*The **CREA**tion of the Department of Physical Chemistry of Biological Sys**TE**ms [CREATE]*

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2nd Report on study visits

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Level of dissemination: Public

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1. An introduction

This document lists study training activities of the employees of the ERA Chair holder's team, members of synergetic groups, and other research groups of the Institute of Physical Chemistry PAS (IPC). It includes mainly short reports from the study visits, some of them paid as a result of positively assessed proposals submitted under the competition "Study visits under the CREATE project".

Study visits are actions aimed at breaking barriers that inhibit international cooperation of IPC with foreign leading scientific units (through study and laboratory visits). Many of these visits have been carried out to world-class research centers, including:

- Department of Pharmacology, School of Medicine, Case Western Reserve University, USA
- Max-Planck-Institute for Dynamics and Self-Organization, Germany
- Institute of Ophthalmology, University College London, UK
- University of Western Australia, Australia
- EPFL - Swiss Federal Institute of Technology Lausanne, Switzerland
- Broad Institute of MIT and Harvard in Cambridge, USA
- University of Limerick, Ireland

Due to hampered international mobility caused by the pandemic, after the consultations with the Project Officer for the CREATE project, we decided to transfer a part of a budget from study visits to **on-line training organised by excellent scientific institutions or leading training centers**.

For this reason, in 2020 the ERA Chair holder launched the competition *"*On-line training courses under the CREATE project*"*. All researchers and specialists employed at the IPC were invited to participate in the competition. The programme cover costs of the fees of on-line training in the field of technology transfer, project/team management, acquiring external funds for research & commercialisation, and quantitative biology or applying physical chemistry to biology or others if resultant from the ERA Chair research agenda. The acquired knowledge and skills will contribute to the achievement of the programme's strategic goal, i.e., strengthening the implementation of the research programme of the Department of Physical Chemistry of Biological Systems through collaborative research, support in obtaining or managing external funds and/or technology transfer.

This report lists study visits and on-line training held from 1/03/2018 till 31/03/2021 (M30 – M66).

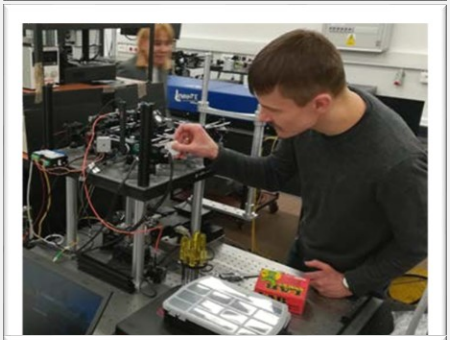
2. Specification of study visits

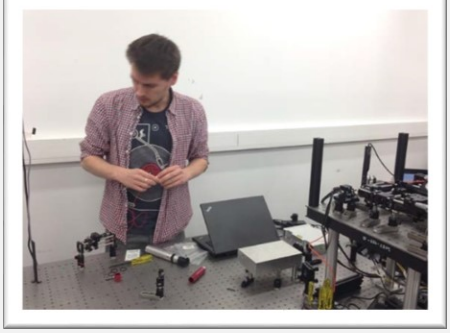
a) Visits of the group members of Professor Maciej Wojtkowski

Name: Łukasz Kornaszewski/Jakub Bogusławski/Piotr Ciąćka

Place: Optical Biomedical Imaging Group Institute of Physics, Nicolaus Copernicus University, Poland

Type of event: study visit **Date: 6/03/2018**





The purpose of the visit was twofold: to learn the experimental setup and procedure of two-photon vision threshold measurement and verify the applicability of an existing product of a partner company – Fluence, manufacturer of femtosecond fibre lasers, for this technique. An extra target was to explore the method and setup requirements to adapt the Fluence laser to the measurement device.

The visitors provisionally incorporated the laser into the measurement system without adapting modules through an existing input fibre. After lowering the laser power down to around 1 mW two-photon vision has been confirmed.

Jakub Bogusławski installed the Fluence laser. Then he coupled the laser beam into the experimental setup and adjusted for optimal signal in the eye position. After the first series of test measurements, Jakub in-stalled the pulse compressor to conduct another measurement in 200 fs mode. He assessed limitations imposed on the laser by the device, mainly caused by the use of fibres.

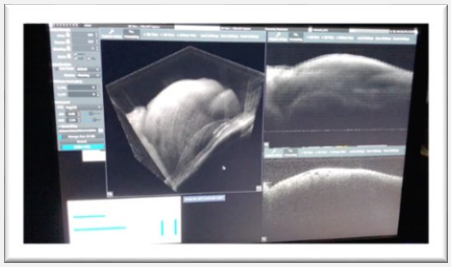
Łukasz Kornaszewski focused on understanding the engineering side and assessed Fluence laser integration potential in this particular environment. The visit confirmed the laser applicability to measure the two-photon vision threshold.

Piotr Ciąćka researched the two-photon vision threshold using the experimental setup to understand its operation principle and to be able to duplicate some of its functions in Warsaw. He also helped in the practical aspects of coupling the laser beam into the input fibre after the compressor. As a result of conversations with NCU staff, P. Ciąćka learned the technique and its limitations linked with testing human eyes in vivo. This knowledge will form a sufficient basis for his experiments in Warsaw.

