ICTER
International Centre for Translational Eye Research

IChF
Institute of Physical Chemistry PAS

ICTER's Overview Report

2019 – 2023

European Funds Smart Growth
Republic of Poland
FNP Foundation for Polish Science
European Union European Regional Development Fund

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From ICTER Chair Professor Maciej Wojtkowski

The International Centre for Translational Eye Research, or ICTER, is an organization created to pursue a research agenda in the frame of the Institute of Physical Chemistry of the Polish Academy of Sciences with guaranteed autonomy in matters of human resource management.

The initiative for the establishment of such a centre came from Prof. Krzysztof Palczewski from the Case Western Reserve University, with whom I have been working since the 2012 FNP Awards Gala. Other ICTER's strategic partner is the Institute of Ophthalmology at University College London.

Our research activity is unique in the world, combining the fields of expertise in physics, optical engineering, biochemistry, physical chemistry, ophthalmic biology, automation, structural biology, genomics and genetics.

Our goal is to develop new technologies that support the introduction of new therapies for eye diseases. We are fortunate to live in a time of breakthroughs for vision treatment, which is related to several key elements: understanding the mechanisms of protein function and regulatory processes in the eye, understanding the genetic determinants of eye disorders, new regenerative therapies, and the development of precise surgical methods that, through the use of robotics, guarantee safer procedures with less damage to the highly sensitive eye tissue.

We are working on the development of imaging methods that will monitor changes in retinal function and new precision guided devices for injections inside the eye. Observations of retinal function are critical for validating new therapies.

From Scientific Director Professor Christophe Gorecki

In ICTER, which is an autonomous sub-unit of the Institute of Physical Chemistry of the Polish Academy of Sciences, 50 collaborators are conducting a multidisciplinary research program on Biophotonics and eye translational research through the five research teams.

The primary expertise of ICTER concerns the technologies of optical imaging with worldwide-renowned research in the field of the optical imaging of retina. Since 2019, ICTER expanded its purview, combining the development of novel, noninvasive functional optical retinal imagers including Artificial Intelligence technologies with studies on the biology of vision, and investigation of computational retinal genomics.

The goal of this interdisciplinary research is to build an international Centre of Excellence of significant scale for the treatment of eye therapies. ICTER continually develops his European and international dimension and partnerships that foster this objective, collaborating with a range of regional, national and international partners to turn research challenges into real world solutions.

ICTER has formal and informal research partnerships with countless universities from all around the world, from the University of California Irvine, through the top European institutes in Ophthalmology (University College London and Sorbonne University), to the University of Zaragoza.

At ICTER, we pride ourselves on our close understanding of industry which helps us to make sure our research is relevant to the needs of the modern business. We have close collaborations with Optopol and Premium; OCT devices and laser manufacturers, Polfa; the main Polish pharmacological company, and Polgenix in USA, a specialist in gene therapies.

Finally, we actively and successfully apply for funding offered on the competitive basis by Polish funding agencies: National Science Centre, National Centre for Research and Development and Foundation for Polish Science.

ICTER Board

Prof. Maciej Wojtkowski

CHAIR

Prof. Maciej Wojtkowski is a physicist specializing in applied optics, as well as medical and experimental physics. The main subject of his research is the development of new techniques of in vivo imaging, optical coherence tomography and low coherence interferometry applied to biomedical imaging. He has a significant impact on development of Fourier domain OCT (FdOCT) technique. From 2016, prof. Wojtkowski heads the Department of Chemical Physics of Biological Systems at the Institute of Physical Chemistry of the Polish Academy of Sciences, POB Group. He is the Founder of ICTER and its Chair since 2019.

Piotr Chaniecki PhD, MD

BOARD CONSULTANT FOR OPHTHALMOLOGY

Dr. Piotr Chaniecki holds the position of chief surgeon at Prof. Zagorski's Eye Surgery Center in Cracow, Poland. From 2010 to 2020, he served as the Head of the Ophthalmic Department of the 5th Military Clinical Hospital in Cracow, and from 2020 to 2023 he was the Head of the Ophthalmic Department of the PCK Hospital in Gdynia. He has more than 20 years of experience in eye surgery and performed more than 2 000 surgeries in 2022. Dr. Piotr Chaniecki is the author of a unique surgical technique for intraocular lens replacement, awarded as the best surgical technique of 2019 by the American ophthalmology journal Cataract & Refractive Surgery Today. His main professional interests are anterior and posterior eye surgery and conservative treatment of dry eye syndrome.

Prof. Christophe Gorecki

DIRECTOR FOR SCIENTIFIC AFFAIRS

Prof. Christophe Gorecki is a former Director of Scientific Research CNRS in Besançon, France. His technological expertise is novel MOEMS architectures for sensing with the development of miniature parallel on-chip microscopes. He has an experience in transferring IP to industrial companies. Prof. Gorecki served as National Secretary of the French Society of Optics (SFO).

Anna Pawlus, MBA

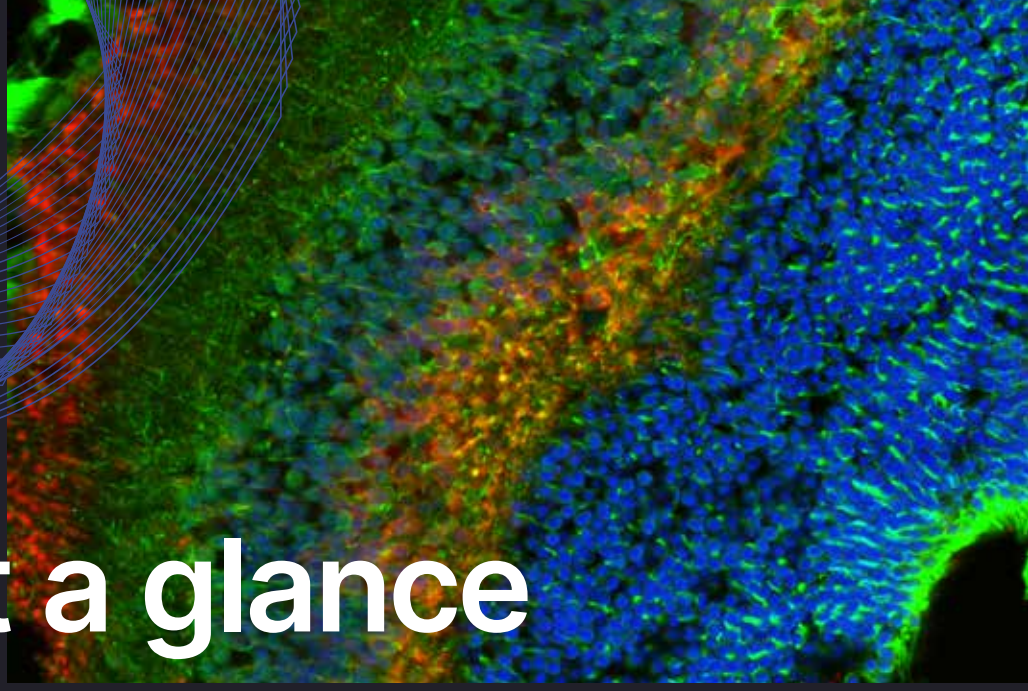
MANAGING DIRECTOR

Anna Pawlus has been associated with the optics and photonics community since 2016, as a lab manager and coordinator of a research group at the Institute of Physical Chemistry, Polish Academy of Sciences. She holds M.Sc. degree from the Wroclaw University of Science and Technology and completed the International MBA programme at Porto Business School. She gained professional experience in the International Cooperation Office at the U. Porto, IBM Global Delivery Centre in Wroclaw, and Sociedade Portuguesa de Inovação. Anna Pawlus volunteers for campaigns supporting gender equality & promotion of multiculturalism.

Łukasz Kornaszewski, PhD

DEPUTY DIRECTOR FOR IP

Łukasz Kornaszewski studied laser physics in Warsaw and Edinburgh. After a postdoc role in Barcelona he moved to an industrial R&D position in Glasgow where he took part in developing a successful ultrafast laser and obtained a few patents. In Poland he spent several years as a senior laser engineer and a deputy project manager which eventually led him to a position of a technology broker where he can apply his industrial experience to scientific systems valuation and organization of commercialization, including IP protection and fostering collaborations.



ICTER at a glance

€ 8 M

Total ICTER budget within International Research Agendas programme

€ 1.07 M

OTHER EU FUNDING

European Commission's Horizon 2020 Programme under the Photonics 2017 KET topic: IMCUSTOMEYE, Project leader: Prof. Maciej Wojtkowski

36,8%

ICTER's success rate

No. of submitted research proposals: 38
No. of awarded research projects: 14

€ 8 M

GRANTS received from Polish funding agencies and institutions

- *Two photon vision and two photon eye imaging (2×2 PhotonVis)*, TEAM TECH, project leader: Prof. Maciej Wojtkowski
- *Removal of image distortions by Spatio-Temporal Optical Coherence manipulation*, project leader: Prof. Maciej Wojtkowski
- *The role of Basal Forebrain in the visual processing*, SONATA 16, project leader: Andrzej Foik, PhD
- *A new approach of vision restoration based on modified Rabies virus tracing technique*, SONATA BIS 9, project leader: Andrzej Foik, PhD
- *Volumetric image reconstruction with filtering of redundant phase information*, DAINA 2, project leader: prof. Maciej Wojtkowski
- *Benchmarking Human Tissue Culture Systems that Mimic the Tumor Microenvironment*, OPUS 21, project leader: Marcin Tabaka, PhD
- *Development of a non-invasive diagnostic method for early detection of changes in the level of retinol binding protein 3 (RBP3) linked to Diabetic Retinopathy,* PASIFIC Fellowship Programme (PAS), project leader: Vineeta Kaushik, PhD
- *Parallel interferometric near-infrared spectroscopy for noninvasive monitoring of the cerebral blood flow in humans in vivo*, SONATA BIS 12, Dawid Borycki, PhD
- *Comprehensive, multimodal profiling of chromatin states and gene expression in single cells*, SONATA BIS 12, Marcin Tabaka, PhD
- *A new approach for gene delivery into retinal bipolar cells*, OPUS 24, Andrzej Foik, PhD
- *Conference on Recent Advances in Translational Eye Research*, Ministry of Education and Science, project leader: Prof. Maciej Wojtkowski
- *Chimeric Rhodopsin as a novel optogenetic tool*, SONATINA 7, Jagoda Płaczkiewicz, PhD

Ministry of Education and Science

FNP Foundation for Polish Science

National Science Centre Poland

Funded by the European Union

48,4% PL FUNDING

51,6% EU FUNDING

Human Resources

61 EMPLOYEES

31 women

30 men

13 FOREIGNERS

USA: **3**

Italy: **2**

Portugal: **1**

India: **5**

Iran: **1**

Belarus: **1**

5	8	11	25	3	9
GROUP LEADERS	POSTDOCS	PHD STUDENTS	R&I STAFF	EMERITUS PROFESSORS	ADMINISTRATION

MEMBERS OF ICTER. PHOTO BY: PÉTER KOVÁCS.

