



华侨华人创业发展洽谈会组委会办公室

Conference on Overseas Chinese Pioneering and Developing in
China 2022—International Youth Talent Summit
Wuhan, China, Nov. 16 2022

Contribution of Hubei province and Saratov region to world
achievements and training of young talents in the field of biophotonics

Valery V. Tuchin

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Bach Institute of Biochemistry, Federal Research Centre 'Fundamentals of
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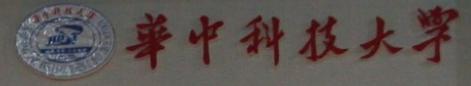
SPIE Short Course—Optical Clearing

Huazhong University of Science and Technology
China



Optical Clearing of Tissues
and Blood

Valery V. Tuchin



武汉光电国家实验室

WUHAN NATIONAL LABORATORY FOR OPTOELECTRONICS



Saratov State University

Division of Optics & Biophotonics

Research-Educational Institute of Optics & Biophotonics

University of Oulu, Finland



Optical Clearing

Vale
tuc
http



**Saratov
accordion**

Saratov, SSU



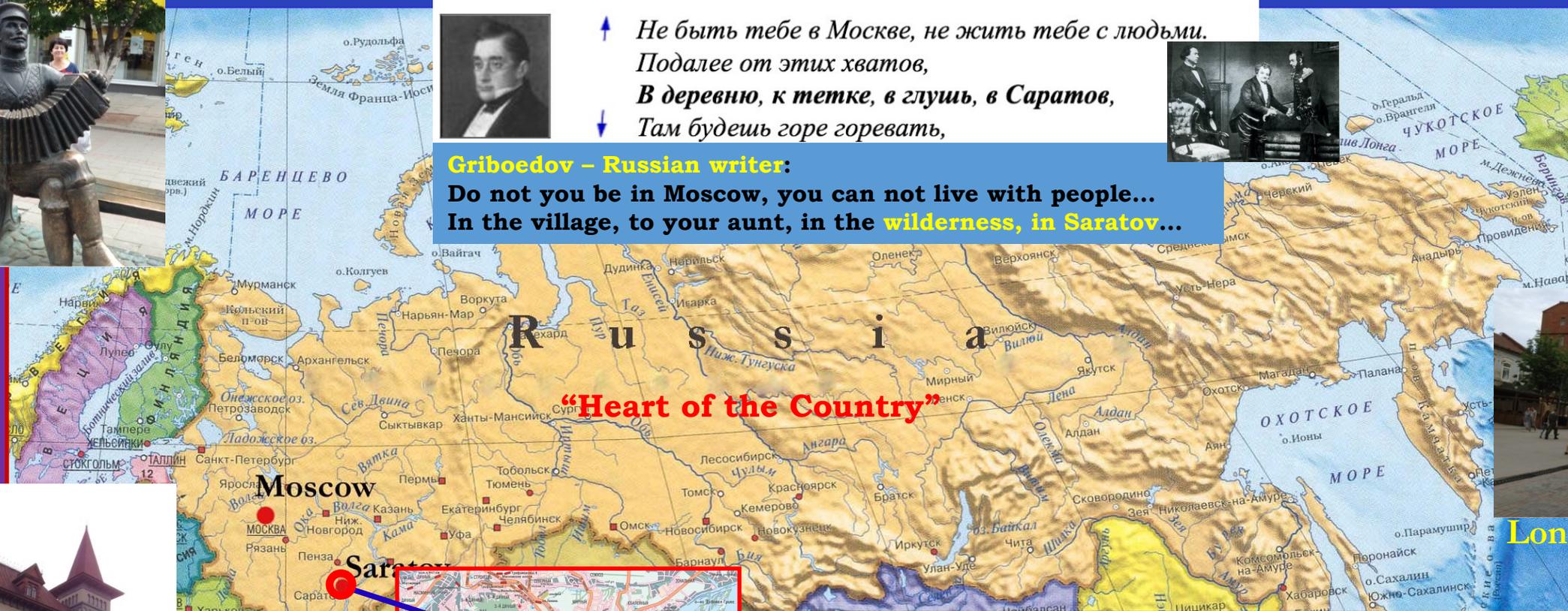
↑ Не быть тебе в Москве, не жить тебе с людьми.
Подалее от этих хватов,
В деревню, к тетке, в глушь, в Саратов,
↓ Там будешь горе горевать,

