Saratov State University

Research-Educational Institute of Optics & Biophotonics

Saratov Fall Meeting SFM'14 - Symposium

Optics and Biophotonics -II

September 23 - 26, 2014
Saratov, Russia

General Chair

Valery V. Tuchin,
Saratov State University, Institute of Precise Mechanics and Control RAS, Russia; University of Oulu, Finland

General Secretary

Elina A. Genina,
Saratov State University

Conferences:

- Optical Technologies in Biophysics & Medicine XVI (*E.A. Genina, I.V. Meglinski, V.V. Tuchin*)
- Laser Physics and Photonics XVI (*V.L. Derbov*)
- Spectroscopy and Molecular Modeling XV (*L.M. Babkov, V.I. Berezin, K.V. Berezin*)
- Electromagnetics of Microwaves, Submillimeter & Optical Waves XIII (*M.V. Davidovich*)
- Nanobiophotonics X (*N.G. Khlebtsov*)
- Internet Biophotonics VII (*A.N. Bashkatov, I.V. Fedosov, V.V. Tuchin*)
- Microscopic and Low-Coherence Methods in Biomedical and Non-Biomedical Applications VII (*K.V. Larin*)
- Nonlinear Dynamics V (*V.S. Anishchenko*)
- Low-dimensional structures IV (*O.E. Glukhova*)
- Biomedical Spectroscopy (*V.I. Kochubey & A.B. Pravdin*)
- Computational Biophysics and Analysis of Biomedical Data (*D.E. Postnov*)
- Advanced Polarization Technologies in Biomedicine and Material Science (*I.V. Meglinski, D.A. Zimnyakov*)

Co-located with:

XVIII International School for Junior Scientists and Students on Optics, Laser Physics & Biophotonics (Saratov Fall Meeting SFM'14-School, September 22 - 26, 2014)

SPIE/OSA SHORT COURSE SESSION

OSA SC:
Towards deep tissue luminescence imaging using upconverting nanoparticles
Stefan Andersson-Engels,
Lund University, Sweden

SPIE SC:
Skin spectra and colour calculator: on-line object oriented GPU accelerated Monte Carlo tool
Igor V. Meglinski,
University of Otago, New Zealand, Saratov State University, Russia

Foundation "Dynasty" Short Course:

The spectroscopy, surface modification and bio/medical applications of nanodiamond
Chia-Liang Cheng,
National Dong Hwa University, Taiwan

Plenary speakers 2014!

Prospective Studies to Determine the Carotenoid Status in Human Skin
Jürgen Lademann,
Center of Experimental and Applied Cutaneous Physiology at the Charite Univ. Clinic, Berlin, Germany

Recent Developments on Nanodiamond for Bio/medical applications
Chia-Liang Cheng,
National Dong Hwa University, Taiwan

Deep tissue imaging using Nd-codoped upconverting nanoparticles and pulsed excitation
Stefan Andersson-Engels,
Lund University, Sweden

Optical Coherence Elastography — methods and applications
Kirill V. Larin,
University of Houston (USA), Saratov State University

When nanotechnology meets microbiology
Aleš Lapanje,
Institute of Metagenomics and Microbial Technologies, Slovenija

Polarized light propagation in turbid media
Igor V. Meglinski,
University of Otago, New Zealand, Saratov State University

Structural and functional imaging with a microscope-in-a-needle for medicine and biology
David D. Sampson,
Optical + Biomedical Engineering Laboratory, School of Electrical, Electronic, and Computer Engineering, Centre for Microscopy, Characterisation and Analysis, University of Western Australia (**IEEE lecturer**)

Internet plenary speakers

Chromophore based analyses of steady-state diffuse reflectance spectroscopy: current status and perspectives for clinical adoption
Henricus J. C. M. Sterenborg,
Department of Biomedical Engineering and Physics, Academic Medical Center – Amsterdam, The Netherlands

Multiphoton tomography of human skin
Karsten König,
JenLab GmbH, Jena, Department of Biophotonics and Laser Technology, Saarland University, Saarbrücken, Germany

ED-e-TEL: Perspectives
Malina Jordanova,
MD, PhD. Solar-Terrestrial Influences Laboratory. Bulgarian Academy of Sciences, Bulgaria

Organized by

N.G. Chernyshevsky Saratov State University

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

Institute of Biochemistry and Physiology of Plants and Microorganisms, Russian Academy of Sciences, Saratov State University

Institute of Precise Mechanics and Control, Russian Academy of Sciences

Saratov State Medical University n.a. V.I. Razumovsky

Yuri Gagarin State Technical University of Saratov

Volga Region Center of New Information Technologies at Saratov State University

Biomedical Photonics Committee of Chinese Optical Society

University of Oulu, Finland

SPIE Student Chapter

OSA Student Chapter

Saratov/Penza IEEE 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

The Biophotonics4Life Worldwide Consortium (BP4L) and BiophotonicsWorld.org

Co-sponsored by

RFBR – Russian Foundation for Basic Research

RAS – Russian Academy of Sciences

SPIE – The International Society of Photo-Optical Instrumentation Engineers

OSA – Optical Society of America

IEEE - Institute of Electrical and Electronics Engineers

LLC SPE Nanostructed Glass Technology, Saratov

Russian Technology Platform "The Medicine of the Future"

