Dynamics Methods in Biology, Physiology, and Medicine

Workshop: **History, Methodology and Philosophy of the Optical Education IV**

Chairs

Vladimir P. Ryabukho,
Saratov State University (Russia)

Boris A. Medvedev,
Saratov State University (Russia)

Secretary

Alexander A. Skaptsov,
Saratov State University (Russia)

International Program Committee

Vladimir L. Derbov,
Saratov State University (Russia)

Alexander V. Priezzhev,
M.V. Lomonosov Moscow State
University (Russia)

Alexander V. Gorokhov,
Samara State University (Russia)

Valery V. Tuchin,
Saratov State University

Alex Vitkin,
University of Toronto (Canada)

The goals of the Workshop are the development of the optical education, the actualization of the interdisciplinary investigation using optical conceptions and tools, the expansion of European educational field of optical physics and biophysics and the increase of creative resources and potential of bachelor, master's degree, post-graduate training in Optics and Biophotonics.

Topics

There are five main discussing topics. History of discoveries in optics:

- Founders of optical physics.
- History of optical scientific schools.
- Optical discoveries on chronicles of the world culture.
- Historical aspects of optical investigations for life science.

Methodology problems of the optical education:

- Lecture demonstrations of optics.
- University optical training.
- Methodology of teaching optics in the general course of physics at a natural-science department.
- Principles of optical

mathematical simulation.

Teaching optics in the light of the interdisciplinary education and scientific knowledge integration:

- Problems of teaching optics at medical colleges and universities.
- Optical physics in the course "The modern natural scientific conception" at humanitarian departments.
- Minimum program of biology, biophysics, biochemistry, and biomedicine for student specialized in optics.

Master class: Optics of the twenty-first century. Elite lectures.

Round table: We and light. Philosophy problems of wave and quantum treatment of light nature.

Workshop: **Low-Dimensional Structures I**

Chair

Olga E. Glukhova,
Saratov State University, Saratov,
Russia

Secretaries

Anna S. Kolesnikova,
Saratov State University, Saratov,
Russia

Michael M. Slepchenkov,
Saratov State University, Saratov,
Russia

International Program Committee

Ming-Fa Lin,
National Cheng Kung University, Tainan,
Taiwan

Irina V. Zaporotskova,
Volgograd State University, Volgograd,
Russia

Gennadiy V. Torgashov,
Institute of Radioengineering and
Electronics (IRE) of RAS, Saratov,
Russia

The theoretical and the experimental methods of the investigation of structure, properties (optical, electronic, etc.) and applications of the low-dimensional structures will be discussed on the workshop. The problem of the biomedical applications of the low-dimensional structures and their using as the biomaterials will be considered in detail. Also the problems of interaction of the low-dimensional structures with the electromagnetic fields will be discussed. It is planned to invite some leading experts on graphene systems for delivering lectures and to present oral and poster contributions of young researchers, PhD students and graduate students.

The workshop program will include the following **topics**:

- Synthesis technology of the low-dimensional structures (nanofilms, nanocoating, nanotubes, nanowires, graphene, fullerenes)
- Atomic cage and properties of the low-dimensional structures and their research methods
- Low-dimensional structures in external fields
- Biomedical and non-biomedical

applications of low-dimensional structures

SPIE/OSA SHORT COURSE SESSION

Optical Coherence Tomography: Imaging and Sensing of Tissues and Cells

Kirill Larin, Ph.D.

Univ. of Houston (USA)



In this short course I will overview recent advances in development and application of Optical Coherence Tomography (OCT) technique for structural and functional imaging and sensing of various transport, developmental, and disease progression in tissues and cells. This course will start with basic description of light-tissue interaction including structural and optical models of tissues with single and multiple scattering. Intensity- and spatially modulated, coherent and polarized light interactions with random and quasi-organized tissues will be considered. It will be shown that light

reflection, transmission, scattering, and state of polarization can be effectively controlled by changes of tissue structure and the refractive index of tissue components. Various medical optical diagnostic and sensing methods and instruments based on CW, time-resolved, and spatially resolved light scattering spectroscopy and tomography, speckle interferometry, confocal, and two-photon microscopy, and polarimetry will be presented. Special emphasis will be devoted to theory and applications of OCT. Applications of these methods and techniques to control tissue and blood optical properties; to sense structure and image human tissues (such as skin, eye tissues, the body's interior tissues, the cerebral membrane, bone, cartilage, and tendon) will be discussed. Additionally, this course will overview OCT-based methods for noninvasive monitoring of drug diffusion and optical clearing, sensing and quantifying of microbubbles and nanoparticles in tissues and blood, early diagnostics of arteriosclerosis, and imaging of early embryonic cardiovascular system development.

Biography

Speaker: Kirill V. Larin is the Associate Professor of Biomedical Engineering at the University of

Houston. He also holds joint appointments at the Department of Physiology and Biophysics at Baylor College of Medicine and Department of Optics and Biophysics at the Saratov State University (SSU) in Russia. Larin received his first M.S. in Laser Physics and Mathematics from the SSU (1995), his second M.S. in Cellular Physiology and Molecular Biophysics (2001) and Ph.D. in Biomedical Engineering (2002) from the University of Texas Medical Branch in Galveston. His research contributions are in Biomedical Optics and Biophotonics and development and application of various optical methods for noninvasive and nondestructive imaging and diagnostics of tissues and cells. Larin has authored more than 50 peer-reviewed publications and chapters in four textbooks on Biomedical Optics. He is the recipient of Presidential Award from Russian President Boris Yeltsin. He has also received Wallace Coulter Young Investigator Translation Award, Office of Naval Research Young Investigator Award, Outstanding Young Investigator Award from the Houston Society for Engineers in Medicine and Biology, and Herbert Allen Award from American Society for Mechanical Engineers. Larin currently serves as an Instructor for short courses on Tissue Optics for the Optical Society of America.