Griboedov – Russian writer:

**Do not you be in Moscow, you can not live with people...
In the village, to your aunt, in the wilderness, in Saratov...**



**Song about
love**



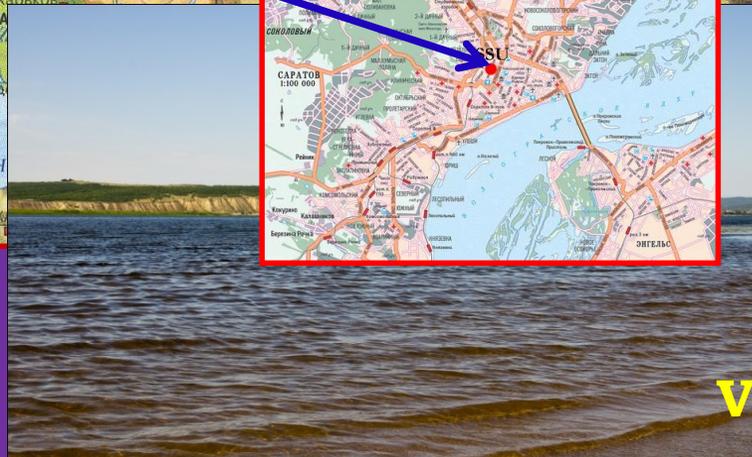
**Longest pedestrian
street**



Conservatory



**Special bread -
Kalach**



Volga-river





Saratov State University & Saratov State Medical University



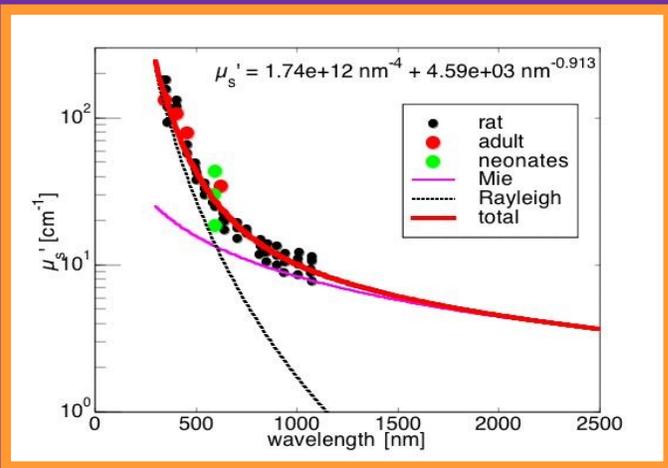
The first cosmonaut

Yuri Gagarin

studied and landed in Saratov
in 1961



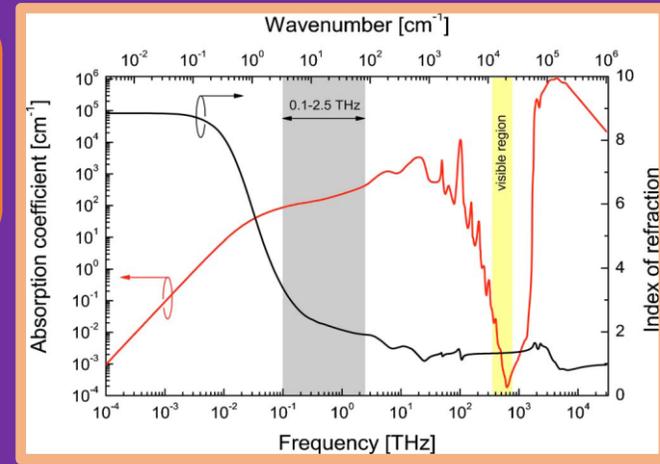
Approx. since that time Hubei province and Saratov
region have established links and collaboration