Russian Technology Platform "Photonics"

Government of the Russian Federation (grant №14.Z50.31.0004 to support scientific research projects implemented under the supervision of leading scientists at Russian institutions and Russian institutions of higher education)

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Alexander B. Pravdin,
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Alexander Priezzhev,
International Laser Center, Moscow State University

Alexander M. Sergeev,
Institute of Applied Physics RAS

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Dmitry N. Agafonov
Ivan V. Fedosov

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Alexey V. Shabunin
Andrey V. Slepnev
Maxim A. Kurochkin

The main goal of the Symposium is to present and discuss recent developments and applications of optical and laser technologies in medicine and biology, precise mechanics and control of tissues and cells, coherent optics of random and ordered media, material and environmental sciences, nonlinear dynamics of laser systems, laser physics, spectroscopy and molecular modeling. Fundamental problems of photonics, quantum optics and ultrafast optical techniques will be discussed. The main attention will be paid to discussion of basic research of interactions of coherent, low-coherent, polarized, spatially- and temporally-modulated electromagnetic radiation within the broad wavelength range from x-rays to terahertz with inhomogeneous scattering media and biological tissues and cells. Elastic, inelastic and dynamic light scattering, Doppler effect, photoacoustic, photothermal and nonlinear effects and interactions, mechanical stresses, and photobiological effects 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 diagnostics and imaging of random and ordered media will be presented. Studies on lasers, fibers, and photonic crystal waveguides will be discussed.

Last year plenary lectures:

Imaging Deep Tissue in Three Dimensions by Near Infrared Imaging,

Martin Wolf,
University Hospital Zurich, Switzerland

Assessing Corneal and Soft Tissue Biomechanical Properties using Optical Coherence Elastography,
Kirill V. Larin,
University of Houston, USA

Optical Biopsy with Complex Structured Light,
Igor Meglinski,
University of Otago, New Zealand

Silicon Nanoparticles for Sensitive Fluorescence Analysis in Living Cells and Drug Delivery Carried out by Multi Departmental and Institutional Collaborations,
Munir H. Nayfeh,
Department of Physics, University of Illinois at Urbana-Champaign, USA

Analytical and Theranostic Applications of Plasmonic Nanoparticles and Multifunctional Nanocomposites,
Nikolai G. Khlebtsov,
Institute of Biochemistry and Physiology of Plants and Microorganisms, Russian Academy of Sciences, Saratov State University, Russia

Terahertz Fingerprints in Biology and Technology,
Alexander Shkurinov,
M.V. Lomonosov Moscow State University, Russia

From Organic Chromophores to Plasmonic Nanoparticles for Photothermal Therapies and Laser-activated Drug Release,
Roberto Pini,
National Reserch Council of Italy and University of Florence, Italy

Green, Compact Diode Laser-based Systems for Biophotonics Application,
Peter E. Andersen,
Technical University of Denmark, Denmark

Collapsing Field Domains in Electron-Hole Plasma of GaAs, and Examples of the Phenomenon Application from Superfast Voltage Switch to sub-THz Imaging,
Sergey N. Vainshtein,
University of Oulu, Finland

Last year Internet plenary lectures

Shaped Light for Biophotonics,
Kishan Dholakia,
University of St. Andrews, UK

Origin of Optical Pulse and Non-Invasive Measurement of Hemoglobin,
Ilya Fine,
Elfi Tech Ltd., Science Park, Israel

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

The Conference fee

For foreign participants the conference fee is $ 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

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

Hotel “Volga” in the downtown

Western style mini-hotel Bohemia in the downtown

http://www.bohemiahotel.ru

mail@bohemiahotel.ru

Student hostel “Volna” ashore the Volga river

Student hostel of SSU

Culture program

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

Registration

Electronic registration before **August 15, 2014**, at http://sfm.eventry.org/symposium2014/ is required.

Submission of Abstracts

Each author is requested to submit a one-page abstract. Abstract must be uploaded to the Conference website http://sfm.eventry.org/symposium2014/ before **August 15, 2014**.

Proceedings

Conference papers will be published as Conference Proceedings (in Russian and English) under the title "Optical Physics and Biophotonics" and International peer-reviewed journals: *J. of Innovative Optical Health Sciences (English)*, *Quantum Electronics (Russian/English)*, *Applied Nonlinear Dynamics (Russian/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 **October 15, 2014**.