Brief history of ICTER

In 2015, to boost its potential in translational eye research, Institute of Physical Chemistry, Polish Academy of Sciences recruited ERA Chair holder - Prof. Maciej Wojtkowski. He developed a new department, subsequently turned in 2019 into a new subunit – International Centre for Translational Eye Research, ICTER, developing cutting-edge technologies to support the diagnosis and treatment of eye diseases in collaboration with the University of California, Irvine.

This includes optical imaging technologies with a leading role in OCT and an interdisciplinary research program in the biology of vision and computational retinal genomics. Establishment of ICTER as a developing Centre of Excellence (CoE), has introduced European Research Area (ERA) standards to scientific innovation in Poland and strenghtened collaboration with the ERA community.

ICTER, as a centre operating within the Institute of Physical Chemistry of the Polish Academy of Sciences, functions under the HR Excellence in Research logo awarded to the Institute by the European Comission in 2014.

1 Safe vision
vision science, laser projection, two photon vision, holography

active corrective instrumentation →

2 Therapeutics
medicine, ophthalmology, structural biology, genomics

← imaging & robotics

3 Technology
3-D guidance, AR systems artificial intelligence, functional imaging

OUR ROAD TO EXCELLENCE

2015-2021
ERA CHAIR: CREATE
€2.5 M

→

2019-2023
IRAP BY FNP: ICTER
€8 M

→

2023-2029
SUBSEQUENT GRANT APPLICATIONS SUBMITTED AND CURRENTLY UNDER EVALUATION

Mission and vision

The aim of the Centre is to advance new technologies leading to the development of new eye treatment methods in the fields of minimally invasive surgery, biochemical control of protein machinery, genetic repair of inherited diseases, and tissue engineering.

We are also working on the advancement of optical imaging technology and state-of-the-art robotics to assist in eye surgery and drug delivery.

Our vision is to emerge as an internationally recognized centre of scientific excellence, with highly qualified staff and resources, engaged in translational activities at the highest global level and aimed at achieving a significant impact on the health of the eye.

vision tech

eye med tech

precision medicine

Prevention and early diagnosis.

Development of methods to introduce new therapies for the eyes.

Cooperation of scientists and business to foster collaboration in the fields of eye med tech and precision medicine.

Interdisciplinary teawork is the key to our success.

ICTER is a part of the Institute of Physical Chemistry, Polish Academy of Sciences.

ICTER's strategic foreign partner is the Institute of Ophthalmology within the Faculty of Brain Sciences of the University College London, United Kingdom.

UCI School of Medicine

ICTER's scientific international partner is the University of California, Irvine (UCI). We closely collaborate with the UCI School of Medicine, especially with the Center for Translational Vision Research at the Gavin Herbert Eye Institute.

We create a global eye health ecosystem

Scientists and engineers working in laboratories in Warsaw/Poland, London/UK and Irvine/US collaborate to achieve our common goal: improve the ocular health of humanity. Our ecosystem is expanding, positively impacting the quantity and quality of scientific knowledge about eye functioning and structure. This leads to the prevention and treatment of sight diseases, and the development of new eye therapies and precision ocular medicine.

ICTER ecosystem

UC Irvine (USA)

Bascom Palmer Eye Institute (USA)

Moorfields Eye Hospital

University of Sorbonne

Institut de la Vision

University of Zaragozza

CSIC Madrid

Institute of Animal Reproduction and Food Research, PAS

Nicolaus Copernicus University, Toruń

Warsaw University, European Studies on Ophthalmic Optics and Optometry

Nałęcz Institute of Biocybernetics and Biomedical Engineering, PAS

Nencki Institute of Experimental Biology, PAS

Wrocław University of Science and Technolog

Department of Construction Engineering and Biomedical Engineering, WTU

Intellectual Property and industry collaboration

Since the beginning of the ICTER life we have been looking for external partnerships, both industrial and academic. Vast potential of our scientific and engineering output attracted a number of interested parties. Our scientific collaborators work with us on new eye imaging techniques and optometrists education while our industrial partners develop novel laser sources, imaging devices or medicines against eye diseases. To strengthen such bonds, ICTER typically arranges for signing a series of documents, including an NDA, R&D framework agreement and eventually specific R&D task contracts. This legal structure, once built, is expected to provide for an easy procedure of initiating new joint projects. We have established a collaboration with companies from big pharma sector, small pharma developers, eye imaging device startups, and laser manufacturers. Several R&D contracts are in the process of negotiating the operational details.

Our well-tested collaborator is the Oculomedica eye surgery clinic in Bydgoszcz, Poland. This is a place where we turn to if we need clinical validation for our new scientific imaging method. Direct contact with ophthalmologists gives us an insight from the perspective of future users of the technologies being developed, allowing us to focus only on the most promising ideas and solutions.

Collaboration with Industry (PL)

FLUENCE
laser manufacturer, start-up from IPC PAS

INCELLVU
start-up from IPC PAS

MODE-LOCKED TECHNOLOGY
laser manufacturer, start-up from Wrocław University of Science and Technology

OCULOMEDICA
ophthalmic surgery clinic from Bydgoszcz

OFTALABS
ophthalmic R&D

OPTOPOL
manufacturer of OCT devices

POLFA WARSZAWA
pharma R&D Centre

Collaboration with Industry (US)

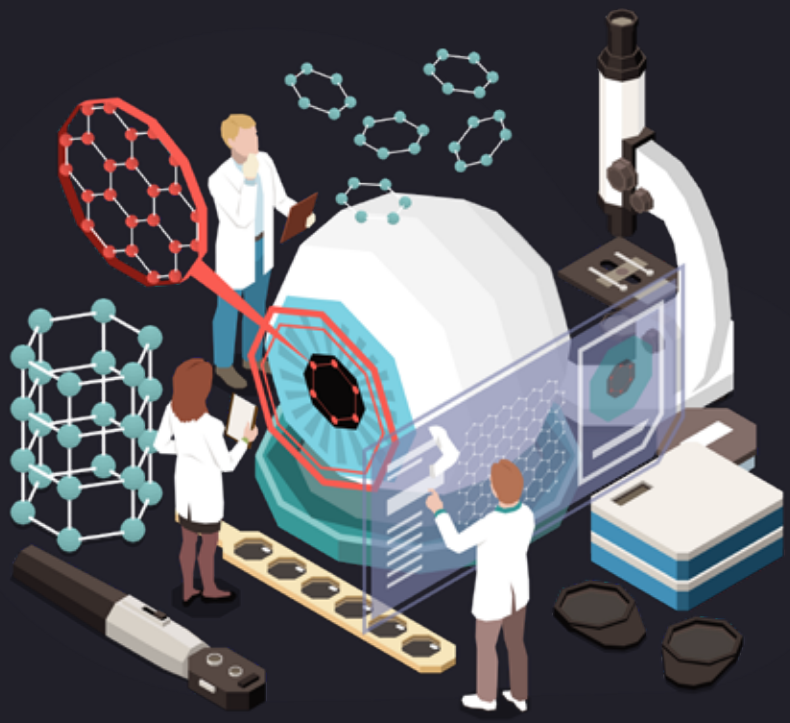
POLGENIX
development of genetic therapies (Prof. Palczewski)

PRAEVIUM
laser manufacturer

Scientific groups

We believe that behind every institution that makes a breakthrough in science there are extraordinary people: visionaries, risk-takers, passionate professionals. That is why we hire the top specialists in their fields, and provide them with optimal conditions and state-of-the-art technological equipment for growth. Our research is carried out within five research groups that work together, aiming at synergy and interdisciplinarity.

Physical Optics and Biophotonics (POB)



The research in our group can be seen as a synergistic interplay of physics, biology, and chemistry. We are focused on developing imaging techniques and using them in many biological and chemical systems.

The uniqueness of our approach is using not only the amplitude of the light but also its phase in order to develop new, worldclass imaging systems. Optical Coherence Tomography is a great example of such a method, and we are advancing its capabilities by implementing an innovative method for removal of image distortion - STOC (Spatio Temporal Optical Coherence manipulation), which has the potential to largely increase the quality of imaging through opaque layers, such as skin.

All projects are aimed to bring to humanity new noninvasive imaging techniques, that will enhance our understanding of nature, increase quality of life, and extend longevity.