Name: Michał Hamkało

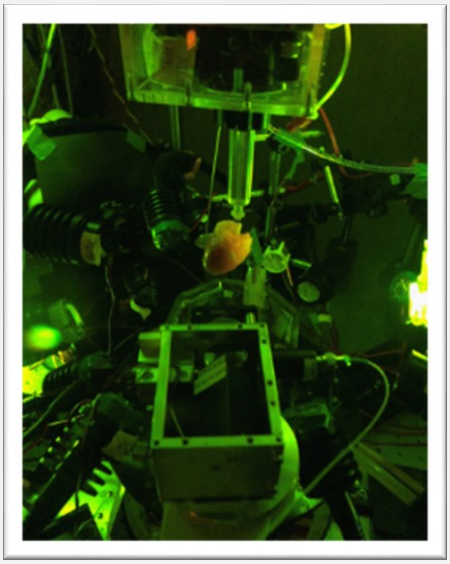
Place: Max Planck Institute, Göttingen, Germany

Type of event: study visit **Date: 22-28/04/2018**



The business trip aimed to perform the first 3D OCT measurements of beating rabbit hearts (in the Langedorrff perfusion system) by the team of prof. Wojtkowski and their collaborators from Max Planck Institute for Dynamics and Selforganization (dr Jan Christoph, Stephan Luther) in Göttingen and Institute for Biomedical Optics in Lübeck (T. Pfeiffer, W. Draxonger and prof. Huber).

Team of prof. Wojtkowski implemented MHz OCT (with MHz FDML laser) system into the optical mapping system for heart measurements. Optical mapping is already a well-known surface-imaging technique that allows tracking

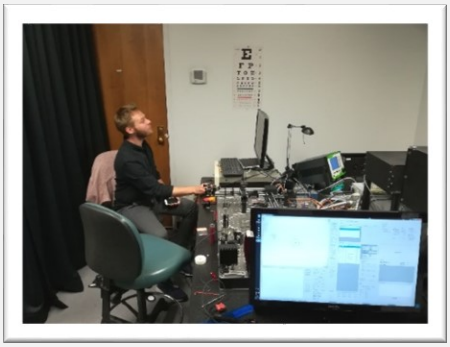


the heart's electrical activity (during both regular beating and abnormal states) at its surface (and after adding electro-sensitive dye). Because this technique allows obtaining 2D images, artefacts connected with heart motions affect the quality of tracking. The MHz OCT system application enables simultaneous measurements of the beating heart in both techniques – 3D OCT (100 vol/s) and 2D optical mapping (200 vol/s). Experiments involved three different rabbit hearts and acquiring multiple 5-7 s long 3D image stacks of different heart parts (with rates up to 100 vol/s) together with continuous optical mapping measurements. The team synchronised two techniques measurements were with the use of TTL-signal triggering. These joint measurements of the same area of a beating heart have not been performed before. Thus, the acquired data has the potential to become an essential contribution to cardiological sciences.

Name: Jakub Bogusławski/Piotr Ciąćka/Patrycjusz Stremplewski

Place: The Case Western Reserve University, Cleveland, USA

Type of event: study visit **Date: 19-30/05/2018**



The visit goals were twofold: a) to integrate a pulse picker into the existing TPEF set up to optimise the signal for limited average excitation power and b) to build the optical setup from scratch for two-photon excitation fluorescence (TPEF) imaging of rodent eye. The TPEF method is used to investigate retinal diseases and help develop new treatment therapies. The use of infrared light and a two-photon process allows one to avoid substantial light absorption in the 320-400 nm range.

Regarding a) reducing the excitation pulses' repetition rate from 80 MHz down to 6 MHz, we achieved a 9-fold increase of the signal with the same average power, below the ANSI limit human eye. Patrycjusz Stremplewski conducted this part of the work.

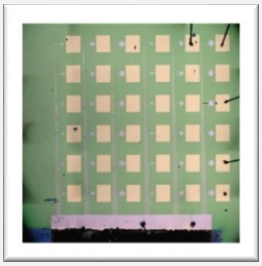
Regarding b) a long-term goal is to simplify the TPEF setup concerning the one existing in the lab, which will allow delivering shorter pulses to rodent's eyes. We expect that TPEF measurement will be possible with lower average laser power, which will further improve the experiment safety. To that end, a custom TPEF setup was built by Jakub Bogusławski and Piotr Ciąćka. The setup allows for simultaneous detection of scattered light and fluorescence signals. Another improvement was to include lock-in detection in the fluorescence channel, allowing for much lower light intensities. The first results obtained with the setup, imaging the fluorescent sample in both scattering and TPEF modes, are encouraging.

Further steps will include setting up a dedicated laser source operating at 780 nm and some improvements in the software, which will allow simultaneous detection of scattered and fluorescence light and correction for eye movement. Then, the setup will be ready for measurements with animals.

Name: Jakub Bogusławski

Place: Wroclaw University of Science and Technology, Wroclaw, Poland

Type of event: study visit **Date: 7-8/05/2018**

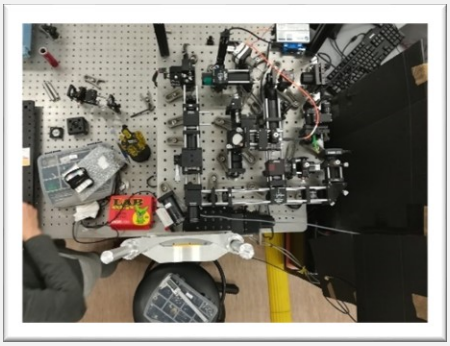


The visit goal was to discuss and plan the collaboration to develop and characterise electro-optic modulators based on graphene. Aalto University, Micronova Nanofabrication Center fabricates these modulators. Prof. Wojtkowski's team made the plan for future experiments and simulations. Jakub also performed the training of a graduate student from Wroclaw, responsible for measuring fabricated modulators' electrical properties. He also carried out the initial optical characterisation of modulators using an optical microscope.