The Publication fee

Conference papers will be published as SPIE Proceedings (CD, SPIE Digital Library, Scopus, Web of Science), if a sufficient number of submissions (about 50) will be provided. The publication fee of $36 should be paid for each accepted paper.

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 is needed:

1. Passport (valid up to six months after September 27, 2014) 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 general secretary of the SFM-14

Elina A. Genina: eagenina@yandex.ru

Important deadlines

Visa application support – information for official invitation letter, before May 31, 2014

Submission of Abstracts – before August 15, 2014

Registration – before August 15, 2014

Hotel reservation – before August 15, 2014

Conference fee – before September 22, 2014

Manuscripts submission – before October 15, 2014

SFM-14 webpage: http://sfm.eventry.org/symposium2014/

On behalf of the Organizing Committee of SFM'14-Symposium I have a pleasure in inviting you to attend this Meeting

Valery V. Tuchin

Conference:
Optical Technologies in Biophysics & Medicine XVI

Chairs

Elina A. Genina,
Saratov State University

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

Valery V. Tuchin,
Saratov State University, Institute of Precise Mechanics and Control RAS, Russia; University of Oulu, Finland

Secretary

Polina A. Timoshina
Saratov State University

International Program Committee

Victor N. Bagratashvili, Inst. of Laser and Information Technologies RAN (Russia); **Alexey N. Bashkatov**, Saratov State Univ. (Russia); **Alexander V. Bykov**, Univ. of Oulu (Finland); **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); **Risto Myllyla**, Univ. of Oulu (Finland); **Maria Farsari**, FORTH-IESL (Greece); **Alexey P. Popov**, Univ. of Oulu (Finland); **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 Conference is to present and discuss recent developments and applications of laser and optical technologies in medicine and biology. The main attention will be paid to discussion of basic research and applications 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 phenomena, as elastic, inelastic and dynamic light scattering, Doppler effect, nonlinear effects, photoacoustic and photothermal interactions, mechanical stresses, photobiological effects, 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.

Topics:

- 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

Conference: Laser Physics and Photonics XVI

Chairs

Vladimir L. Derbov, Saratov State University (Russia)

Secretary

Andrei I. Konukhov

Saratov State University (Russia)

International Program Committee

Vladimir L. Derbov (Chair) (SSU, Saratov, Russia)

Alexander P. Kuznetsov (Saratov Division of IRE of RAS, Saratov, Russia)

Leonid A. Melnikov (SSTU, Saratov, Russia)

Marian Marciniak (National Institute of Telecommunications, Poland)

Igor S. Nefedov (Aalto University, Helsinki, Finland)

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Alexander V. Gorokhov, (Samara State University, Samara, Russia)

Valery V. Tuchin (SSU, IPM&C RAS, Saratov, Russia)

Sergue I. Vinitsky (JINR, Dubna, Russia)

The main goal of the Conference is to involve junior researches and students in the field of recent developments and applications of laser physics and photonics. The main attention will be paid to discussion of the physical processes underlying the laser operation, new developments in laser design and applications, as well as the quantum and coherent properties of light and a wide scope of light-matter interaction problems, including both microscopic and macroscopic effects. Physics and technology of optical fibers and networks, photonic band-gap structures, optoelectronic and acoustooptical devices will be discussed.

Topics

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

- Physical processes in lasers, dynamics of laser systems
- Optical waveguides, fiber optics, optical networks
- Photonic band-gap structures
- Laser beam and pulse propagation, ultrafast optics
- Interaction of laser radiation with matter, nonlinear optics
- Quantum optics, photon statistics
- Acoustooptics
- Optoelectronics
- Photonics of low-dimensional structures
- Laser spectroscopy
- Coherence and holography

The preliminary list of sessions:

- Nonlinear dynamics in lasers and optical systems.
- Optical coherence and holography
- Nonlinear beam and pulse propagation, ultrafast optics
- New trends in computer modeling of lasers and optical systems
- Atom and quantum optics, optical devices for quantum computing,

photonics of exotic quantum systems

- Laser physics and applications
- Nonlinear optics
- Dynamics of atoms, molecules and quantum-dimensional systems in laser fields
- Band-gap structures and optical waveguides

Conference: Spectroscopy and Molecular Modeling XV

Chairs

Lev M. Babkov, **Valentin I. Berezin, Kirill V. Berezin,** Saratov State University (Russia)

Secretary

Galina N. Ten
Saratov State University (Russia)

International Program Committee

Lev M. Babkov,
Saratov State University, Russia

Valentin I. Beresin,
Saratov State University, Russia

Michael D. Elkin
Saratov State Technical University, Russia

Lev A. Gribov,
Institutute named by V.I. Vernadskyi RAS, Moskow, Russia

Dmitry S. Umreiko,
Belarus State University, Minsk, Belarus

Nadezda A. Davydova,
Institute of Physics NAS of Ukraine, Kiev, Ukraine

Tatiana G. Burova,
Saratov State University, Russia

Nikolai V. Burenin,
Institute of Applied Physics RAS, Moscow, Russia

Victor L. Furer,
Kazan Civil Engineer Academy, Kazan, Russia

Alexandr V Gorokhov,
Samara State University, Samara, Russia

We will discuss theoretical and experimental methods of spectroscopy and molecular modeling for study of structure and properties of atomic and molecular systems.