Group members:

Prof. Maciej Wojtkowski
Anna Salamończyk
Dawid Borycki, PhD
Michał Dąbrowski, PhD
Hubert Doleżyczek, PhD
Oliwia Kaczkoś
Piotr Kasprzycki, PhD
Katarzyna Komar, PhD
Monika Malinowska, PhD
Marta Mikuła-Zdańkowska, PhD
Kamil Liżewski, PhD
Sławomir Tomczewski, PhD
Piotr Węgrzyn

Marcin Marzejon, PhD
Karol Karnowski, PhD
Aliaksei Bohdan
Jakub Bogusławski, PhD
Grażyna Palczewska, PhD
Onur Çetinkaya
Rafał Pietruch
Mounika Rapolu, PhD
Justyna Sałacińska
Saeed Samaei
Szymon Korotko
Lyane Darabian, PhD

Ophthalmic Biology Laboratory (OBi)

The ultimate goal of the OBi Group is to prevent loss of neuronal cells, restraining pathological functional plasticity, and restore visual signal processing in the diseased retina by strengthening and adjustment of activity in the remaining neuronal cells.

Our molecular biology lab utilizes the latest advancements in genetics and viral tracing techniques to find new viral gene therapies to support cellular structures responsible for the detection of visual signals. In the electrophysiological lab using in vivo and in vitro techniques, we analyze local and distant communication between the different populations of neurons responsible for visual information processing in healthy and diseased retina and brain in order to get insight into changes in the functioning of the neuronal networks of the visual pathway in the pathological conditions. Electrophysiology is also a tool to test at the systematic level the effects of the therapies which will be created in our molecular biology lab.

The engineering and computational branch of OBi Group makes an effort to harness new technologies and machine learning to desigh new diagnostic devices and equipment for support visual processing in the diseased retina. Creating models of neuronal networks of visual pathways enables us to investigate the mutual functional relationships between different neuronal cell populations in order to predict how they will change when some of them become unfunctional under pathological conditions.

Group members:

Andrzej Foik, PhD
Anna Posłuszny, PhD
Bartłomiej Bałamut
Mehdi Borjkhani, PhD
Anna Galińska
Katarzyna Kordecka, PhD
Maciej Kostałkowski
Milena Mućka
Marta Nowak
Lucyna Piórkowska
Jagoda Płaczkiewicz, PhD
Karolina Saran
Anna Zajfert

Katarzyna Oksejuk

Integrated Structural Biology (ISB)

Research in the Integrated Structural Biology Group aims to elucidate the mechanisms of vision, particularly involving proteins of the phototransduction pathway and the visual cycle, at an atomic and molecular level, using structural biology techniques and other complementary biophysical characterization.

The reception of light by the eye, via photons captured by chromophoreloaded opsin proteins with 11cis to all-trans-retinal photoisomerization, initiates both phototransduction and the visual cycle. In phototransduction, a series of complex reactions lead to the perception by the brain of the visual stimulus via a signal cascade that, ultimately, decreases the levels ofintracellular cGMP, which is later replenished. In the visual cycle, a series of enzymatic reactions and transport processes across different cells restores the 11-cisretinal from its all-trans form. Thus, the photoreceptors immediately follow through to restore cellular homeostasis and the responsive state of the opsins with their adducted 11-cis retinal chromophores, poised for a new stimulus.

Our ultimate goal is to help develop therapeutics for the treatment of eye disorders and help prevent or at least delay the onset of eye diseases.

Group members:

Humberto Fernandes, PhD
Magdalena Pieczyńska-Kovács, PhD
Luca Gessa
Sathi Goswami, PhD
Nelam Kumar
Łukasz Olejnik

Aruna Rani, PhD
Joanna Krwawicz, PhD
Vineeta Kaushik, PhD

Image-guided Devices for Ophthalmic Care (IDoc)

The Image-guided Devices for Ophthalmic Care Group seeks to research novel techniques and develop instrumentation to address unanswered questions in vision science and unmet needs in ophthalmology and optometry.

The IDoc team members put their expertise in optical engineering, imaging, biomedical physics, computing, and mechatronics to work on the full range of translational eye research, by collaborating with vision scientists on the basic end and with ophthalmologists, optometrists, and surgeons on the clinical end.

The IDoc Group's research topics can be classified in two broad categories:

- Research into novel optical, biomechanical, and computing techniques for structural and functional studies of the eye.
- Development of instrumentation for preclinical, clinical, and surgical eye care.

Group members:

Andrea Curatolo, PhD
Katarzyna Wybrańska, PhD
Krzysztof Gromada
Karol Karnowski, PhD
Wiktor Kulesza
Jadwiga Milkiewicz
Klaudia Nowacka
Tomasz Piesio
Maciej Wielgo

Adam Kurek
Piotr Ciąćka, PhD
Bartłomiej Piotrowski
Kamil Łuczkiewicz
Filomena Kowalska

Computational Genomics Group (CGG)

Research conducted at the CGG focuses on combining approaches from statistics, statistical physics, mathematics, and computer science to develop new computational methods to manage the complexity of information from massive single-cell omics experiments and resolve biological processes.

Computational work in our lab focuses on developing new algorithms and scalable tools for analyzing massive single-cell datasets and integrating them across platforms and techniques.

Our chief experimental activity focuses on leveraging high-throughput single-cell transcriptome and epigenome sequencing for interrogation of the ecosystems of eye cancer. Uveal melanoma is a rare but highly metastatic eye cancer resistant to therapies. When uveal melanoma metastasizes to different parts of the body, the 5-year survival rate is only 13%. Single-cell multiomics sequencing will allow us to dissect the complex ecosystem of the tumor and the immune repertoire infiltrating it; and to understand the intercellular communication between subpopulations of immune cells. This approach will also provide new mechanistic insights about the biology of uveal melanoma, suggesting potential therapies.

Group members:

Marcin Tabaka, PhD
Magdalena Banach-Orłowska,PhD
Chinjusha
Julita Machlowska, PhD
Natalia Ochocka-Lewicka, PhD
Agnieszka Olszewska
Damian Panas, PhD
Stefania Robakiewicz, PhD
Piotr Rutkowski

Witalis Domitrz
Bartosz Banasik

Research Supporting Team

Administrative support plays a crucial role in ensuring the smooth functioning of ICTER. From managing human resources and accounting, processing purchases and invoices, coordinating scientific projects and handling research grant proposals, research supporting professionals provide essential assistance to executives and groups. They are responsible for maintaining efficient office operations, handling inquiries, and facilitating effective communication, both internally and externally. These professionals contribute to increased productivity, organisational excellence, and the overall success of ICTER.

Group members:

Anna Pawlus
Zuzanna Gaworska
Joanna Kartasiewicz
Agnieszka Leonkiewicz
Anna Przybyło-Józefowicz, PhD
Magdalena Samson
Barbara Wendołowska

Ewa Wiśniewska
Monika Żelazik
Karolina Drygas
Agnieszka Berendt

Publications

Our scientists publish their research in international peer-reviewed journals. ICTER's papers since 2019 include 66 articles, 2 book chapters, 40 peer reviewed (JCRs), 24 conference proceedings (6 full text). The articles were published in the following journals: Brain Research Bulletin, eNeuro, Investigative Ophthalmology & Visual Science, Physica B: Condensed Matter, Nature Communications, PNAS, Biomedical Optics Express, OPTICA, iSCIENCE, Pathogens, Diagnostics, Acta Neurobiol Exp, Journal of Clinical Investigation, JCI insight, Optics Letters, Nature Biomedical Engineering. ICTER's researchers have delivered 85 conference presentations (oral and posters), 15 invited conference talks, and 12 invited seminars and short courses.

The complete and updated publications list can be found on the ICTER website.

The Journal of Clinical Investigation — CLINICAL MEDICINE

In vivo imaging of the human eye using a 2-photon-excited fluorescence scanning laser ophthalmoscope

Jakub Bogusławski,[1,2,3] Grazyna Palczewska,[1,2,4,5] Sławomir Tomczewski,[1,2] Jadwiga Milkiewicz,[1,2] Piotr Kasprzycki,[1,2] Dorota Stachowiak,[2] Katarzyna Komar,[1,2,6] Marcin J. Marzejon,[1,2,7] Bartosz L. Sikorski,[8,9] Arkadiusz Hudzikowski,[3] Aleksander Gluszek,[9] Zbigniew Łaszczych,[9] Karol Karnowski,[1,2] Grzegorz Sobon,[9] Krzysztof Palczewski,[5,10,11,12] and Maciej Wojtkowski[2,5,8]

BACKGROUND. Noninvasive assessment of metabolic processes that sustain regeneration of human retinal visual pigments (visual cycle) is essential to improve ophthalmic diagnostics and to accelerate development of new treatments to counter retinal diseases. Fluorescent vitamin A derivatives, which are the chemical intermediates of these processes, are highly sensitive to UV light; thus, safe analyses of these processes in humans are currently beyond the reach of even the most modern ocular imaging modalities.

METHODS. We present a compact, 2-photon–excited fluorescence scanning laser ophthalmoscope and spectrally resolved images of the human retina based on 2-photon excitation (TPE) with near-infrared light. A custom Er:fiber laser with integrated pulse selection, along with intelligent postprocessing of data, enables excitation with low laser power and precise measurement of weak signals.

RESULTS. We demonstrate spectrally resolved TPE fundus images of human subjects. Comparison of TPE data between human and mouse models of retinal diseases revealed similarity with mouse models that rapidly accumulate bisretinoid condensation products. Thus, visual cycle intermediates and toxic byproducts of this metabolic pathway can be measured and quantified by TPE imaging.

CONCLUSION. Our work establishes a TPE instrument and measurement method for noninvasive metabolic assessment of the human retina. This approach opens the possibility for monitoring eye diseases in the earliest stages before structural damage to the retina occurs.