Name: Piotr Ciąćka

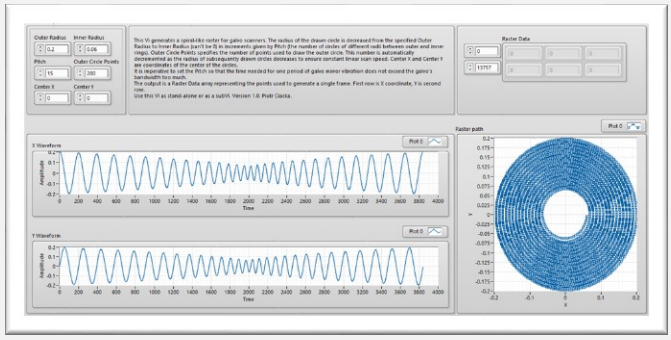
Place: Nicolaus Copernicus University, Torun, Poland

Type of event: study visit **Date: 15/05;7-8,27/06/2018**



The first visit concerned pupillary light reflex measurements in response to strong infra-red light perceived by the human eye due to the two-photon absorption process. The scheme of the experiments envisaged employing an existing two-photon scanning light ophthalmoscope. The team performed preliminary tests to work out the changes in the setup needed to perform reliable measurements. The subsequent steps included providing stimulus synchronisation with camera frames and devising an optimal path for the galvo scanner.

Piotr Ciąćka provided an optimal raster for galvo scanners, allowing the increase in the stimulus's angular size. Together with team members, they debugged the experiment control software and made some changes to the setup to improve iris images' contrast. They performed a series of experiments and recorded the changes in pupil size upon two-photon excitation. The first results are encouraging, but further work needs to be done to reject unwanted pupil contractions not resulting from the stimulus and improve the iris illumination scheme.



During the next visit, Piotr continued to refine the pupillary light reflex's refinements and measurements in response to strong infrared light (perceived by the human eye due to the two-photon absorption process).

Name: Jakub Bogusławski/Łukasz Kornaszewski

Place: Wroclaw University of Science and Technology, Wroclaw, Poland

Type of event: study visit **Date: 16/07/2018**

The goal of the visit was to discuss the possibility of scientific collaboration. The idea was to develop a femtosecond fibre laser working in the 740 nm spectral range for two-photon excited fluorescence imaging, a valuable addition to the project. Jakub Bogusławski & Łukasz Kornaszewski with Prof. Jarosław Sotor and Dr. Grzegorz Soboń discussed the possibility of the development of the laser with desired specifications and technical issues related to this laser. During a laboratory tour, the visitors observed the experiments and currently developed laser systems.

Name: Maciej Wojtkowski

Place: Institute of Ophthalmology, University College London, UK

Type of event: study visit **Date: 18-20/07/2018**

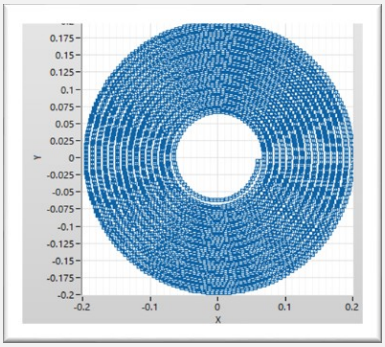
The purpose of this visit was to meet several representatives of this UCL, including Prof Andrew Dick, the Director of the Institute of Ophthalmology. These meetings were related to the International Research Agendas programme joint application.

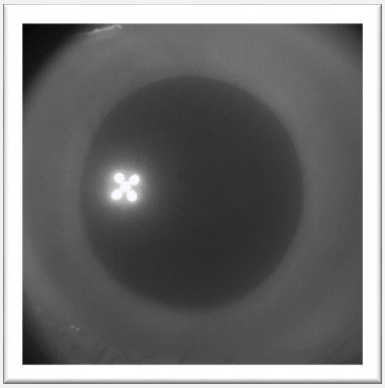
Prof. Wojtkowski presented IPC to the management of UCL Ophthalmology, explained the International Research Agendas programme goals and strategic assumptions, and discussed the role of UCL in the project. This fruitful visit ended with a short lab-tour of UCL Ophthalmology facilities.

Name: Piotr Ciąćka

Place: Nicolaus Copernicus University, Torun, Poland

Type of event: study visit **Date: 17-19/09/2018**





The primary goal of the visit was to measure the pupillary light reflex in response to strong infrared light. Several new developments have taken place. A new method for processing the pupil images was implemented. The team discussed current challenges and ways to tackle them, including the need to work on elucidating the mechanism of the infra-red vision. Competing hypotheses include second harmonic generation, two-photon absorption, and excited-state absorption. Approaches to prove/disprove the aforementioned hypotheses were devised.

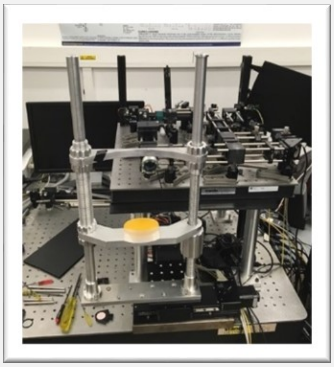
Piotr rebuilt the setup to enable a measurement scheme based on stimulating one eye and observing the other's pupil contraction. Together with impeding the accommodation of the stimulated with the use of tropicamide, it allows separating the intensity-related pupil reflex from parasitic accommodation reflex. Preliminary results show consistently smaller pupil contraction, supporting the soundness of the concept. The work will continue to obtain any quantitative results.

Piotr also checked the unwanted spectral broadening of the pulses in the delivery fibre. Unfortunately, results showed significant broadening even at relatively low power settings. The work will continue to devise solutions for the pulses' controllable temporal properties.

Name: Marcin Marzejon

Place: Nicolaus Copernicus University, Torun, Poland

Type of event: study visit **Date: 14-16/11/2018**



The purpose of the visit was to perform two-photon vision threshold measurements in cataract patients. The first step was to check and adjust the measurement setup and software. Next, Marcin Marzejon performed two-photon vision threshold measurements for three patients and analysed obtained results. Next, he made measurements for two patients using a different two-photon vision threshold measurement strategy. This visit enabled to measure the two-photon vision threshold for patients suffering from cataract, preliminary compare threshold strategies and indicate further improvements.