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

- IR spectroscopy
- Raman spectroscopy
- Fluorescence spectroscopy
- Atomic spectroscopy
- Molecular modeling (methodical aspects and applications)

Conference: Electromagnetics of Microwaves, Submillimeter and Optical Waves IX

Chair

Michael V. Davidovich, Saratov**,** Saratov State University (Russia)

Secretaries

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International Program Committee

Alexander I. Nosich, Kharkov Institute of Radio-Engineering and Electronics, NAS Ukraine (Ukraine)

Nikita M. Ryskin, Saratov State University (Russia)

Igor S. Nefedov,
Aalto University, Espoo (Finland)

Georgi N. Georgiev, "Sts. Cyril and Methodius", Veliko Tirnovo, (Bulgaria);

Andrei D. Grigoriev;

St. Petersburg Electrotechnical University LETI (Russia)

Josef Modelsky,

Warsaw University of Technology (Poland)

Dmitry I. Trubetskov, Saratov State University (Russia)

Organizing Committee

Co-Chairs: **Nikita M. Ryskin,** Saratov State University

Vladimir N. Titov, Saratov State University

The main goal the Conference is to discuss the recent developments and applications of laser, optical and electromagnetic technologies in engineering, medicine and biology, material and environmental sciences, nanotechnology, nonlinear dynamics, laser systems, laser spectroscopy and molecular modeling. The main attention will be paid to fundamentals and general approaches of description of nonlinear and nonstationary electromagnetics for optics, biomedicine, active and passive photonics and metamaterials, interactions with nonlinear media, inhomogeneous scattering media, photonic crystals, tissue phantoms, and various types of tissues *in vitro* and *in vivo*. Another trend is the nonlinear dynamic and electronics applications to various engineering and practice problems.

Topics

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

- Antennas and propagation
- General electromagnetic field theory
- Nonstationary electromagnetics, pulse generation and propagation
- Nonlinear electromagnetics and electronics
- Diffraction and scattering of waves
- Resonators, waveguides, transmission line discontinuities and units
- Microwave, millimeter, sub-millimeter and optical wave radio physics and electronics
- Electromagnetic methods in optics
- Electromagnetics in biomedical applications

- Electromagnetics for condensed and artificial media, metamaterials, photonic crystals, left-handed materials
- Nonlinear dynamics
- Sensors and measurements
- Boundary value problems and algorithms

Proceedings

Papers will be published in Conference Proceedings (in Russian and English) under the title **"Problems of Optical Physics and Biophotonics"** and in Saratov IEEE Chapter Proceedings under the title **"Modeling in applied electromagnetics and electronics"** which is the annual issue without additional charge. All papers will be subjected to the normal refereeing process for the journals. Manuscripts of papers to be published should be submitted not later than **November, 2014**.

The papers for **"Modeling in applied electromagnetics and electronics"** must be sent to Prof. Michael V. Davidovich DavidovichMV@info.sgu.ru in doc and pdf formats.

Conference:
Nanobiophotonics X

Chair

Nikolai G. Khlebtsov,
Institute of Biochemistry and Physiology of Plants and Microorganisms, Russian Academy of Sciences, Saratov State University (Russia)

Secretary

Vitaly Khanadeev,
Institute of Biochemistry and Physiology of Plants and Microorganisms, Russian Academy of Sciences (Russia)

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The main goal of the Conference is to present and discuss recent developments and applications of plasmonic nanostructures with controlled geometrical, optical, and surface chemical properties, as well as multifunctional nanocomposites conjugated to various molecular ligands. These topics are the subject of intensive studies and applications in biology and medicine. To date, this field has included genomics and biosensorics, immunoassays and clinical chemistry, phototherapy of cancer cells and tumors, targeted delivery of drugs and antigens, and optical bioimaging of cells and tissues with state-of-the-art nanophotonic detection systems. Multifunctional nanocomposites that combine therapeutic, diagnostic, and sensing modalities in a single nanostructure are widely used in a new field of nanobiotechnology called theranostics. Although the term theranostics has been employed for the first time quite recently, it is now rapidly growing and promising field at the crossroads of plasmonics and nanomedicine.