Optical clearing method helps to reduce scattering of tissues

$$\mu_s' = \mu_s(1-g) \sim d^2 \rho (d/\lambda)^{0.37} (m-1)^2$$

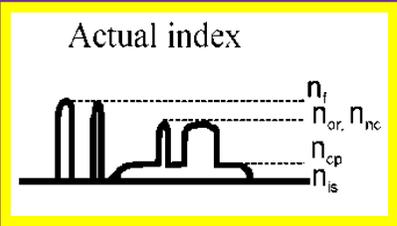
$$m \equiv n_s/n_0$$



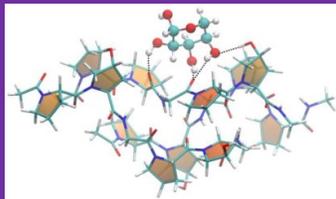
Refractive index matching mechanism

Optical clearing agents

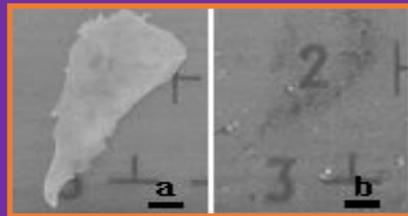
Dehydration mechanism



- Hyperosmotic agents:**
- ❖ Glucose
 - ❖ Sorbitol
 - ❖ Glycerol
 - ❖ Polyethylene glycol
 - ❖ Propylene glycol
 - ❖ Dimethyl sulfoxide



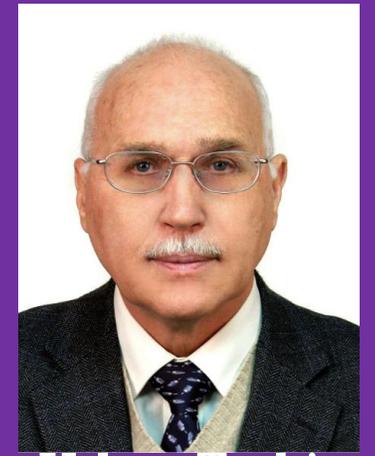
- Isosmotic solutions:**
- ❖ X-ray contrast agents: iohexol, iodixanol
 - ❖ MRI contrast agents: gadobutrol, etc.



Zhu Lab: Tissue optical clearing



Dan Zhu
Wuhan National
Laboratory for
Optoelectronics, Huazhong
University of Science and
Technology
China



Valery Tuchin
Saratov State University
Russia

Molecular mechanism

Physical
mechanism

High-efficient
OCAs

Physiological
mechanism

In vitro optical
clearing
methods

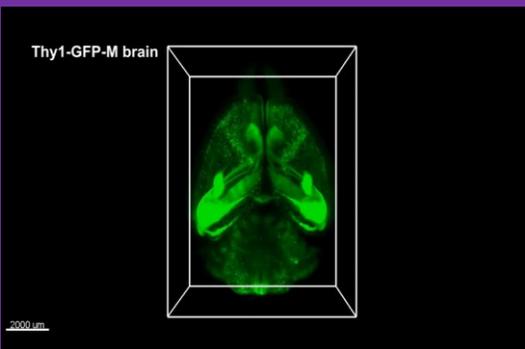
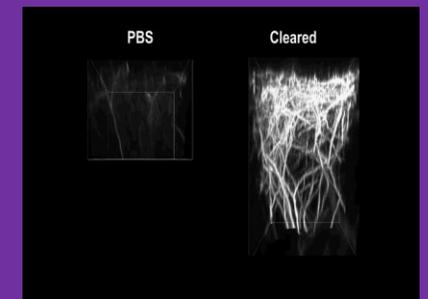
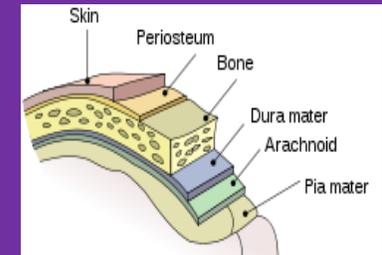
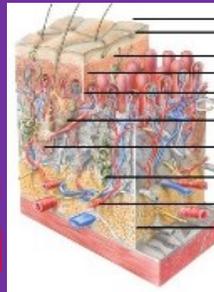
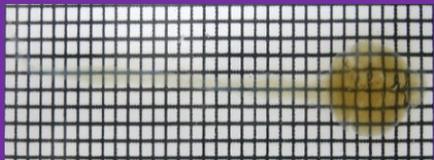
In vivo optical
clearing methods

More rapid
More effective
More versatile

Biocompatibility &

Skin safety Skull

Enhancing:
performance vascular
& cell imaging





Chinese-Russian Workshops on Biophotonics and Biomedical Optics 2006-2022

The first Russian-Chinese Workshop on Biophotonics and Biomedical Optics “BBO-06” was held in Wuhan, P.R. China, September 2-3, 2006.