Name: Piotr Ciąćka

Place: Nicolaus Copernicus University, Torun, Poland

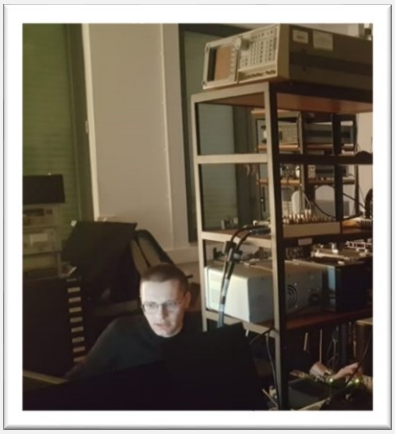
Type of event: study visit **Date: 8-9/01/2019**

The visiting goal was to set up an optical autocorrelator for pulse-width measurement in two-photon vision experiments. For better control over the experiments' conditions concerning the occurrence of vision upon allowing infrared pulsed laser light into the eyes, an employed device should estimate the pulse-widths. To that end, an optical autocorrelator was sourced from APE Photonics. Researchers rearranged the laser sources on the optical table to make subsequent measurements easier. Piotr adjusted the autocorrelator so that it could accept pulses delivered by fibre and over free space. He also made possible the measurement of interferometric and intensity autocorrelations (with and without background). The researcher measured the pulse-width of the laser used in the vision experiments and got results very much in agreement with the manufacturer's specifications. Measurement of fibre-coupled beams (attenuated to ensure only linear propagation) showed typical pulse distortions resulting from propagating in the glass over long distances.

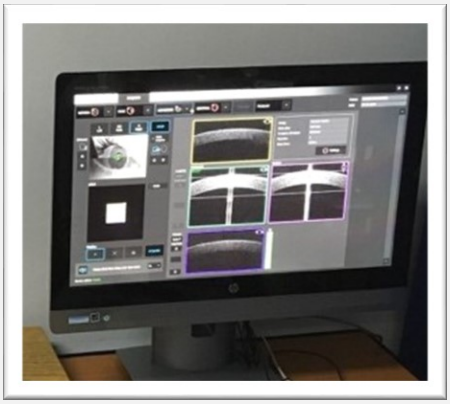
Name: Marcin Marzejon

Place: Nicolaus Copernicus University, Torun, Poland

Type of event: study visit **Date: 24/01;13-15/03;3-5/04/2019**



Marcin Marzejon aimed to measure two-photon vision threshold values for two subjects suffering from cataracts. For every subject, Marcin performed visual acuity tests and visual field tests. During the experiment, Marcin employed both green and infrared laser sources. The visual acuity test was an examination of the rotation of an E letter with varying size. The visual field test was a visibility threshold examination for a 9-points radial retina location pattern using the 4-2-1 strategy. Collected data were initially analysed and compared to each other. For the first subject, Marcin made an OCT to ensure that the measurement results are correct.



Marcin continued the two-photon vision threshold value measurements during the next two visits visit, testing new subjects suffering from cataracts and two subjects after cataract surgery. For the new subjects, he performed measurements of visual acuity test and visual field test following the experiment scheme from the previous visit.

Name: Karol Karnowski

Place: University of Western Australia, Australia

Type of event: study visit **Date: 12-27/03/2019**

Karol Karnowski aimed to meet prof. Barry Cense (local group supervisor) and attended OBEL group meetings. He worked in a lab with Ph.D. candidate Qingyun Li taking measurements with an ultra-high-resolution polarisation-sensitive OCT system, and worked with Micheal Hackman on optical fiber probe fabrication and on the upper airway OCT imaging system (it was the prepared system for measurements on healthy volunteers). With Dr. Peijun Gong, they discussed the possibilities of using polarisation-sensitive OCT to enhance angiography and lymphangiography maps.

Karol also devoted to finalising the Matlab processing of data previously acquired in the dental clinic with prof. Camile Farah and to report on results of PS-OCT measurements of treatment of burn-induced pig skin scars.

Name: Jakub Bogusławski

Place: AGH University of Science and Technology, Krakow, Poland

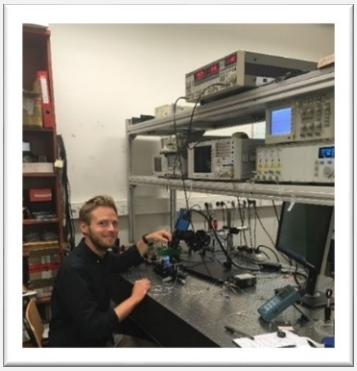
Type of event: study visit **Date: 20/03/2019**

During this trip Jakub aimed to fabricate a saturable absorber based on antimony telluride on the surface of the active Tm: KLuW waveguide. He used the saturable absorber to build and study a pulsed laser working in a 2 µm spectral range, which is essential for many biomedical applications. Layers of antimony telluride were sputtered on the surface of the waveguide using a pulsed magnetron sputtering technique. Simultaneously, antimony telluride was sputtered on glass and silica substrates as a reference and for further characterisation (Raman spectroscopy, XRD, SEM and AFM microscopy, measurement of optical properties).