Topics:

- Fabrication of plasmon-resonant NPs and nanostructures
- Multifunctional nanostructures for theranostics
- Composite nanostructured functional materials
- Optical properties of plasmon resonant NPs and nanostructures
- Physicochemical characterization of NPs and nanostructures
- Functionalization of NPs with biospecific macromolecules
- Nanoscale biosensors

- Chemical technologies based on nanoparticles
- Cell imaging with NP bioconjugates
- Photothermal and photodynamic therapy using nanocomposites
- Application of nanoparticles to the targeted drug delivery
- Uptake of NPs by cells
- Biodistribution and toxicity of NPs *in vitro* and *in vivo*
- Analytical applications of NPs and bioconjugates
- SERS with plasmonic nanostructures
- SERS tags as novel nanoprobes
- Quantum dots and its application

Conference:
Internet Biophotonics V

Chairs

Alexey N. Bashkatov,

Saratov State University (Russia)

Ivan V. Fedosov,
Saratov State University (Russia)

Valery V. Tuchin,
Saratov State University, Institute of Precise Mechanics and Control RAS (Russia); University of Oulu (Finland)

Secretary

Daria K. Tuchina,
Saratov State University (Russia)

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The main goal of the Conference is to involve international community of researches 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 16 years. In 2013 such presentations have included plenary lectures made by

Kishan Dholakia, University of St. Andrews, UK,

Shaped Light for Biophotonics

Ilya Fine, Elfi Tech Ltd., Science Park, Israel,
Origin of Optical Pulse and Non-Invasive Measurement of Hemoglobin

Participants from Australia, Bulgaria, Belarus, Belgium, Canada, China, Denmark, Finland, Germany, India, Iran, Ireland, Italy, New Zealand, Latvia, Russia, Slovakia, Portugal, Singapore, Switzerland, Turkey, UK, USA, Uzbekistan have located their papers at the meeting website: http://sfm.eventry.org/2013/internet.

In 2014 we are expecting 2-3 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 post-docs and PhD students all over the world.

Topics:

- 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

Conference:
Optical Microscopy and Low-Coherence Methods in Biomedical and Non-Biomedical Applications VII

Chair

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Ruikang K. Wang,
Univ. of Washington, USA

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Samara State Aerospace University, Russia

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

Conference:
Nonlinear Dynamics V

Chair

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University of Copenhagen, Denmark

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Tatjana E. Vadivasova,
Alexey V. Shabunin,
Saratov State University, Russia

The main goal of the Conference is to attract young scientists and students to the discussion of topical problems and results in the field of theoretical nonlinear dynamics with special attention to its application in the living systems, such as mathematical physiology, neuroscience and advanced time series analysis of biophysical and medical data.

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 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 limited 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

Conference: Low-Dimensional Structures IV

Chair

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Saratov State University, Russia

Secretaries

Anna S. Kolesnikova, Michael M. Slepchenkov, Vladislav V. Shunaev,
Saratov State University, Russia

International Program Committee

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National Cheng Kung University, Tainan, Taiwan

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Saratov State Medical University named after V.I. Razumovsky, Saratov, Russia

Igor S. Nefedov,
Aalto University, Espoo, Finland

Nikolay I. Sinitsyn,
Institute of Radioengineering and Electronics (IRE) of RAS, Saratov, Russia

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

We will discuss theoretical and experimental methods for studying of structure, properties (optical, electronic, etc.) and applications of the low-dimensional structures. We will discuss in detail a problem of the biomedical applications of low-dimensional structures as biomaterials. Also, within the workshop we will discuss different aspects of nanobiomechanics, molecular dynamics, nanobioelectronics.

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

- synthesis technology of the low-dimensional structures (nanofilms, nanocoating, nanotubes, nanowires, graphene, fullerenes);
- atomic framework 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;
- investigation of mechanisms for lipid-protein complexes diffusion into intima of arteries: biomechanical modeling, molecular modeling, 3D-computational modeling;
- atomic-force microscopy for topology of the endothelium surface.

Conference:

Computational Biophysics and Analysis of Biomedical Data

Chair:

Dmitry E. Postnov,
Saratov State University (Russia)

Secretary:

Elena S. Stukhina,
Saratov State University (Russia)

International Program Committee:

Alexander Neiman,
Ohio University, USA

Oxana Semyachkina-Glushkovskaya,
Saratov State University, Russia

Anatoly Skripal,
Saratov State University, Russia

Boris Bezruchko
Saratov State University, Russia

The mathematical and computational modeling are the powerful tools for modern research. Together with advanced experimental techniques, data analysis and mining they provide a solid basis for both experimental and theoretical studies in biophysics and medicine.

Recently introduced term "Biosimulation" incorporates the variety of mathematical modelling approaches and techniques and becomes the powerful tool for biomedical research and drug development. It implies different modelling levels ranging from phenomenological one to detailed description of biochemical processes and used both to reveal basic physical mechanisms and to predict the quantitative features of physiological processes in living systems.

The rapid development of optical visualization and measurement techniques in biological systems resulted in significant increase of attributed flows of raw data. Thus there is the need for continuous grows of capability of data processing, both quantitative (computational performance) and qualitative (adaptive and problem-specific data pre-processing). The GPU (graphics processor unit) based techniques of parallel computing becomes the popular solution providing high performance at a reasonable costs. However, it requires the adoption of existent and the development of new computational algorithms for filtering and spatial-temporal patterns detection and data mining.