Chinese-Russian Workshop on Biophotonics and Biomedical Optics-2011 was held in Wuhan, China, on Nov. 1-3, 2011

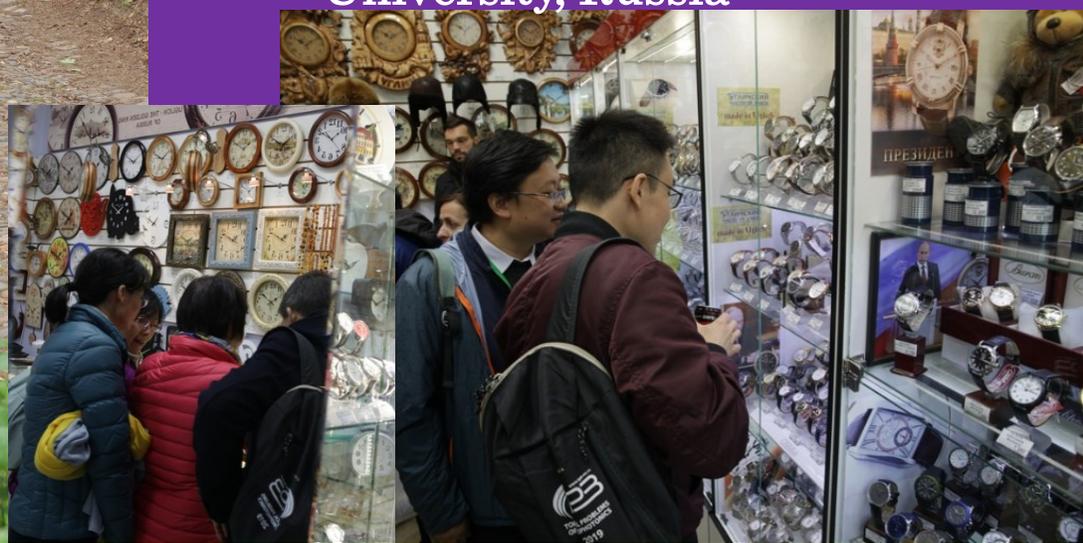


JULY 27-31, 2019

*"Konstantin Korotkov" boat, Nizhny
Novgorod – Uglich - Nizhny Novgorod*

**RUSSIAN-CHINESE WORKSHOP
ON BIOPHOTONICS &
BIOMEDICAL OPTICS
CHAIRS**

- Dan Zhu, Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology
- Valery Tuchin, Saratov State University, Russia



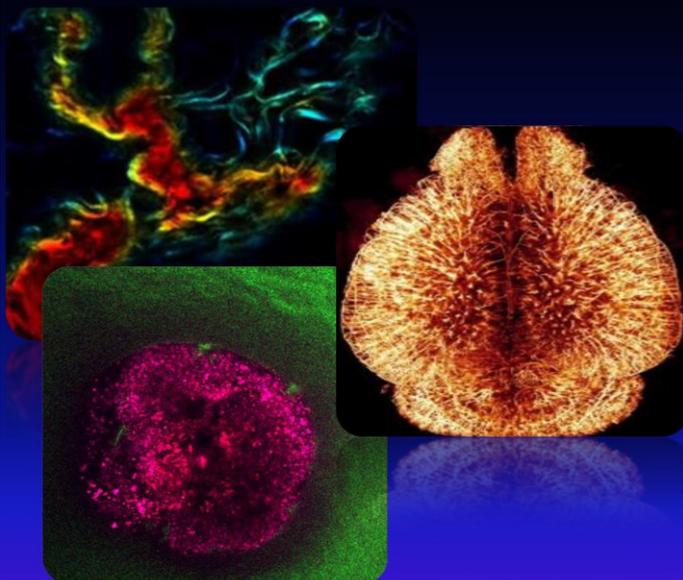


**JULY 27-31,
2019**

*"Konstantin Korotkov"
boat, Nizhny Novgorod
– Uglich - Nizhny
Novgorod*



Chinese-Russian Workshop on
Biophotonics
and Biomedical Optics-2020



SEPTEMBER 28 – 30, 2020

SARATOV STATE UNIVERSITY, SARATOV, RUSSIA
WUHAN NATIONAL LABORATORY FOR OPTOELECTRONICS,
HUAZHONG UNIVERSITY OF SCIENCE
AND TECHNOLOGY, CHINA