FUNDING. NIH, Research to Prevent Blindness, Foundation for Polish Science, European Regional Development Fund, Polish National Agency for Academic Exchange, and Polish Ministry of Science and Higher Education.

Introduction

Ophthalmic imaging techniques are cornerstones in diagnosing retinal pathologies, disease management, and as a measure of surgical outcomes. In the last few decades, improvements in noninvasive imaging techniques have revolutionized the practice of ophthalmology. For example, optical coherence tomography (OCT) (1), scanning laser ophthalmoscopy (SLO) (2), and fundus autofluorescence (FAF) imaging (3) are imaging modalities that provide significant structural information about the back of the eye, complementary to traditional fundus photography. These 3 techniques continue to undergo further innovative transformations.

Noninvasive assessment of metabolic processes that sustain regeneration of visual pigment in the human eye is essential for the development of therapies against degenerative retinal diseases. Although existing optical imaging tools can provide high-resolution images, they reveal tissue dysfunction only when a structural phenotype already exists and, therefore, they are insensitive to early or low-grade tissue dysfunction. For example, age-related macular degeneration (AMD) is one of the most common blinding diseases affecting the world's aging population. However, optical imaging reveals phenotypic abnormalities after disease begins, and no visual function testing can discern early disease from normal retinal function (4). Different aspects of retinal tissue function are encoded

Authorship note: JB and GP are co–first authors.
Conflict of interest: KP is Chief Scientific Officer at Polgenix, Inc. and is an inventor on US patents 7,768,653 and 8,346,345 (Methods for assessing a physiological state of a mammalian retina). GP is an employee of Polgenix, Inc.

Submitted: August 18, 2021; **Accepted:** November 24, 2021; **Published:** January 18, 2022.
Reference information: J Clin Invest. 2022;132(2):e154218.
https://doi.org/10.1172/JCI154218.

https://icter.pl/publications

Supplemental Document

Optics Letters

Multimode fiber as a tool to reduce cross talk in Fourier-domain full-field optical coherence tomography: supplement

Egidijus Auksorius,[1,2,3,*] Dawid Borycki,[1,3] Piotr Wegrzyn,[1,3,4] Ieva Žičkienė,[2] Karolis Adomavičius,[2] Bartosz L. Sikorski,[5,6] and Maciej Wojtkowski[1,3,7]

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[4]*Faculty of Physics, University of Warsaw, Pasteura 5, 02-093 Warsaw, Poland*
[5]*Department of Ophthalmology, Nicolaus Copernicus University, Skłodowskiej-Curie 9, 85-090, Bydgoszcz, Poland*
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and the published article's title, journal ci

Research Article — Vol. 11, No. 5 / 1 May 2020 / Biomedical Optics Express 2849

Biomedical Optics EXPRESS

In vivo imaging of the human cornea with
peed and high-resolution Fourier-domain
d optical coherence tomography

Auksorius,[1,4,*] Dawid Borycki,[1,4] Patrycjusz
ewski,[1] Kamil Liżewski,[1] Sławomir Tomczewski,[1]
Niedźwiedziuk,[1] Bartosz L. Sikorski,[2,3] and Maciej
ski[1]

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orneal evaluation in ophthalmology necessitates cellular-resolution and fast imaging
t allow for accurate diagnoses. Currently, the fastest volumetric imaging technique
main full-field optical coherence tomography (FD-FF-OCT), which uses a fast
rapidly tunable laser source. Here, we demonstrate high-resolution, high-speed,
orneal volumetric imaging *in vivo* with FD-FF-OCT that can acquire a single 3D
voxel rate of 7.8 GHz. The spatial coherence of the laser source was suppressed
from focusing on a spot on the retina, and therefore, exceeding the maximum
xposure (MPE). The inherently volumetric nature of FD-FF-OCT data enabled
urved corneal layers. The acquired FD-FF-OCT images revealed corneal cellular
ch as epithelium, stroma and endothelium, as well as subbasal and mid-stromal

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tion

ing is crucial in the diagnosis and treatment of eye diseases. Imaging of cornea,
allenging due to its relatively high transparency in the visible and near-infrared
ns. Slit-lamp biomicroscopy and specular microscopy are routinely employed
elium and endothelium layers of the cornea, but they cannot visualize its inner
ch as stroma, due to the lack of optical sectioning. To address that, confocal
as been introduced [1] to discriminate different corneal layers with the help of
ple that provides optical sectioning. However, it is a relatively slow technique since
D) imaging requires point-by-point scanning of the cornea in all three directions
takes the method vulnerable to imaging artifacts due to eye motions. Nipkow disc
ning [3] confocal microscopy can be used to achieve higher speeds. However, to
olve different corneal layers axially, high numerical aperture (NA) objectives have
reate a narrow depth-of-field (DOF), which, however, typically requires immersion
gh the immersion also helps to reduce specular reflections from the cornea, it does,
ands ocular anesthesia, making the confocal microscopy a contact method and,
ractive for routine medical examinations.
erence tomography (OCT) is a well-established tool in corneal imaging [4,5]. It

Research Article — Vol. 6, No. 5 / May 2019 / Optica 608

optica

***In vivo* volumetric imaging by crosstalk-free full-field OCT**

Patrycjusz Stremplewski, Egidijus Auksorius, Paweł Wnuk, Łukasz Kozoń, Piotr Garstecki, and Maciej Wojtkowski*

Institute of Physical Chemistry, Polish Academy of Sciences, Kasprzaka 44/52, 01-224 Warsaw, Poland
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Received 25 February 2019; revised 8 April 2019; accepted 8 April 2019 (Doc. ID 360929); published 7 May 2019

Cellular resolution imaging of biological structures has always been a challenge due to strong scattering that limits the achievable transverse resolution or imaging penetration depth. Recently, a major advancement toward high-resolution and volumetric imaging was achieved by implementing a parallel detection (i.e., full field) into Fourier-domain optical coherence tomography. The drawback of using parallel detection is that scattered light can travel laterally and get mapped improperly at a camera creating optical crosstalk, which severely impairs the interpretation of subcellular images and limits its use in medical diagnostics. In this work, we demonstrate for what we believe is the first time how to efficiently reduce crosstalk and enable microscopic quality volumetric reconstructions of the scattering tissue-like human skin *in vivo*, all within less than a half of a second. To minimize crosstalk, we implemented a very fast deformable membrane that introduces random phase illumination. Additionally, the sample is illuminated under variable angles to reduce the contrast of speckles by incoherent summation of the crosstalk-free volumes. Introducing crosstalk and speckle-free OCT will advance imaging prospects closer to the ideal of a noninvasive optical biopsy.

https://doi.org/10.1364/OPTICA.6.000608

1. INTRODUCTION

The remarkable development of optical imaging methods that has taken place in recent decades brings us closer to noninvasive microscopic imaging of cells embedded in the tissues of living organisms. Special attention should be paid to optical methods providing information about the amplitude and phase, which can be further processed by advanced computational techniques to create volumetric reconstructions. One such modality is optical coherence tomography (OCT), which is a family of imaging technologies based on low-coherence interferometry [1,2].

There are currently more than a dozen different ways to exploit low-coherence imaging in competitive scenarios, including time versus Fourier domain detection, full-field versus scanning (confocal) configurations, *en face* versus B-scan acquisition, and swept-source versus spectrometer-based detection [2–5]. To obtain an appropriate signal-to-noise ratio (SNR) of optical reconstructions, most of the OCT techniques use spatially coherent light with adequately high optical density values.

Unfortunately, spatially coherent radiation severely impairs the interpretation of cross-sectional images and limits its use in medical diagnostics by the presence of speckles in OCT reconstructions [6–10]. Recently, we demonstrated that it is possible to emulate the spatial incoherence by using spatio-temporal optical coherence manipulation (STOC), which tailors the effective fringe visibility of spatially coherent radiation [11,12]. This method can only be effectively applied to full-field OCT (FF-OCT) since it requires spatial mode mixing for different locations in space, which is impossible in scanning OCT systems. It is especially advantageous to apply such solutions to Fourier-domain full-field OCT (FdFF-OCT), which benefits from higher speed and improved SNR [13–16].

In the scanning OCT devices, the signal-degrading contributions from multiply scattered light are reduced by an aperture placed before the detector, which is usually implemented in the form of a single-mode fiber [7,9,17,18]. This approach is like the designs in classical confocal microscopy. Therefore, in the most typical OCT applications, the contribution of the signal-degrading speckle pattern is less pronounced, and the dominating source of coherence noise becomes signal-carrying speckle patterns [18]. The remaining part of multiply scattered light, which is not filtered by the confocal gating, contributes to the coherence signal only in the in-depth direction causing axial delocalization of the OCT signal by forming artificial "tails" in optical A scans [19]. Additionally, the sensitivity of OCT is greatly improved by a rejection of most of the multiply scattered waves that additionally experience optical delays longer than the coherence time (temporal coherence gating). The combination of those two filtering mechanisms is critical to achieve high-quality reconstructions of living tissue.