The advanced data processing is now capable to provide the insight in structural features of source system, such as interaction of internal rhythms, coupling between system's components, or casualty of events. In this field, the development, validation and application of both temporal and spatial complexity measures is highly relevant, such as multimodal wavelet analysis, chirplets, fractality measurement, etc.

The main goal of the Conference is to provide the platform for discussion of the listed topics in the framework of Saratov Fall Meeting with special attention to task-specific, rather than generic aspects. The later means that the contributions based on experimental studies showing the need for computational support are also appreciated.

Topics

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

- Mathematical Modeling of Biochemical and Physiological Processes
- Advanced Time Series Analysis for Biomedical Applications
- Computational Neuroscience
- Dynamical Patterns in Experimental Physiology
- GPU Computing in Processing of Biomedical Data
- Complexity measures, coupling and rhythm detection techniques

Conference:

Advanced Polarization Technologies in Biomedicine and Material Science

Chairs:

Igor V. Meglinski,

University of Otago, New Zealand,

Saratov State University, Russia

Dmitry A. Zimnyakov,

Yuri Gagarin Saratov State Technical University, Russia

Institute of Precise Mechanics and Control RAS, Russia

Secretary:

Elena A. Isaeva,

Yuri Gagarin Saratov State Technical University, Russia

International Program Committee:

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The main goals of the Conference are:

- to present the recent results and achievements in the area of light polarization probes of random media;

- to discuss the fundamental aspects of polarized coherent and non-coherent light propagation in scattering and absorbing media with complex structure;

- to discuss the possible applications of spectral-polarization and coherence-domain techniques for morphological and functional diagnostics in biomedicine and for characterization of micro- and nanostructured dispersive media and composite materials in material science;

- to involve young scientists and student to the active and creative work in the fields of fundamental and applied optics, laser physics, and photonics.

Topics

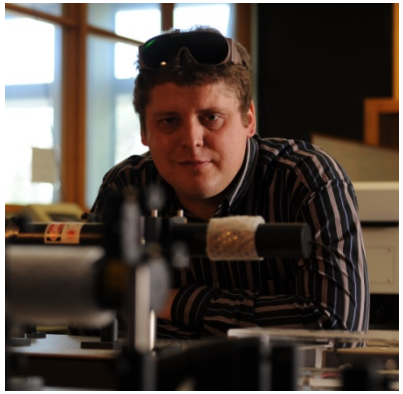
The scientific program will include but is not restricted to the following topic areas:

- fundamentals of polarized light propagation in random media and interrelations between the coherence and polarization properties of light waves – traditional approaches and new sights;

- basic principles and applications of singular optics and theory of optical vortices;
- polarized light in biomedicine – from simple devices to sophisticated applications;
- design and practical use of polarization-based probes and sensors in various areas of modern science and technology;
- double refraction, optically active, and chiral homogeneous and heterogeneous natural and artificial media;
- resonant light-matter interactions at nanometer scale and their manifestations in polarization properties of scattered light;
- analytical and numerical approaches to simulation of polarized light propagation in multiple scattering random media.

SPIE Short Course:

Skin spectra and colour calculator: on-line object oriented GPU accelerated Monte Carlo tool



Igor Meglinski, *University of Otago, Dunedin, New Zealand*

This course aims at introducing the basics of light-tissue interaction, and the influence of tissue optical properties on the signal formation in major optical modalities used in skin diagnosis. The basics of tissue optical properties will be reviewed in order to appreciate the parameters used for the modelling and its physical origin. The theoretical framework is based on the radiative transfer principles and the known exact analytic solution of wave propagation in random media. The choice of phase function will be discussed. Comparison to numerical simulations of human skin spectra and skin colour with the experimental data will be presented. A range of probing conditions for screening the complex composite structure of skin and detection the optical signal affected by structural or physiological changes will be considered. Finally, the online Monte Carlo tool, specially developed for imitation of optical radiation propagation within complex multi-layered tissue-like media will be introduced. The current version provides access to simulation of detector depth sensitivity (sampling volume) for a range of probes typically used in reflectance-based measurements, reflectance spectra of human skin and/or multi-layered scattering structures, and skin-colour modelling. The tool allows users to customize the parameters of the medium, probe, and observation area. In addition the particular applications of the computational tool, including fluence rate distribution, OCT images, laser pulse propagation, and coherent polarized light, will be considered.