РФФИ
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ИССЛЕДОВАНИЙ

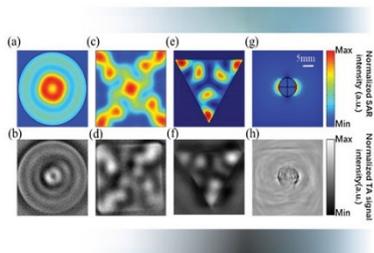
SPIE, OSA
The Optical Society

OPEN ACCESS
Journal of Innovative Optical Health Sciences
Vol. 14, No. 5 (2021) 2102003 (2 pages)

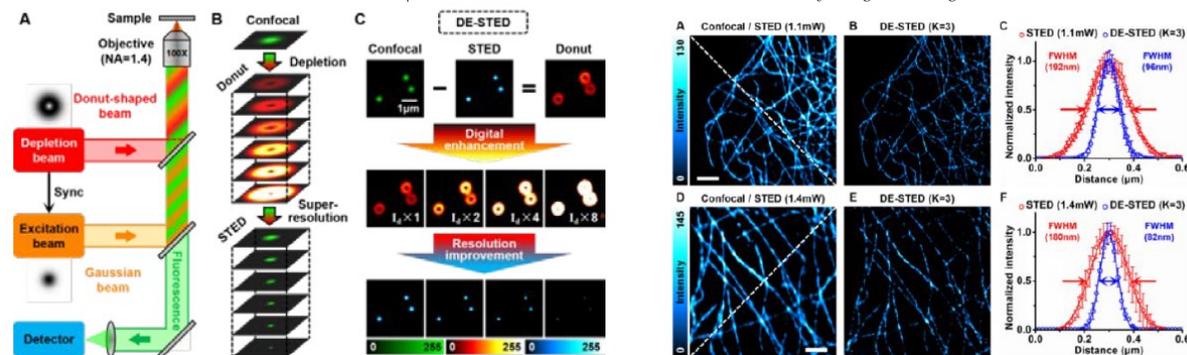
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Journal of
Innovative Optical
Health Sciences

Volume 14 • Number 5 • September 2021



World Scientific



Editorial

Introduction to the Special Issue on Advances in
Biophotonics and Biomedical Optics

Polina Dyachenko (Timoshina)*, Tingting Yu^{†,‡}, Dan Zhu^{†,‡} and Valery V. Tuchin*

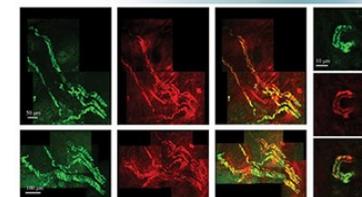
*Research-Educational Institute of Optics and Biophotonics
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[†]Britton Chance Center for Biomedical Photonics
Wuhan National Laboratory for Optoelectronics
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[‡]MoE Key Laboratory for Biomedical Photonics
School of Engineering Sciences

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Volume 15 • Number 1 • January 2022



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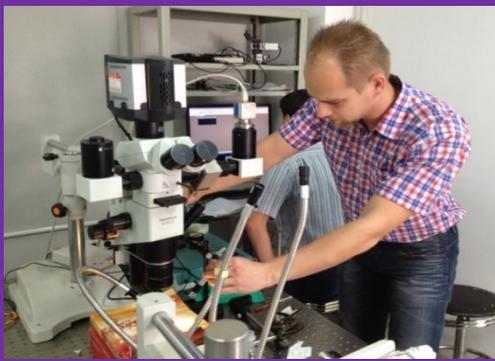


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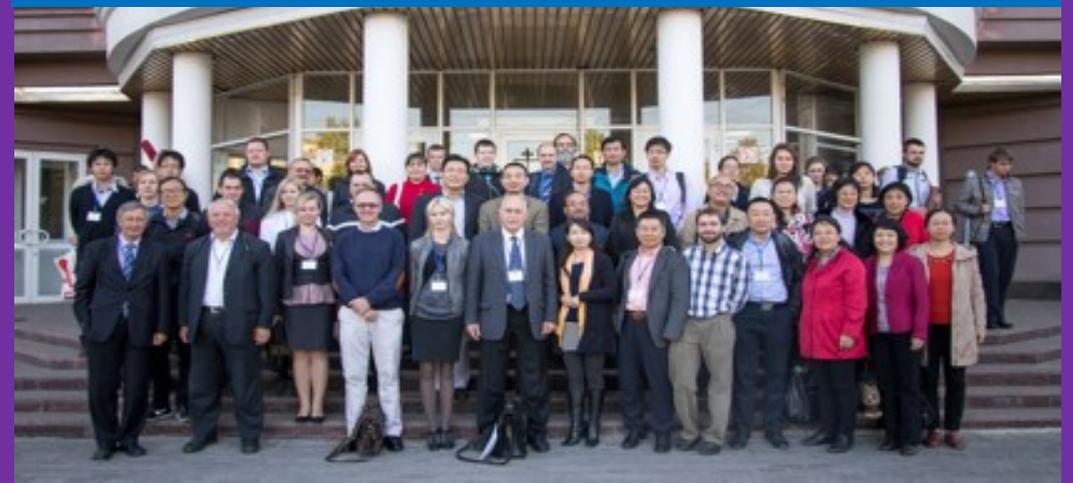
PIBM 2021 | Dec. 2-4, 2021
Haikou, China