Name: Jakub Bogusławski

Place: Wroclaw University of Science and Technology, Poland

Type of event: study visit **Date: 31/07-2/08/2019**



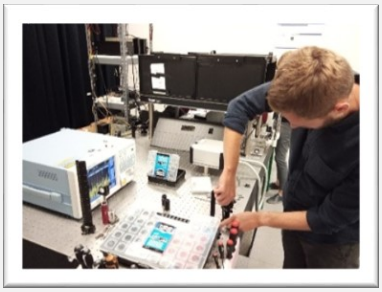
The first goal was to study graphene-based electro-optical modulators fabricated at Aalto University. To do so, Jakub built an optical setup for measurements of electro-optical parameters of fabricated modulators (modulation depth, frequency characteristics). He tested the measurement setup on the standard commercially available modulator. Then, Jakub trained a Ph.D. student, how to perform those measurements.

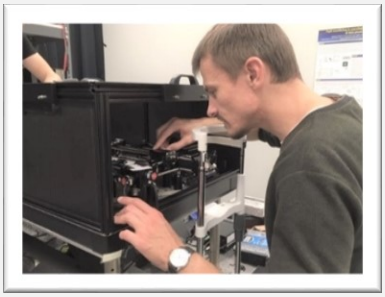
The second aim of the visit was to monitor the status of the fabrication of a new 780 nm femtosecond fibre laser, constructed in Wroclaw. Researchers discussed the current situation and future perspective on available parameters.

Name: Piotr Ciąćka/Jakub Bogusławski/Łukasz Kornaszewski

Place: Baltic Insitute of Technology, Gdynia, Poland

Type of event: study visit **Date: 18-20/09/2019**





Łukasz Kornaszewski, Jakub Bogusławski, and Piotr Ciąćka visited the group collaborators in the field of human two-photon vision studies. Researchers examined the complicated experimental setup of a high level of automation, namely – a standalone system for human microperimetry measurements. There is currently a controversy of assumptions and calculations in the comparison of two lasers used as light sources, and the team aimed wanted to help resolve this.

Researchers examined the system to understand the optical path through its components. They measured the optical spectra of both lasers in comparison and analysed their shapes for abnormalities. This check did not answer any questions but produced data for publication. Researchers performed a complete calculation of laser pulse peak power to eliminate any potential mistakes in the current approach. They identified a few issues in the previous estimates. Łukasz suggested a cross-check method for establishing a clear explanation if the experimental setup causes the laser difference or a

fundamental phenomenon found in the two-photon vision process. He proposes to use a two-photon photodiode (made of GaAsP or GaP) to mimic the two-photon absorption action of photoreceptor cells in the retina and measurement of the voltage resulting from the illumination of this detector. This test will answer whether the eye or the setup introduces the unexplained so far difference.

Name: Jakub Bogusławski

Place: Baltic Institute of Technology, Gdynia, Poland

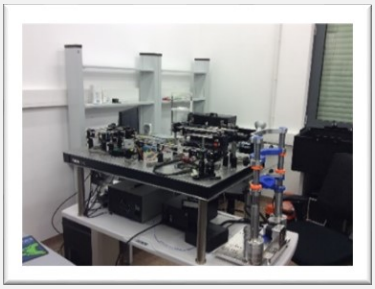
Type of event: study visit **Date: 08/11/2019**

Jakub Bogusławski aimed to perform an autocorrelation measurement of ultrashort laser pulse used in the two-photon vision system build in Gdynia. The goal was to measure the actual pulse duration in the plane of the eye for each laser which is used there: femtosecond solid-state laser and picosecond fiber laser. Jakub measured the pulse duration of both lasers just outside the laser cavity (before the measurement setup) and after propagation through the measurement setup (in the eye plane). This allows us to know not only the actual pulse duration in the eye plane but also the influence of the two-photon vision measurement setup on the temporal properties of those pulses. He established that stretching of the pulses is negligible, and the pulse duration is almost preserved during the propagation through measurement setup.

Name: Jadwiga Milkiewicz

Place: Nicolaus Copernicus University in Torun, Poland

Type of event: study visit **Date: 14-15/11/2019**



This visit's main goal was to acquaint with the new two-photon microperimetry – a technique that is mapping the sensitivity of the eye photoreceptors using IR radiation. During this visit, she briefly learned about the method and helped rebuild the setup to make it more convenient for use in preclinical eye tests on a group of patients. During this visit, Jadwiga also learned another technique used to investigate pupil's reactions to IR radiation.

Name: Jadwiga Milkiewicz

Place: Oculomedica company, Bydgoszcz, Poland

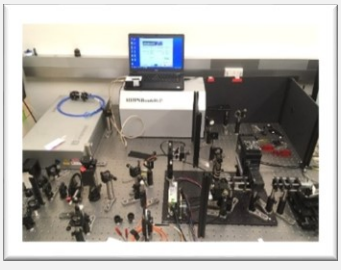
Type of event: study visit **Date: 22/11/2019**

Jadwiga Milkiewicz took part in preclinical tests. Thanks to this visit, she became more familiar with the procedures and difficulties related to preclinical trials. The main goal of the research was to compare the one-photon and two-photon vision for patients with cataracts using an apparatus constructed by dr Katarzyna Komar. These patients could better see IR radiation. Therefore in the future, it could be an alternative diagnostic tool, especially for such patients.

Name: Jakub Bogusławski

Place: University of California Irvine

Type of event: study visit **Date: 28-30/01;8-18/02/2020**



This visit aimed to continue developing a two-photon excited fluorescence scanning laser ophthalmoscope (TPEF SLO) for eye imaging. Specific goals included (1) setting up and incorporating a new hybrid photodetector (HYD) in the TPEF SLO setup, (2) setting up and incorporating a new, faster galvanometer scanner in the TPEF SLO setup, and (3) general rearranging of the setup on the optical table to enable incorporating adaptive optics device. After those changes,

the setup was tested while imaging biological samples, including mouse retinal cross-sections.