LEARNING OBJECTIVES

This course will enable you to:

- understand the basic principle of light-tissue interaction and become familiar with the state-of-the-art in the computational modelling of light propagation in complex tissue-like turbid media;
- be introduced to the basics of skin tissue optical properties, their origin, and skin colour formation
- understand and explain the basics of light propagation in biological tissues in relation to the major optical diagnostic modalities used in non-invasive skin tissue diagnosis/imaging, and to discuss the potential of these techniques for particular biomedical applications;
- major optical diagnostic/imaging modalities will be discussed, including presentation of the on-line computational model and its details description for practical use in particular applications.

INTENDED AUDIENCE

Physicists, engineers, and scientists who are interested in optical and laser diagnostics, light-tissue interaction, and computer modelling of radiative transfer in complex tissue-like turbid medium will benefit from this course.

COURSE LEVEL

Intermediate

COURSE LENGTH

Half-day

INSTRUCTOR

Igor V. Meglinski, PhD, Fellow of SPIE and Institute of Physics (UK) is a Professor at the Department of Physics, University of Otago (New Zealand). His research interests activities lie at the interface between physics, biomedical engineering, medicine and biological sciences, focusing on the development of new non-invasive optical diagnostic and imaging techniques and their applications in medicine & biology, material sciences, combustion, pharmacy, environmental monitoring, agricultural, food processing and health care industries. He is author or co-author of more than 190 papers in peer-reviewed scientific journals, proceedings of international conferences, book chapters and patents. Over 300 presentations at the major international conferences, symposia and workshops, including over 140 invited lectures and plenary talks.

OSA Short Course: Towards deep tissue luminescence imaging using upconverting nanoparticles

Stefan Andersson-Engels,
Lund University, Sweden

This course aims at introducing the basics of fluorescence techniques for biomedical imaging, and how the signal is influenced by the tissue optical properties. Fluorescence is a very sensitive technique used in many disciplines. It provides a unique potential for biomedical diagnostics, and is today well explored. Here we will focus on two major challenges that remain for fluorescence imaging in biomedical applications: to achieve good sensitivity and specificity to regions located deeply into tissue, and to image those with as high spatial resolution as possible. Light scattering is making the light diffuse, limiting the spatial resolution of measured images. Light absorption in tissue is providing the basis for generating the fluorescence signal, while it restricts the penetration of light limiting the probe volume. Reabsorption of emitted fluorescence often also alters the spectroscopic signature of the fluorescence signal. This makes it challenging to extract the intrinsic fluorescence properties, directly related to the fluorophore concentration; and to obtain sensitivity at depths. In the course we will address techniques to extract the intrinsic fluorescence signal and also methods to provide better depth sensitivity at slightly better spatial resolution. Two issues are in particular important in order to provide good sensitivity at depth: to use excitation and emission wavelengths penetrating deep into tissue, and to be able to efficiently suppress any unspecific background light generated in other regions of the tissue. Especially fluorescence generated superficially in the tissue, being much less attenuated due to the shorter light paths through the tissue, constitute a severely disturbing source of background limiting the sensitivity for deep imaging. Upconverting nanoparticles (UCNPs) provide unique abilities to obtain images of deep tissue locations. They can be engineered so that both the excitation and emission wavelengths are in the tissue optical window (at wavelengths where tissue is attenuating the light as little as possible). They also provide a signal that is shifted towards shorter wavelengths than the excitation, providing very powerful possibilities to completely filter out any tissue autofluorescence, and thus provide a background-free signal. In addition they yield an improved spatial resolution. This is because they require several photons to be sequentially absorbed, altering the sensitivity profiles of the excitation process. Much effort is today devoted to develop this new class of optical contrast agent for bioimaging, and some of the current research directions will be outlined in this course.

LEARNING OBJECTIVES

This course will enable you to:

- understand the basic principle of fluorescence spectroscopic techniques for tissue diagnostics. You will also learn how the optical properties becomes important for the signal you will measure from

tissues;

- better grasp some basic biomedical needs for fluorescence diagnostics in biomedicine. Examples in particular pre-clinical and clinical specialities will be provided;
- know some endogenous and exogenous fluorophores used in fluorescence diagnostics today. You will also get a feeling for pros and cons with various fluorescence modalities.
- know how upconverting nanoparticles can be used to further improve the potential of deep tissue luminescence imaging, and also understand some of the unique properties of upconverting nanoparticles of importance for bioimaging.

INTENDED AUDIENCE

Physicists, engineers, and biomedical scientists who are interested in fluorescence techniques and deep optical imaging in tissue will benefit from this course.

COURSE LEVEL

Intermediate

COURSE LENGTH

Half-day

INSTRUCTOR

Stefan Andersson-Engels received the M.Sc. degree in engineering physics and the Ph.D. degree in physics from Lund University, Lund, Sweden, in 1985 and 1990, respectively.

He was involved in developing methods for tissue diagnostics based on optical spectroscopic techniques. He was at McMaster University, Hamilton, ON, Canada, for one year, and was involved in tissue optics as well as confocal and two-photon microscopy. In 1993, he joined Lund University as an Assistant Professor, and became an Associate Professor in 1994 and a Full Professor in 1999. He is the author or coauthor of more than 160 articles published in peer reviewed journals. His current research interests include optical spectroscopy for biomedical and pharmaceutical applications as well as interstitial photodynamic therapy of malignant tumors.