Chinese-Russian Workshop on
Biophotonics and Biomedical Optics-2021
December 3-4, 2021

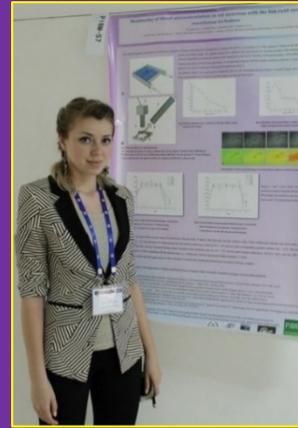
Visitors Wuhan - Saratov



Russian-Chinese Workshop on Biophotonics and Biomedical Optics Saratov, Russia, Sept. 26-29, 2012



Visitors Wuhan - Saratov



We are working hard to train new generations of researchers in the field of biophotonics in Hubei province, Saratov region and around the world



SPIE. JOURNAL OF BIOMEDICAL OPTICS
WEBINAR SERIES

**Seeing Through Tissue II:
 Tissue Clearing Methods**

Host:
Brian Pogue, Dartmouth College, JBO Editor-in-Chief

Moderator:
David Sampson, University of Surrey

Valery Tuchin
 Saratov State University

Jonathan Liu
 University of Washington

Dan Zhu
 Huazhong University of Science and Technology

Kwanghun Chung
 Massachusetts Institute of Technology

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POEM Wuhan International Meeting: Young Researcher Awards Ceremony





BRICS Workshop on Biophotonics-21 SEPTEMBER 27 –29, 2021, SARATOV, RUSSIA

Chairs:

- Valery V Tuchin, Saratov State University, Russia
- Qingming Luo, Hainan University, China
- Vanderlei Salvador Bagnato, University of São Paulo, Brazil
- Santhosh Chidangil, Manipal Academy of Higher Education, India
- Heidi Abrahamse, University of Johannesburg, RSA

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- Lilian Moriyama & Natalia M. Inada, University of São Paulo, Brazil
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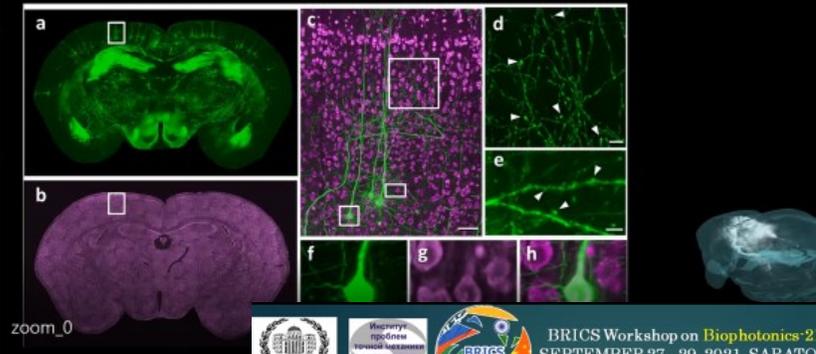


Academician Qingming Luo

BPS for Brainsmatics

dfMOST for 3D Fine Brain Atlas

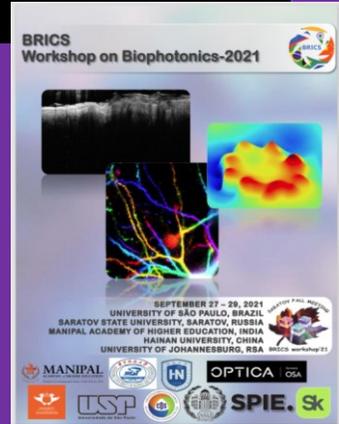
Simultaneous visualization of fine structural information and cytoarchitectural landmarks in the same mouse brain