Name: Jakub Bogusławski

Place: Wroclaw University of Science and Technology, Wroclaw, Poland

Type of event: study visit **Date: 04/05;28/08/2020**

The purpose of the visits to Laser & Fiber Electronics Group was to test and learn how to operate a femtosecond fibre laser prototype with a wavelength of 780 nm developed at the Wrocław University of Technology in collaboration with the group of Prof. Wojtkowski.

Name: Piotr Węgrzyn

Place: Ophthalmic Center – Oculomedica clinic, Bydgoszcz, Poland

Type of event: study visit **Date: 10/09/2020**

Piotr Węgrzyn visited Specialized Ophthalmic Center – Oculomedica clinic. In addition to modern ophthalmological diagnostics, the clinic offers a wide range of specialist and treatment rooms and performs qualifications for surgical procedures.

During this working visit, Piotr had a long discussion with dr Bartosz Sikorski on planned studies at IPC using full-field swept-source optical coherence tomography. The aim of the research is to image eye epithelium with a specular microscope, which is a medical gold standard. In addition, the possibilities offered by new tools developed at the IPC will be checked and tests on volunteers. This visit allowed Piotr to check the required equipment and discuss the planned submission to the local ethics committee.

b) *Visits of the members of synergetic groups*

Name: Łukasz Richter, Soft Condensed Matter Group

Place: EPFL - Swiss Federal Institute of Technology Lausanne, Switzerland

Type of event: study visit **Date: 12/02-10/03/2018**

Łukasz Richter carried out research in Prof. Francesco Stellacci's group. The working visit's main goals involved 1) getting familiar with techniques of synthesising and analysing gold nanoparticles and 2) examining the influence of these nanoparticles on bacteriophages (viruses that attack bacteria).

Łukasz Richter learned about different methods of creating nanoparticles covered with a single type of ligand or mixture of ligands. One of the most important aspects of his internship was determining the virustatic or virucidal properties of different nanoparticles against bacteriophages.

Moreover, except for nanoparticles, Łukasz also tested also classical and specially modified cyclodextrins against bacteriophages. Cyclodextrins are biocompatible and FDA approved. Thus, they are great candidates for additives in many products and processes.

The research revealed nanoparticles and cyclodextrins with virustatic and virucidal properties. These results are the beginning of further studies that will be held jointly by IPC and EPFL. Additionally, physicochemical interactions between different types of nanoparticles and bacteriophages are of great importance but are still poorly addressed. Thus, this trip resulted in interesting experimental results and in much potential future cooperation with the world-class scientific facility.

Name: Marta Janczuk-Richter, Surface Nanoengineering for chemo- and bio-sensors Group

Place: EPFL - Swiss Federal Institute of Technology Lausanne, Switzerland

Type of event: study visit **Date: 15/01-11/02/2018**

During the working visit, Marta Janczuk-Richter was conducting research in the Bionanophotonic Systems Laboratory Group (BIOS) led by professor Hatice Altug. The main goal of the visit was to get familiar with the preparation and measurements of plasmonic biosensors.

Marta learned about different plasmonic structures used for biosensing applications with particular regard to gold nanohole arrays (NHAs). NHAs have unique capabilities for multiplexed and label-free detection and promise miniaturisation and integration into lab-on-a-chip devices. The sub-wavelength NHAs fabricated on optically thick metal films support the extraordinary optical transmission (EOT) phenomenon enabling the NHAs to be highly sensitive to minute local refractive index changes, induced, e.g., by biomolecules binding to the sensor surface. These changes are monitored by tracking the variations of the transmission spectra in real-time.

Moreover, during the visit, Marta analysed obtained data, participated in group meetings, seminars, and lectures given in the EPFL. She also gave a talk about her research during a group seminar.

Performed research and new skill acquired during the trip are beneficial for Marta's Ph.D. studies and further collaboration between Surface Nanoengineering for Chemo- and Biosensors Group and Physical Optics and Biophotonics Group and other groups in the Institute.

Name: Witold Postek, Microfluidics and Complex Fluids Group

Place: Broad Institute of MIT and Harvard in Cambridge, USA

Type of event: study visit **Date: 8-29/02/2020**

The goal of the visit was to learn a novel droplet-based method developed at the Broad Institute. The method uses three fluorescent dyes in a range of concentrations. The combinations of concentrations are unique in a given experiment and can serve to barcode a droplet with given reaction conditions. The droplets are paired in an array of microwells and identified by their barcodes. Then the droplets are merged with an electric pulse. This method was used during Witold's visit to encode antibiotic concentrations and study bacteria's growth with different antibiotic concentrations. The mid-term goal of the project is to study antibiotic interactions with different bacterial strains, and the ultimate goal is to provide a platform that will be able to screen for the activity of proposed new antibiotics or antibiotic adjuvants. The method described is transferable and, after some adjusting, can be used at the Institute of Physical Chemistry of the PAS, either for antibiotic studies at the single-cell level or for e.g., screening of reaction conditions for mammalian cells, e.g., for leukemia cells.

c) "Study visits under the CREATE project" (competition laureates)

Below we specify study visits of the laureates of the competition "Study visits under CREATE project". Each applicant prepared a proposal for a study visit to an excellent research unit, a biological/ interdisciplinary lab, a technology transfer unit, or a company, showing intercorrelations between their research activities and the ERA Chair's research profile.

OPEN CALL - Study visits under the CREATE project

The competition "Study visits under the CREATE project" - NOW IS OPEN

LAB VISIT DURATION: ca. 2 weeks

PLACE OF THE VISIT: excellent research units, biological/interdisciplinary labs, technology transfer units, companies to strengthen the expertise of the IPC PAS employees in the field of biology, application of physical chemistry in biology and technology transfer

WHO CAN APPLY: All researchers employed at IPC PAS, who are not fully paid under European Union framework programmes. Some additional restrictions may apply in case there are interferences between funding sources.