Prof. Andersson-Engels has been a Co-Organizer of several international conferences including the Gordon Conference on Lasers in Biology and Medicine in 2000, the European Conference on Biomedical Optics in 2003, and a series of biannual international summer schools in biophotonics at the Island Ven in Sweden.

Foundation "Dynasty" Short Course:

The spectroscopy, surface modification and bio / medical applications of nanodiamond

Chia-Liang Cheng, *National Dong Hwa University, Taiwan*

In this short course, we intend to introduce a newly emerged versatile nanomaterial, nanodiamond, and its promising bio and medical applications. The advantage of using nanodiamond as a nano-bio-probe compared to other nanoparticles (gold and quantum dots, etc.) will be the focus. First, we will start with a general introduction on nanoparticles used in life science applications, and an introduction on various instrumentation and methods of applications in biological systems. Then, we will cover the basic knowledge on the material, spectroscopic methods (Infrared, Raman spectroscopy and fluorescence measurements), the characterization and applications of nanodiamond. Finally, some implementations of nanodiamond in bio imaging will be demonstrated to show the promising bio and medical applications of nanodiamond. The whole short course is divided into three parts as the following

Lecture 1: Nanoparticles and spectroscopic techniques used in life science applications. This section starts with an introduction on various nanoparticles, instrumentation and methods of applications used in bio imaging. Infrared, Raman and fluorescence techniques are illustrated with examples to explain how these techniques are implemented in life science measurements. Then, the advantage of using nanodiamond in bio and medical applications compared to other nanoparticles are demonstrated.

Lecture 2: Surface functionalization, characterization of nanodiamond prepared for bio and medical applications. The basic properties of nanodiamond as well as other carbon related materials such as diamond like carbon, carbon nanotubes and carbon nanostructures will be discussed. The surface functionalization/characterization and spectroscopic properties of various techniques will be covered. For bio and medical applications, the surfaces of nanodiamond are functionalized for further conjugation of biologically interested molecules such as proteins or drug. The nanodiamond serves as a biocompatible nano-label or transport vehicles of bio molecules into biological systems. The cytotoxicity of the nanodiamonds and the surface functionalization and characterization methods will be discussed in this section.

Lecure 3: Bio and medical applications of nanodiamond. In this section, we will demonstrate the bio application of nanodiamond. Nanodiamond conjugated with interested biomolecules to form nanodiamond-biomolecules complexes; the interaction of biomolecules with cells or bacteria is demonstrated using nanodiamond as a biocompatible labeling marker. The methods of using spectroscopic properties of nanodiamond such as Raman and fluorescence signals as a bio labeling marker for visualizing the bio interaction will be illustrated.

LEARNING OBJECTIVES

This course will enable you to:

- understand and become familiar with the basic spectroscopic properties of Nanoparticles and spectroscopic techniques used in life science applications,
- be introduced to the basics of fluorescence and spectroscopic imaging using nanodiamond in biological systems, and the Surface functionalization, characterization of nanodiamond prepared for bio and medical applications
- be introduced the latest Bio and medical applications of nanodiamond, such as in bio imaging and in drug delivery.

INTENDED AUDIENCE

Engineers, scientists, and physicians who are interested in nanobiotechnology and nanomaterial application for medical science and clinics will benefit from this course.

COURSE LEVEL

Intermediate

COURSE LENGTH

Half-day

INSTRUCTOR

Chia-Liang Cheng is a professor in the Physics Department, and Vice President of National Dong Hwa University (NDHU), Hualien Taiwan. He received his Ph. D. degree from the Physics Department of the University of Oregon, USA in 1993. After obtaining his Ph.D. degree, he was a post-doc with Prof Y.T. Lee (Nobel Laureate in Chemistry, 1986) at the Chemistry Department in the University of California, Berkeley and Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei from 1994-1997. He was an assistant professor at Physics Department of the National Taiwan Normal University for one year, and then he joined NDHU in 1998. In 2005, he was promoted full professor. He is specialized in spectroscopy, and optical imaging. Currently, he is the Vice President of NDHU.

His research interests are in Bio/medical applications of nanodiamond; spectroscopic studies on nanomaterial; visible-light-activated TiO_2 nanoparticles; Infrared, Raman spectroscopy, etc. His interests go beyond the boundary of physics, chemistry, biology and medicine. His group is one of the pioneering groups in the world to successfully use nanodiamond as a biological marker to observe bio molecules interaction with cells or bacteria. They have recently delivered anticancer drug using nanodiamond as a delivery vehicle into lung cancer tumors in the animal model. He has been giving invited lectures in almost all the important diamond research conferences.