Brains HUST-Suzhou Institute For Brainsmatics
华中科技大学苏州脑空间信息研究院

海南大学 HAINAN UNIVERSITY

Qingming Luo 骆清铭
qluo@hainanu.edu.cn



BRICS Workshop on Biophotonics-21
SEPTEMBER 27 –29, 2021, SARATOV, RUSSIA

Optical Clearing as a Tool for Multimodal Tissue Imaging

Valery V. Tuchin
Saratov State University
National Research Tomsk State University
ITMO University
Institute of Precision Mechanics and Control of the RAS
Bach Institute of Biochemistry, Federal Research Centre 'Fundamentals of Biotechnology' of the RAS, Russia

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OCT
FLIM measurements
Photoacoustics
Multiphoton microscopy

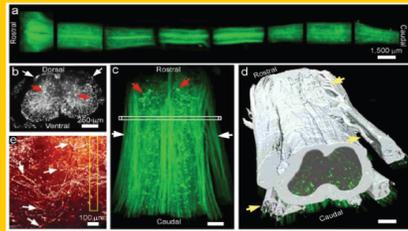
Diagrams and images illustrating various imaging techniques: OCT (Optical Coherence Tomography), FLIM (Fluorescence Lifetime Imaging Microscopy) measurements, Photoacoustics, and Multiphoton microscopy. The diagrams show light paths and tissue interactions.

Books, reviews, special issues of journals

Laser Photonics Rev., 1–26 (2013) / DOI 10.1002/lpor.201200056

LASER & PHOTONICS REVIEWS

Abstract Tissue optical clearing technique provides a prospective solution for the application of advanced optical methods in life sciences. This paper gives a review of recent developments in tissue optical clearing techniques. The physical, molecular and physiological mechanisms of tissue optical clearing are overviewed and discussed. Various methods for enhancing penetration of optical-clearing agents into tissue, such as physical methods, chemical-penetration enhancers and combination of physical and chemical methods are introduced. Combining the tissue optical clearing technique with advanced microscopy image or labeling technique, applications for 3D microstructure of whole tissues such as brain and central nervous system with unprecedented resolution are demonstrated. Moreover, the difference in diffusion and/or clearing ability of selected agents in healthy versus pathological tissues can provide a highly sensitive indicator of the tissue health/pathology condition. Finally,



recent advances in optical clearing of soft or hard tissue for in vivo imaging and phototherapy are introduced.

REVIEW
ARTICLE

Recent progress in tissue optical clearing

2013

Dan Zhu^{1,2,*}, Kirill V. Larin^{3,4}, Qingming Luo^{1,2}, and Valery V. Tuchin^{4,5,6,*}