Full-field OCT methods do not use transversal scanning of the focused probing beam. Instead, the interferometric signal is recorded in parallel for all transverse points of the illuminated sample by a matrix of photodetectors, such as in CMOS or CCD cameras. Single-scattered or reflected light waves coming from

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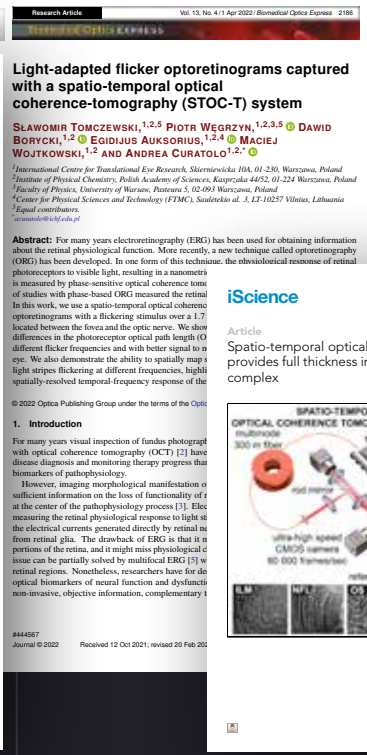

nature biomedical engineering — ARTICLES

https://doi.org/10.1038/s41551-020-00632-6

Check for updates

Restoration of visual function in adult mice with an inherited retinal disease via adenine base editing

Susie Suh,[1,2,12] Elliot H. Choi[1,2,12], Henri Leinonen[1], Andrzej T. Foik[3,4], Gregory A. Newby[5,6,7], Wei-Hsi Yeh[5,6,7,8], Zhiqian Dong[1], Philip D. Kiser[9,10], David C. Lyon[3], David R. Liu[5,6,7] and Krzysztof Palczewski[1,9,11]

Cytosine base editors and adenine base editors (ABEs) can correct point mutations predictably and independent of Cas9-induced double-stranded DNA breaks (which causes substantial indel formation) and homology-directed repair (which typically leads to low editing efficiency). Here, we show, in adult mice, that a subretinal injection of an adeno-associated virus expressing an ABE and a single-guide RNA targeting a de novo nonsense mutation in the *Rpe65* gene corrects the pathogenic mutation with up to 29% efficiency and with minimal formation of indel and off-target mutations, despite the absence of the canonical NGG sequence as a protospacer-adjacent motif. The ABE-treated mice displayed restored RPE65 expression and retinoid isomerase activity, and near-normal levels of retinal and visual functions. Our findings motivate the further testing of ABEs for the

protospacer-ad

ations with non-canonical

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Research Article — Vol. 13, No. 4 / 1 Apr 2022 / Biomedical Optics Express 2186

Biomedical Optics EXPRESS

Light-adapted flicker optoretinograms captured with a spatio-temporal optical coherence-tomography (STOC-T) system

Sławomir Tomczewski,[1,2,5] Piotr Węgrzyn,[1,2,3,5] Dawid Borycki,[1,2] Egidijus Auksorius,[1,2,4] Maciej Wojtkowski,[1,2] and Andrea Curatolo[1,2,*]

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Abstract: For many years electroretinography (ERG) has been used for obtaining information about the retinal physiological function. More recently, a new technique called optoretinography (ORG) has been developed. In one form of this technique, the physiological response of retinal photoreceptors to visible light, resulting in a nanometri
is measured by phase-sensitive optical coherence tom
of studies with phase-based ORG measured the retinal
In this work, we use a spatio-temporal optical coheren
optoretinograms with a flickering stimulus over a 1.7
located between the fovea and the optic nerve. We show
differences in the photoreceptor optical path length (O
different flicker frequencies and with better signal to n
eye. We also demonstrate the ability to spatially map s
light stripes flickering at different frequencies, highli
spatially-resolved temporal-frequency response of the

1. Introduction

For many years visual inspection of fundus photograph
with optical coherence tomography (OCT) [2] have
disease diagnosis and monitoring therapy progress that
biomarkers of pathophysiology.

However, imaging morphological manifestation o
sufficient information on the loss of functionality of r
at the center of the pathophysiology process [3]. Elec
measuring the retinal physiological response to light st
the electrical currents generated directly by retinal n
from retinal glia. The drawback of ERG is that it n
portions of the retina, and it might miss physiological d
issue can be partially solved by multifocal ERG [5] w
retinal regions. Nonetheless, researchers have for de
optical biomarkers of neural function and dysfuncti
non-invasive, objective information, complementary t

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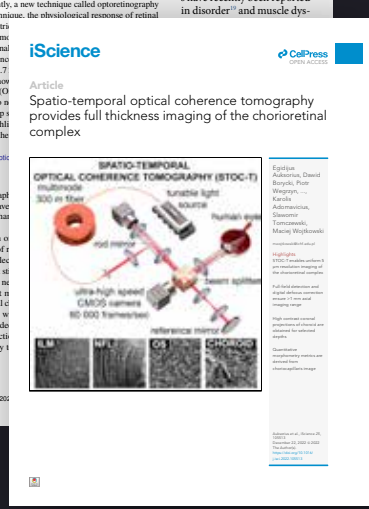

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Article

Spatio-temporal optical coherence tomography provides full thickness imaging of the chorioretinal complex

Egidijus Auksorius, Dawid Borycki, Piotr Węgrzyn, Karolis Adomavicius, Sławomir Tomczewski, Maciej Wojtkowski

Communication and PR

Highlights of 4 years of activity

Employee survey about internal and external communication - December 2020 •

Creation of a Communication Strategic Report - January 2021 •

Hiring a Communication and PR Manager - May 2021 •

Launching of the Internal and External Newsletter - May 2021 •

Professional photo session of all the employees - June 2021 •

Creation of branding and visual identity of ICTER - June 2021 •

Launching of the new ICTER website - September 2021 •

Graphic design and printing of the new brochure - October 2021 •

PR training by a professional science promotion agency – October 2021 •

Creation of a PR Team (7 members) – November 2021 •

Hiring a science popularization journalist – February 2022 •

Organization of an Annual Employees and ISC Meeting in Warsaw – March 2022 •

Training in Public Speaking - May 2022 •

Launching of Facebook and Instagram channels – June 2022 •

Implementing a storytelling strategy and interviews' series – July 2022 •

Enlargement of the PR Team with new members (curently 11) and volunteers – September 2022 •

PR Team training in SEO – September-December 2022 •

PR management

ICTER's communication and PR is carried out by PR Manager and actively supported by the PR Team. The Team is composed by 11 employees, representing all research groups and all levels of seniority, and by members of administrative staff. The team is additionally assessed by the Board Consultant in Ophthalmology. PR Team members and collaborators conduct interviews with our most promising scientists, prominent researchers worldwide, ophthalmologists and a representative of the optics industry.

Professional photo sessions illustrating press materials are carried out by our senior researcher and photographer Karol Karnowski.

Internal and external communication

In terms of internal communication, we have several weekly initiatives: meetings of ICTER Chairs, meetings of ICTER Board, general Principal Investigators meetings, among others. So far, we published 75 internal newsletters.

ICTER is present on Twitter/X and LinkedIn. Additionally, in 2022 we launched Facebook and Instagram ICTER pages. The Centre is present on the Institute of Physical Chemistry, Polish Academy of Science, and Foundation for Polish Science (FNP) websites, with particular subpages dedicated to ICTER. So far, we have published 20 external bulletins and maintained a vivid and constant presence on social media.

ICTER scientists have been showcased in radio, TV, Youtube, and press interviews. Some of our appearances include: interviews for Science in Poland, Polityka Weekly, PAP Health Service, Innovation Leaders, radio channels from different regions of Poland, Interia Weekly Academic Forum, and international magazines like The Ophthalmologist, Modern Retina, Ophthalmology Times, and others. The press event we held on 10 May 2023 at ICTER co-organized with the FNP resulted in more than 40 press materials featuring the centre and presenting the groundbreaking research our scientists advance at ICTER.

Public relations

ICTER has implemented PR strategy to promote targeted and professional information about the Centre and increase its international visibility.

Our particular popularization success in 2022 was a PR campaign with a press release entitled: „OCT examinations without noise. A new method for better detection of eye diseases" regarding the paper *Multimode fibre as a tool to reduce cross talk in Fourier-domain full-field optical coherence tomography*, published in Optics Letters, which received recognition from the prestigious Optica association. The aforementioned press release reached an audience of 4.8 million worldwide!

In July 2022, the storytelling strategy was launched. PR Team members and collaborators conduct interviews with prominent researchers worldwide, ophthalmologists and a representatives of the optics industry. So far, we have interviewed the following people, among others:

- Brendan Kennedy, Associate Professor, University of Western Australia,
- Prof. Marco Ruggeri, Bascom Palmer Eye Institute,
- Brook Hardwick, Head of ICFO's Corporate Communications,
- Jarosław Bugaj, owner of Studio Optyk Optical Store,
- Anna M. Ambroziak, MD, Scientific Director of the Ophthalmology Centre Świat Oka in Warsaw.

The interviews were published on ICTER website and widely promoted on ICTER's social media: Facebook, Instagram, Twitter, and LinkedIn.

In June 2023, ICTER's Communication and PR Manager Anna Przybyło-Józefowicz became a member of the Network for the Public Communication of Science and Technology (PCST).

Awards

In May 2022, Prof. Krzysztof Palczewski from UC Irvine has been selected to the National Academy of Sciences (NSA), one of the world's most respected scientific organizations.

Prof. Palczewski is also the 2022 laureate of the Goodman and Gilman Award in Receptor Pharmacology by the American Society for Pharmacology and Experimental Therapeutics (ASPET). •

In October 2021, Prof. Wojtkowski was declared one of the winners of the „100 years of medical innovations in Poland" competition, awarded during the European Congress of Innovative Technologies for Health.

Prof. Wojtkowski was awarded this prize for creating the innovative tomograph for non-invasive and non-contact examination of the interior of the eye. •

Jakub Bogusławski was the laureate of the "Young Researchers" competition organized by the Institute of Physical Chemistry Polish Academy of Sciences (16.11.2020).