HOW TO APPLY: applications containing: a) description of the hosting institution, b) plan of a study visit and expected results should be sent directly to mwojtkowski@ichf.edu.pl.

Make sure that your application contains information allowing to assess it against the the following criteria:

a. host institution conducts research in biology, applies physical chemistry to biology, and/or supports academia-business technology transfer, and
b. knowledge & experience gained during the visit will be useful for the candidate's professional career development and may positively affect their potential to cooperate with the Department of Physical Chemistry of Biological Systems.

CAUTION: Limited number of visits is available. "First in – first served" rule applies.

Admissibility of a study visit outside the European Economic Area is contingent upon the approval of the Project Officer of the CREATE project (from Brussels).

For more information see:

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Poster

Information at the CREATE webpage promoting the competition (for more information see: here)

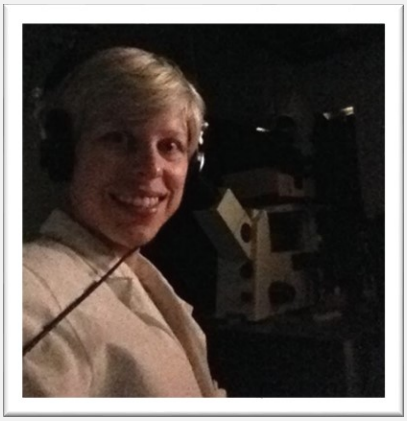
Prof. Wojtkowski assessed the proposals against eligibility criteria and selected laureates. The winners obtained funds to cover the costs of their visits to the prominent laboratories (financial conditions in line with generally applicable in Poland legal provisions on settling business trips in public institutions).

Name: Magdalena Wiloch
Place: University of Limerick, Ireland
Type of event: study visit **Date: 4-11/03/2020**

Research internship of Magdalena Wiloch in a group led by prof. Micheal Scanlon allowed her to learn the technique of AC voltammetry. Magdalena Wiloch explored how to conduct this type of measurement in systems with two immiscible liquids. Additionally, she could learn how to select the appropriate measurement parameters and interpret the obtained results. Magdalena will use the acquired knowledge in further research on Pillar[n]arenes.

Name: Izabela Kamińska
Place: Ludwig Maximilians-Universität München, Germany
Type of event: study visit **Date: 25/07-09/08/2020**

The primary aim of the research visit in the group of Prof. Tinnefeld was further development of the biosensor based on DNA origami and graphene for viral DNA detection, as well as first test measurements with the DNA nanostructure immobilised on graphene for the investigation of the properties of DNA double helix using



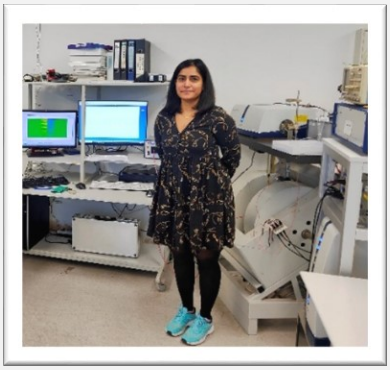
fluorescence correlation spectroscopy. During the visit, Izabela prepared DNA origami nanostructures (folding and purification) and graphene substrates (graphene transfer and cleaning) and carried measurements on two fluorescence confocal microscopes.

During the visit, she managed to solve the problem of DNA origami orientation on graphene. Izabela performed measurements to demonstrate the detection of the single viral DNA in various configurations of the biosensor. Experiments also considered monitoring DNA double helix's behaviour, taking advantage of the strong distance-dependent interactions between single dye molecules and graphene. The main challenge of these experiments was to find appropriate experimental conditions, among others, the solvent's density, which can strongly influence the movability of DNA.

Name: Jyoti Jyoti

Place: Leibniz Institute for Solid State and Material Research, Germany

Type of event: study visit **Date: 02/01-02/02/2021**



Jyoti, a Ph.D. student of Modified electrodes for potential application in sensors and cells (IPC), visited Leibniz Institute for Solid State and Materials Research, Dresden, Germany. Her study visit was funded under the CREATE program. The aim of the research visit in the group of Dr. Evgenia Dmitrieva was to investigate why some carbazole derivatives do not form stable polymers. To achieve notable results, the in-situ EPR/UV-vis-NIR spectroelectrochemistry technique was used. During her stay, preliminary experiments were performed to optimise the measurement parameters and interpret the obtained results.