Journal of Biomedical Optics

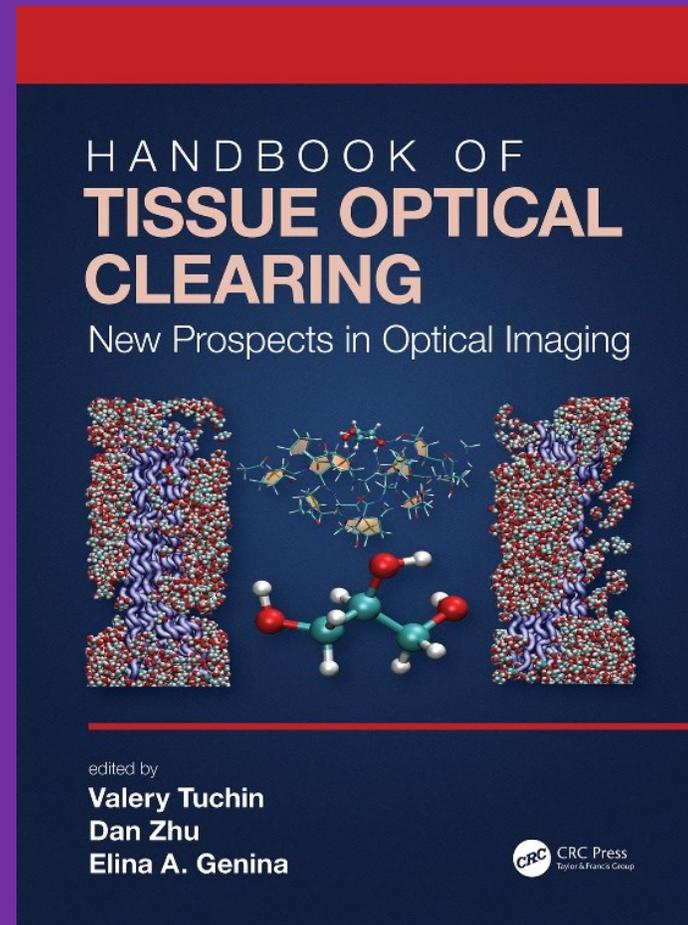
BiomedicalOptics.SPIEDigitalLibrary.org

Tissue and Blood Optical Clearing for Biomedical Applications

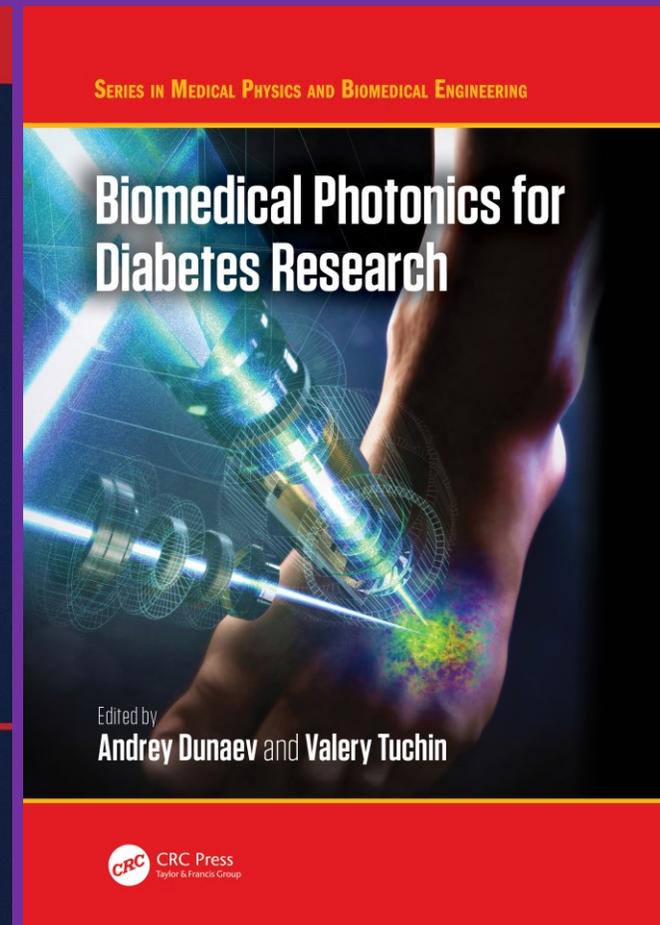
Dan Zhu
Bernard Choi
Elina Genina
Valery V. Tuchin

2016

2022



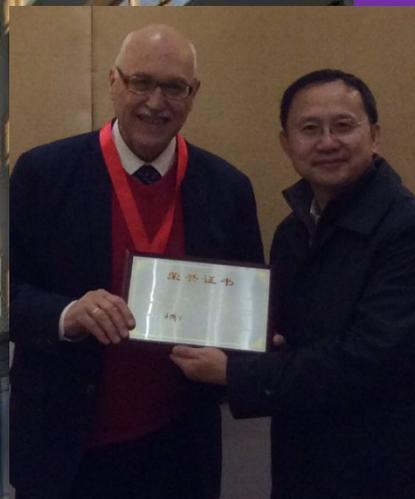
37 Chapters



Huazhong University of Science and Technology



Chime Bell Prize of Hubei
Province, China (2014), in
appreciation of the positive
contribution to the economic
and social development in
Hubei Province



LETTER OF APPOINTMENT

Mr. Valery Tuchin

You are hereby appointed to be Advisory
Board Member of School of Engineering
Sciences, from June 2014 to May 2019.

School of Engineering Sciences
Wuhan National Laboratory for Optoelectronics
Huazhong University of Science and Technology

ISSUE DATE:12/6/2014

聘 书

兹聘请 Valery Tuchin
(瓦列尼·图钦) 教授为华中
科技大学工程科学学院咨询
委员会委员。聘期 2014 年 6
月至 2019 年 5 月。

华中科技大学工程科学学院
武汉光电国家实验室
二〇一四年六月十二日



We Love Chinese Culture