We won 1st prize in the competition for the best scientific paper published in the Institu- te of Physical Chemistry Polish Academy of Sciences in 2020. The awarded paper was: G. Palczewska, J. Bogusławski, P. Stremplewski, L. Kornaszewski, J Zhang, Z. Dong, X.-X. Liang, E. Gratton, A. Vogel, M. Wojtkowski, K. Palczewski, "Noninva- sive two-photon optical biopsy of retinal fluorophores," Proceedings of the Natio- nal Academy of Sciences 117(36), 22532-22543 (2020). •

In July 2021, Dr. Katarzyna Komar was honored by Optica (formerly OSA) with a Senior Membership. •

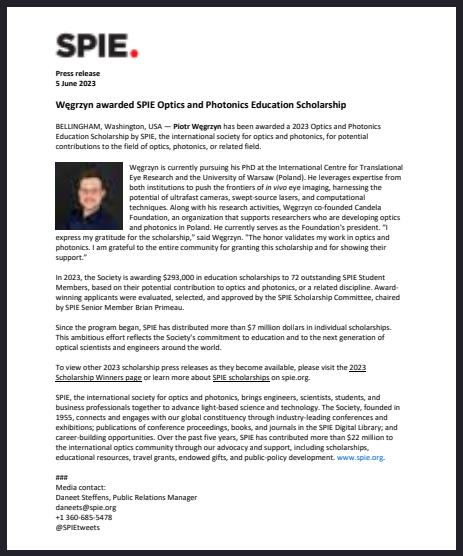
PhD student, Wiktor Kulesza won the Best Presentation for Young Scientist Award at the VII Polish Optical Conference in Toruń, in July 2023. •

Jagoda Płaczkiewicz, Post-doc in Ophthalmic Biology Laboratory, was awarded the Scientist of the Future (Naukowiec Przyszłości) prize by the Centre for Intelligent Growth (Centrum Inteligentnego Rozwoju). •

Bartłomiej Bałamut won the 2nd prize in the „MedTech-Athon competition - Engineers for Medicine", organized by CEZAMAT and the Warsaw University of Technology. Bartłomiej participated in this hackathon with his team „Fluofibers". •

PhD student Piotr Węgrzyn's presentation entitled "Role of multimode fibers in structural imaging of the choroidal and retinal tissue with Spatio Temporal Optcal Coherence Tomography (STOC-T)" was selected for the 2022 Biophotonics Congress: Biomedical Optics Student Paper Prize by the Optical Coherence Tomography committee chairs. •

Piotr Węgrzyn was also awarded the prestigious 2023 Optics and Photonics Education Scholarship by SPIE, the International Society for Optics and Photonics. This scholarship recognizes individuals who demonstrate remarkable potential in the field of optics, photonics, or a related discipline. •



SPIE.

Press release
5 June 2023

Wegrzyn awarded SPIE Optics and Photonics Education Scholarship

BELLINGHAM, Washington, USA — **Piotr Węgrzyn** has been awarded a 2023 Optics and Photonics Education Scholarship by SPIE, the international society for optics and photonics, for potential contributions to the field of optics, photonics, or related field.

Węgrzyn is currently pursuing his PhD at the International Centre for Translational Eye Research and the University of Warsaw (Poland). He leverages expertise from both institutions to push the frontiers of *in vivo* eye imaging, harnessing the potential of ultrafast cameras, swept-source lasers, and computational techniques. Along with his research activities, Węgrzyn co-founded Candela Foundation, an organization that supports researchers who are developing optics and photonics in Poland. He currently serves as the Foundation's president. "I express my gratitude for the scholarship," said Węgrzyn. "The honor validates my work in optics and photonics. I am grateful to the entire community for granting this scholarship and for showing their support."

In 2023, the Society is awarding $293,000 in education scholarships to 72 outstanding SPIE Student Members, based on their potential contribution to optics and photonics, or a related discipline. Award-winning applicants were evaluated, selected, and approved by the SPIE Scholarship Committee, chaired by SPIE Senior Member Brian Primeau.

Since the program began, SPIE has distributed more than $7 million dollars in individual scholarships. This ambitious effort reflects the Society's commitment to education and to the next generation of optical scientists and engineers around the world.

To view other 2023 scholarship press releases as they become available, please visit the 2023 Scholarship Winners page or learn more about SPIE scholarships on spie.org.

SPIE, the international society for optics and photonics, brings engineers, scientists, students, and business professionals together to advance light-based science and technology. The Society, founded in 1955, connects and engages with our global constituency through industry-leading conferences and exhibitions; publications of conference proceedings, books, and journals in the SPIE Digital Library; and career-building opportunities. Over the past five years, SPIE has contributed more than $22 million to the international optics community through our advocacy and support, including scholarships, educational resources, travel grants, endowed gifts, and public-policy development. www.spie.org.

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ICTER Events

2022 ICTER & ISC Annual Review Meeting

The ICTER International Scientific Committee meeting was held on 9 March 2022 and was attended by important figures, including Prof Paweł Rowiński - Vice President of the Polish Academy of Sciences, Prof Maciej Żylicz - President of the Board of the Foundation for Polish Science and Prof Adam Kubas - Deputy Director for Scientific Affairs of the Institute of Physical Chemistry, Polish Academy of Sciences.

We were honoured to host Alice Davidson, PhD and Colin Chu, PhD from University College London, Institute of Ophthalmology, Pearse Keane, PhD from Moorfields Eye Hospital, London, and Prof. Kris Palczewski from the University of California, Irvine. There was also a poster session presenting reseach progress in ICTER groups. The meeting was also an excellent opportunity to strengthen group relations.


ICTER

Press conference on the 10th of May 2023

On 10 May 2023 we hosted press conference to present centre's achievements to the wider audience. **Anna Clunes, the Ambassador of the United Kingdom of Great Britain and Northern Ireland to Poland**, was the event's guest of honor.

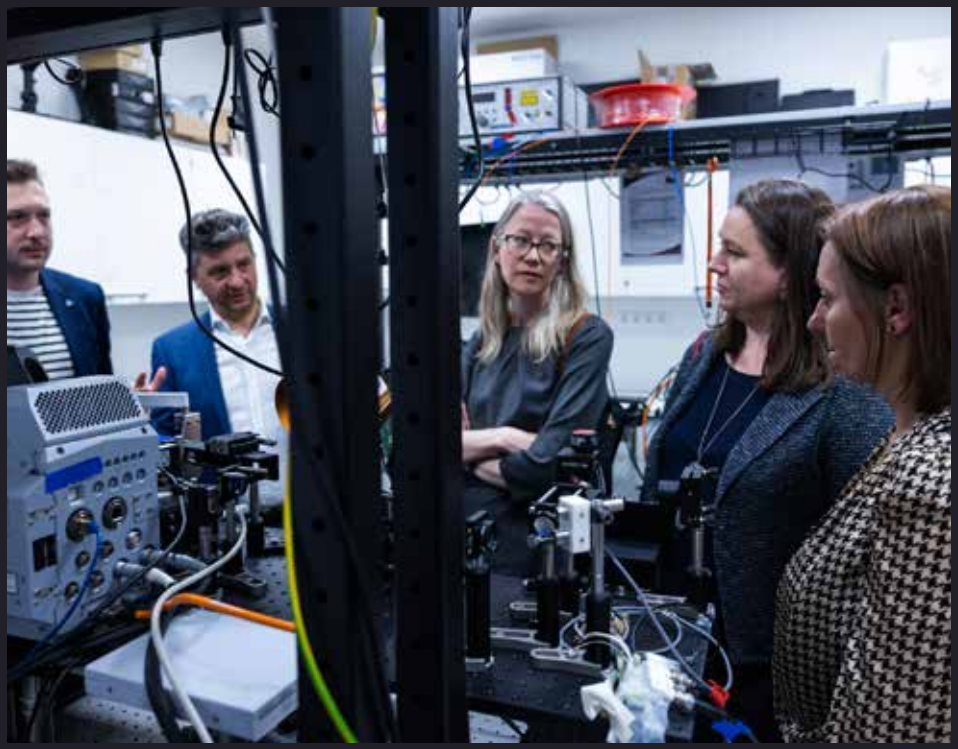
– ICTER is one of 14 International Research Agendas. It is the only such program in Poland, which allows the creation of new research units led by outstanding scientists, explained FNP Vice President Dr. Tomasz Perkowski, adding: *– The aim of the International Research Agendas program is to strengthen the quality of science in Poland, develop international cooperation and attract talent, and support the creation of innovative, internationally competitive solutions in a given field*.

Some of the technologies developed at ICTER are at the implementation stage. One of them is an innovative method enabling imaging of the retina using so-called fluorescence with two-photon excitation. This method permits, on the smallest, chemical scale, to assess whether the cells responsible for the vision process are functioning properly. Another technique is optoretinography, which offers precise measurement of the response of photoreceptors present in the retina to light.

Both techniques can be used to diagnose visual disorders, but they also make it possible to analyze whether implemented therapies are having the intended effect. In the case of optoretinography, the technique requires previously unimaginable precision – measuring devices must detect the elongation of light-sensitive eye cells by 1 nanometer, despite the movement of the entire organ.

ICTER collaborates with the world's leading eye research institutes, including University College London – the centre's strategic partner – as well as London's Moorfields Eye Hospital and the University of California, Irvine.

International scientific collaboration is key to advancing science and innovation, as well as to solving global health, climate or security challenges. Scientific cooperation across borders allows for the expansion of knowledge by additional elements, exchange of experience and competencies, access to research infrastructure and technology transfer – said Ambassador Anna Clunes, adding: *– The UK is an active partner of Poland in the field of scientific research. I am pleased that British centres and ICTER maintain close cooperation in research on the eye and its diseases. This is an important area for improving the quality of life for millions of people around the world. I hope that this cooperation will grow and benefit all countries*.



Our seminar series

We host invited talks by renowned scholars from the field of eye research and health science in our weekly seminar series. This recurring event is organized jointly with the Department of Physical Chemistry of Biological Systems at the Institute of Physical Chemistry, Polish Academy of Sciences.

