3. Specification of on-line training courses

a) Training selected by the ERA Chair group members

Management Essential (Harvard Business Cours) - training in project/team management provides tools and strategies for effective leadership, decision-making, strategy implementation, stimulating the institution's learning process, and change management.
Training participants: Karol Karnowski, Angela Pachacz, Marcin Marzejon, Maciej Wojtkowski, Agnieszka Tadrzak, Patrycja Nitoń, Adam Kubas, Sławomir Toczewski, Wojciech Nogala, Karina Kwapiszewska, Kamilla Nielek-Zawadzka
Advanced Architectures in LabVIEW (NI-National Instruments Corp.) – training in advanced design patterns and large application development. Course participants will learn how to design and implement scalable, extensible software architectures for large LabVIEW applications.
Training participants: Marcin Marzejon, Piotr Ciąćka, Jadwiga Milkiewicz, Piotr Kasprzycki
LabView-Core 1,2,3 (NI-National Instruments Corp.) – within part 1 - LabVIEW Core 1 participants will learn the basics of application development in the LabVIEW development environment. Under Part 2 - LabVIEW Core 2, training participants will learn the basics of implementing and distributing their own LabVIEW applications. Part 3 - LabVIEW Core 3 of the training is designed to familiarise course participants with the methods of designing, implementing, documenting, and testing LabVIEW applications.
Training participants: Angela Pachacz, Marcin Marzejon, Piotr Kasprzycki, Onur Cetinkaya, Jadwiga Milkiewicz
Optical System Design Learning Plan (Zemax OpticStudio) – optical system design training. Course participants will learn methods for modeling, analysing, and optimising various optical systems, and become familiar with the various tools and features included in OpticStudio.
Training participants: Angela Pachacz, Karol Karnowski, Marcin Marzejon, Piotr Ciąćka, Jadwiga Milkiewicz, Katarzyna Krupa, Egidijus Auksorius
Domain Modeling Made Functional MasterClass (DDD Europe BV) – training in functional programming. Course participants will learn how to create working solutions with rich domain models using only functional programming techniques.
Training participants: Rafał Pietruch
DNA: The Way of the Modern Architect – training in the field of Software Architecture. It covers such issues as a practical application of DDD (Domain Driven Design) and ES (Event Storming) or architecture design.
Training participants: Rafał Pietruch
Design and Make infographics (Coursera Inc.) – training in written communication skills based on the understanding, designing, and using infographics to present scientific results.
Training participants: Alejandra Consejo
Python Programming: A Concise Introduction (Coursera Inc.) – training in programming in Python Version 3.x. Course participants will learn how to install Python and use the Spyder IDE (Integrated Development Environment) to write and debug programs.
Training participants: Alejandra Consejo

Coaching and emotional intelligence (FORMACIÓN ALCALÁ SL) – training in coaching and emotional intelligence. Course participants will learn the techniques and tools of coaching. After the course they will be able to apply strategies to improve professional communication through empathy, active listening and emotional intelligence.
Training participants: Alejandra Consejo

b) "On-line training courses under the CREATE project" (competition laureates)

Below we specify on-line training courses of the laureates of the competition "On-line training courses under CREATE project". Each applicant prepared a proposal for an on-line training provided by an excellent research scientific institution or leading training centre. The Project-Support-Office assessed the proposals against eligibility criteria and selected competition laureates.

The competition "On-line training courses under the CREATE project"- OPENS 25 Nov., 2020

WHAT WE OFFER: Covering fees for **online training courses**, **organised by excellent research institution or leading training centres,** in the field of:

- technology transfer between academia and business,
- project/team management,
- acquiring external funds for research & commercialisation,
- quantitative biology or application of physical chemistry to biology or other if resultant from the ERA Chair research agenda

MAIN REQUIREMENTS: The applicants to the programme should explain how their participation in the proposed training course will reinforce the implementation of the research agenda of the ERA Chair (Dept. of Physical Chemistry of Biological Systems), e.g. through collaborative research, supporting services (enhancing knowledge and skills in acquiring or managing external funds and/or technology transfer).

All training courses must be carried out till the end of March 2021 (non-extendable).

FUNDING: CREATE – H2020, ERA Chairs

ca. up to EUR 500/ training day

WHO CAN APPLY: 1. **employed at IPC PAS**:

- researchers – i.e. research workers and research-technical workers,
- managers and specialists serving externally co-/funded projects or supporting applications for grant funding,
- specialists involved in the commercialisation of R&D results,

2. **PhD students affiliated at IPC PAS**,

who are not fully paid under the European framework programmes or structural funds

HOW TO APPLY: applications should be sent directly to agnieszka.tadrzak@ichf.edu.pl

CAUTION: A limited number of courses is available.

For more information see:

Announcement

Rules

Information at the CREATE webpage promoting the competition (for more information see: here)

The programme will cover the fees for the online training courses of the winners in accordance with the purchase regulations valid for IPC.

13th International Course on "Time-resolved Microscopy and Correlation Spectroscopy" (PicoQuant) – training in time-resolved fluorescence microscopy with a focus on life science applications.
Training participants: Aneta Karpińska, Karolina Kucharska, Karina Kwapiszewska, Robert Hołyst, Tomek Kalwarczyk, Alicja Kijewska, Marta Pilz, Grzegorz Bubak
High Impact Leadership (University of Cambridge) – Project/Team Management Training. Course participants get new perspectives, knowledge, and get acquitted with strategies maximising their leadership skills and competencies in the individual, team, and organisational contexts.
Training participants: Tomasz Ratajczyk
Python w Data Science (Kodołamacz/SAGES) – this course deals with the world's most popular programming language, focusing on one of the most growing data science branches - Data Science. It is an interdisciplinary discipline dealing with methods and tools for processing and analysing data, and in general, extracting useful knowledge from it, allowing to solve specific problems.
Training participants: Paweł Albrycht, Krzysztof Bielec
Certified Product Manager (CGE – Certified Global Education Sp. z o.o./ Warsaw University of Technology Faculty of Management) – training provides the participants with the knowledge supporting research commercialisation in the form of spin-off/out from the research unit. The participants learn to build effective product marketing strategy - product marketing plan, manage product on sale, shape strategy of placing the product on the market and build a competitive advantage.
Training participants: Monika Księżopolska-Gocalska
Finance and Accounting from the Basics (Kozminski University) – training in the field of finance and MBA, includes classes in two modules: Accounting from the scratch and Enterprise Finance.
Training participants: Monika Kuczyńska-Wydorska
LabVIEW for Beginners Self – Paced Training (Grafitects™) – training in LabVIEW software. LabVIEW is a graphical programming environment that has become prevalent throughout research labs, academia, and industry. It is a versatile analysis and instrumentation software system for measurement and automation in research laboratories.
Training participants: Agnieszka Jamrozik
Multivariate Classification with Unscrambler training (Camo Analytics) – training provides the participants with the knowledge of supervised and unsupervised chemometric techniques for data analysis such as PCA, SIMCA, PLS-DA, SVM, LDA.
Training participants: Ariadna Nowicka