CRATER

Conference on Recent Advances in Translational Eye Research 2023

CRATER conference 7-8 September 2023

The **Conference on Recent Advances in Translational Eye Research 2023 (CRATER)** is a platform for all researchers, investors, and entrepreneurs whose interests focus on the eye to meet and discuss.

The conference will enable discussion between specialists from different fields who are united in their pursuit to understand better the challenges of eye imaging, the process of vision, and the formation of eye diseases. During this international and interdisciplinary event, we will discuss frontiers of research on new methods and tools enabling diagnosis and treatment of eye diseases and also ideas on how to facilitate rapid implementation of new eye therapies.

The conference will be chaired by: Andrew Dick (Institute of Ophthalmology, University College London, UK), Krzysztof Palczewski (University of California, Irvine, USA), and Maciej Wojtkowski (International Center for Translational Eye Research, Poland).

Detailed information on the conference, including a list of amazing invited speakers, is available on the conference webpage:

https://crater.icter.pl/

18 invited speakers

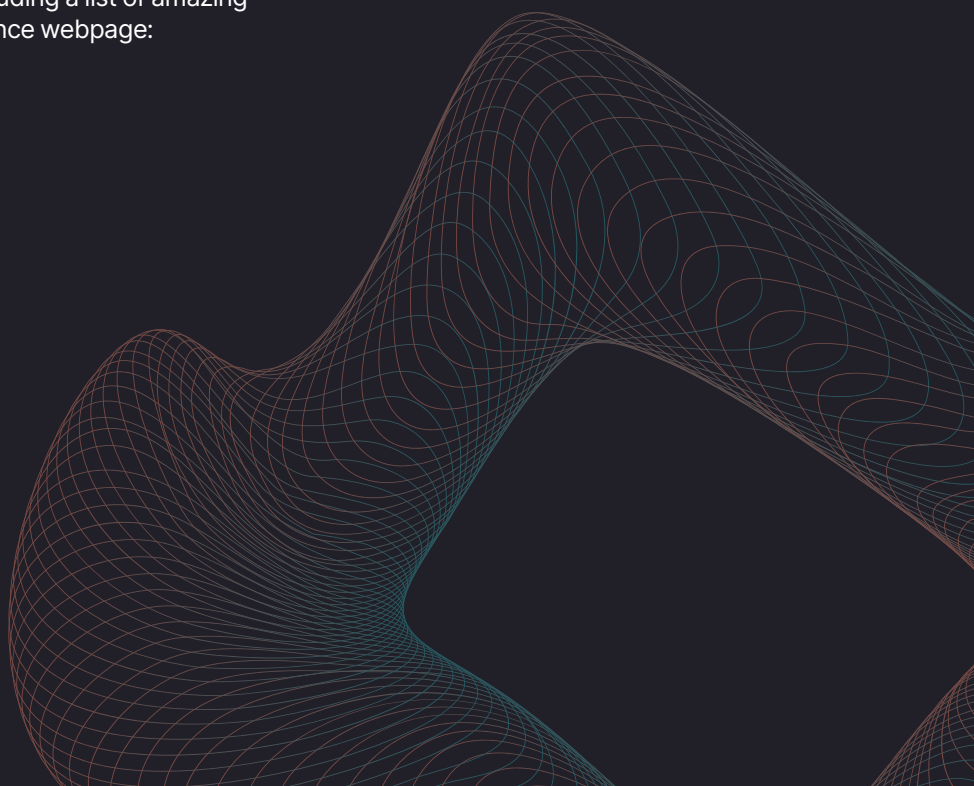
Specialists in their fields, renowned scientists from around the world.

52 poster presentations

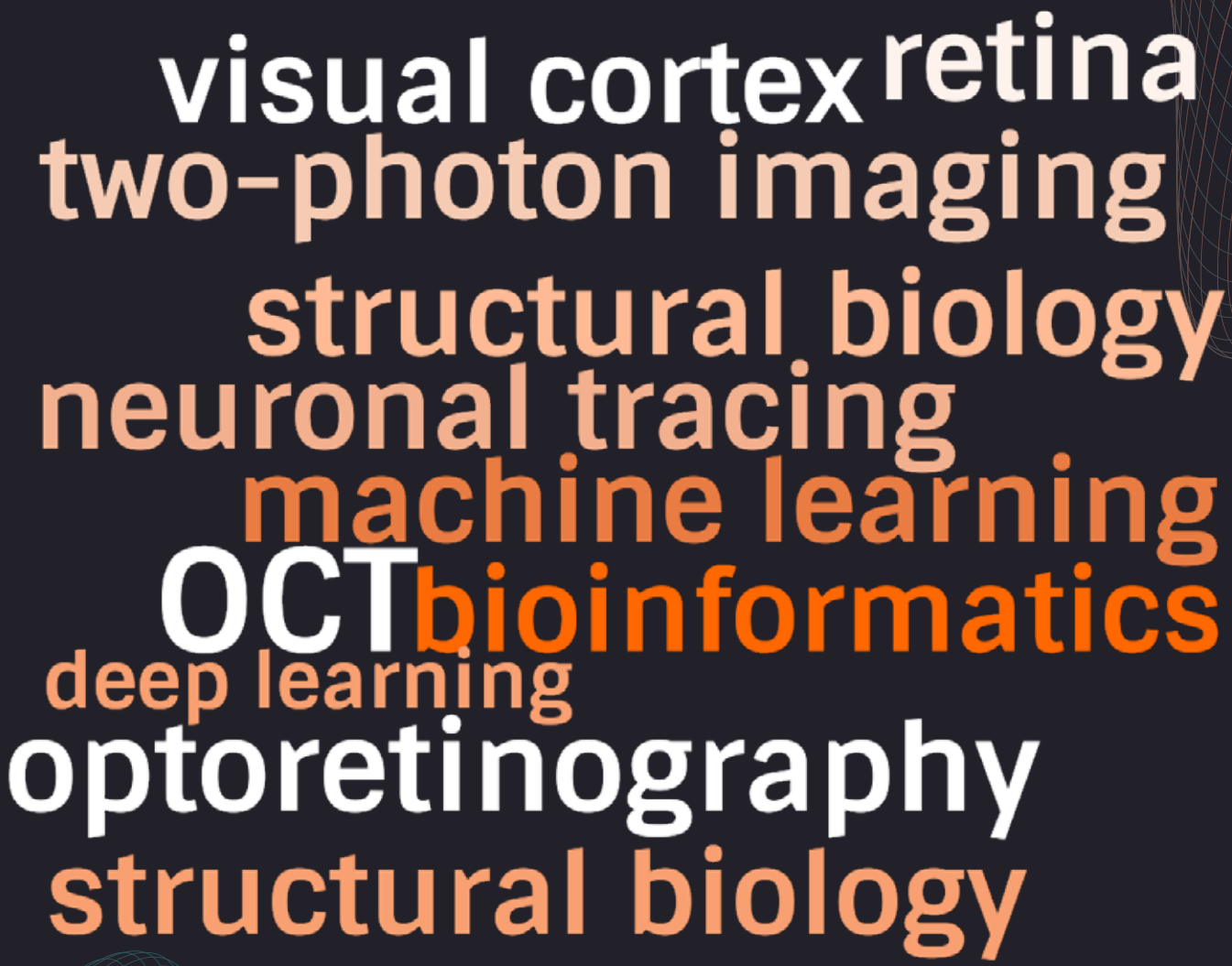
Presentation of the progress of research conducted by early-stage researchers.

150 attendees

A cross-disciplinary assembly: researchers hailing from various domains with a shared focus on eye research, industry representatives, and medical practitioners.

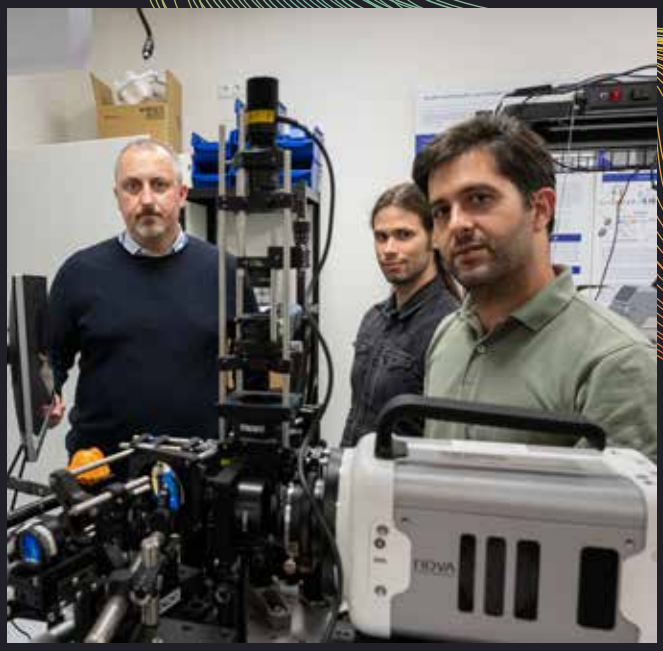


Research topics of the CRATER conference:

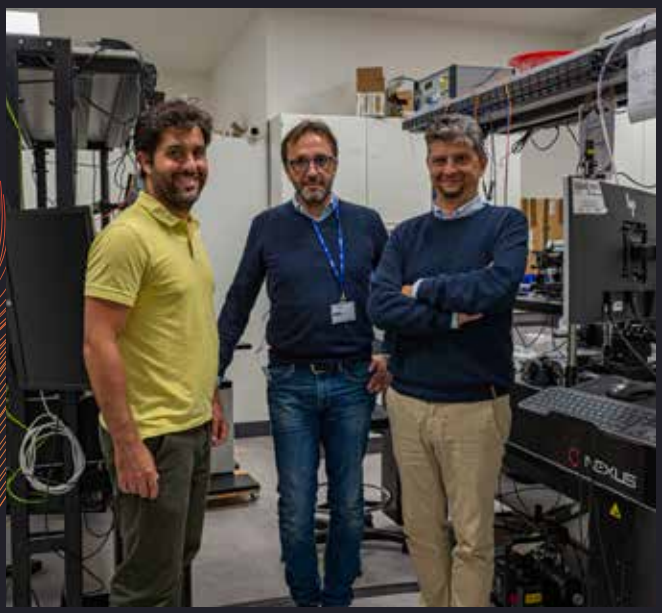


Visitors

Associate Professor Brendan Kennedy from The University of Western Australia, a renowned expert in biomedical optics and tissue biomechanics imaging and long-time collaborator of Prof. Maciej Wojtkowski and Dr Andrea Curatolo, visited the ICTER labs at Skierniewicka on 4 July 2022.



In October 2021, Professor Robert Zawadzki, PhD, came to ICTER to initiate collaboration on the development and application of the next generation of ocular imaging systems. Specifically, together with POB researchers and IDoc Principal Investigator and scientists, Prof. Zawadzki focused on the construction and testing of the Full Field Swept Source Optical Coherence Tomography (FF-SS-OCT) prototype for in vivo retinal imaging. Prof. Zawadzki is an Associate Professor of Ophthalmology and Vision Science at University of California Davis.



On 23 September 2022, Prof. Marco Ruggeri of the Bascom Palmer Eye Institute visited our centre. His area of expertise includes instrumentation and quantitative imaging technologies for diagnostic and surgical applications in ophthalmology. Having a signed letter of intent with the Bascom Palmer Eye Institute, we discussed potential cooperation looking for joint projects to pursue, especially in the field of ophthalmic procedures. Prof. Ruggeri gave and interview which is available on our website on eye treatment technologies and how to create them.

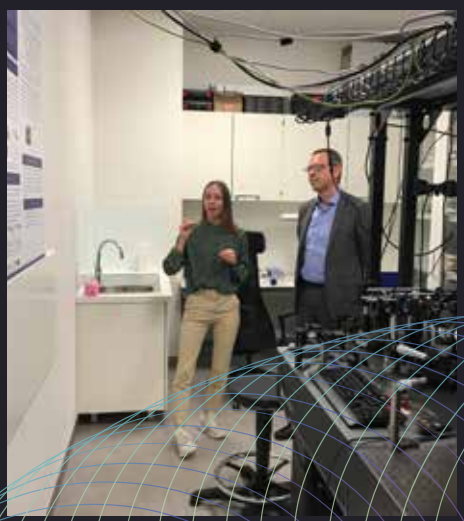
On 19 January 2023 we hosted Wiesław Gruszecki, Professor and Head of the Department of Biophysics, from Maria Curie-Sklodowska University in Lublin. The research activity of Prof. Gruszecki is focused on biophysical aspects of photosynthesis, role of carotenoids in biomembranes, polyene antibiotics, photo-physics and molecular spectroscopy. Prof. Gruszecki gave a presentation within the ICTER Seminar Series entitled: „Molecular blinds in the retina of the human eye".

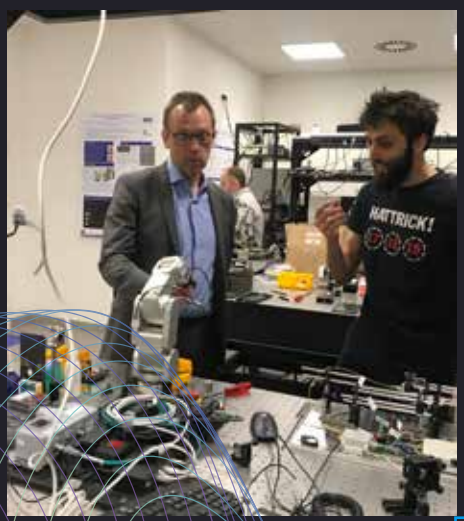
Dr. Irene Nepita of the Istituto Italiano di Tecnologia and Dr. Mario Damiano Toro from the Medical University of Lublin visited us on 10 February 2023, at the invitation of Dr. Andrea Curatolo, Principal Investigator and leader of the Image-guided Devices for Ophthalmic Care Group (IDoc). Our guests shared with us their knowledge of experimental surgery and identified some unmet needs in this field. It looks like fruitful cooperation is just beginning.

On 9 May 2023, Dr. Claus Roll, Optica's Director for Europe, visited ICTER. We discussed ICTER's accomplishments and projects with him.

Dr. Andrea Curatolo provided an overview of ICTER's goals and scope, as well as insights into research within the IDoc and POB groups.

Lab tours facilitated detailed discussions on projects, including STOC-T research by Piotr Węgrzyn, Wiktor Kulesza, and Maciej Wielgo. Klaudia Nowacka presented Dynamic Light Scattering (DLS) and the Pi-NIRS method. Jadwiga Milkiewicz and Karol Karnowski shared the corneal biomechanics device from the Imcustomeye project. Karol Karnowski and Krzysztof Gromada showcased the image-assisted eye microsurgery platform. Lastly, Marcin Marzejon discussed the two-photon excited fluorescence systems for mice and humans. Dr. Claus Roll also introduced Optica's key initiatives, including scholarships, internships, grants, and programs fostering young talent's career growth.





International Centre for Translational Eye Research project is carried out within the International Research Agendas programme of the Foundation for Polish Science, co-financed by the European Union under the European Regional Development Fund.

LOCATION:

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Skierniewicka 10A, 01-230 Warsaw

Biological & Chemical laboratories
Kasprzaka 44/52, 01-224 Warsaw

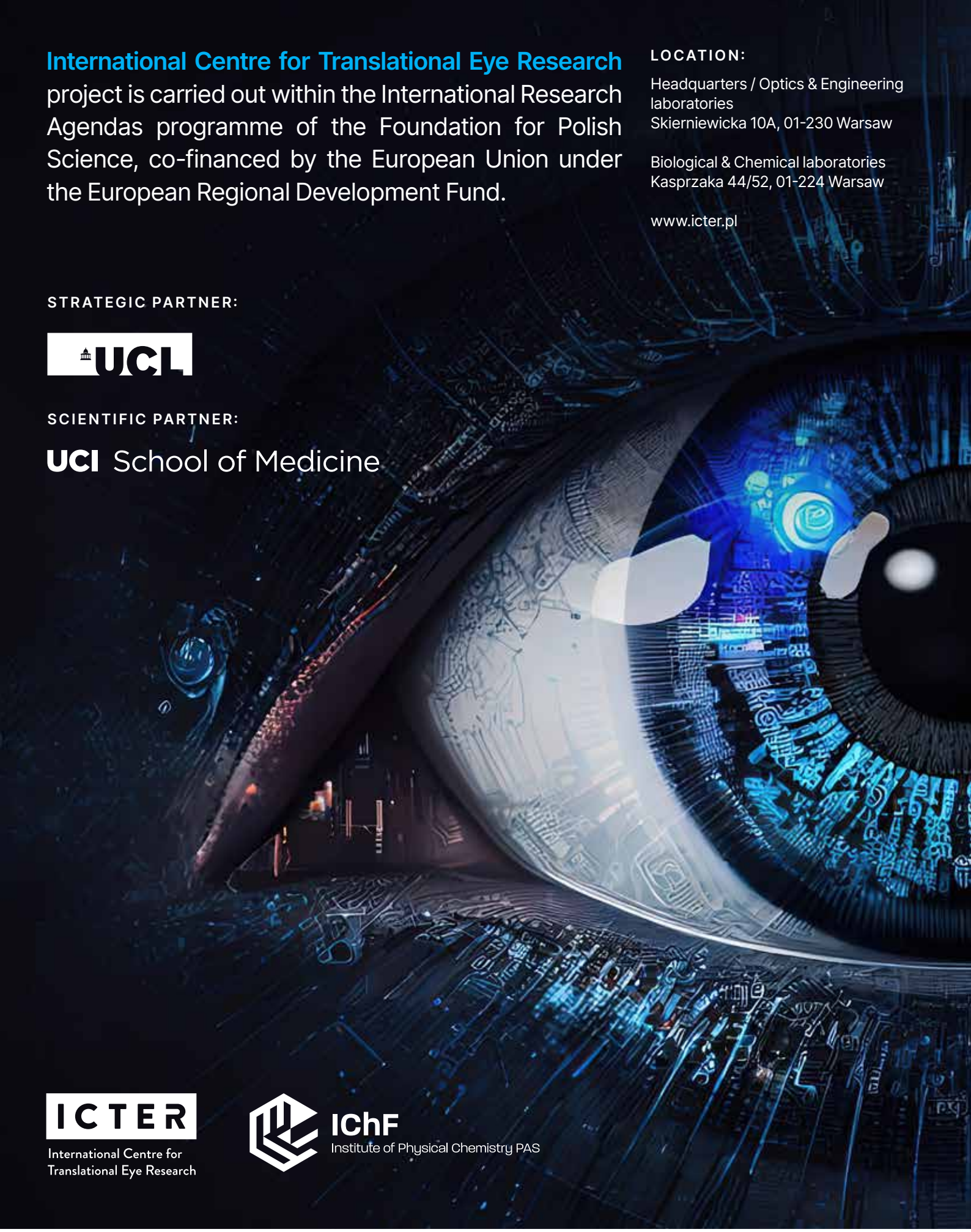
www.icter.pl

STRATEGIC PARTNER:

UCL

SCIENTIFIC PARTNER:

UCI School of Medicine



ICTER
International Centre for Translational Eye Research

IChF
Institute of Physical Chemistry PAS

European Funds Smart Growth

Republic of Poland

FNP Foundation for Polish Science

European Union
European Regional Development Fund