



*The **CRE**ation of the Department of Physical Chemistry of Biological Sys**TE**ms [CREATE]*

666295 — CREATE — H2020-WIDESPREAD-2014-2015/H2020-WIDESPREAD-2014-2

2nd report on Establishing Knowledge Transfer Zone

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1. Introduction

This document lists activities supporting knowledge transfer between academia and business held under the CREATE project. It includes business open lectures and the conference “*Where biology meets physical chemistry and business*”. The ERA Chair holder and the CREATE Coordinator selected the lecturers, considering their experience in launching innovative products at the market and a broad scope of possible forms of knowledge commercialisation that take place in academia.

2. Conference “Where biology meets physical chemistry and business”

On 7th and 8th of October, 2020, the conference entitled **Industrialization Potential of Optics in Biomedicine** took place. IPC PAS organised the conference as part of WP5 of the CREATE project. Due to the pandemic, the event had an online form. All lectures and talks were broadcast via the conference channel (Pine conference platform) and streamed live on YouTube and FB.

208 participants registered for the conference. There were also many non-registered observers on YouTube, from 80 scientific centres from all over the world, including China, Denmark, Finland, France, Great Britain, United States and even New Zealand, not to mention many reputable Polish universities and institutes.

The scientific committee of the conference was composed by:

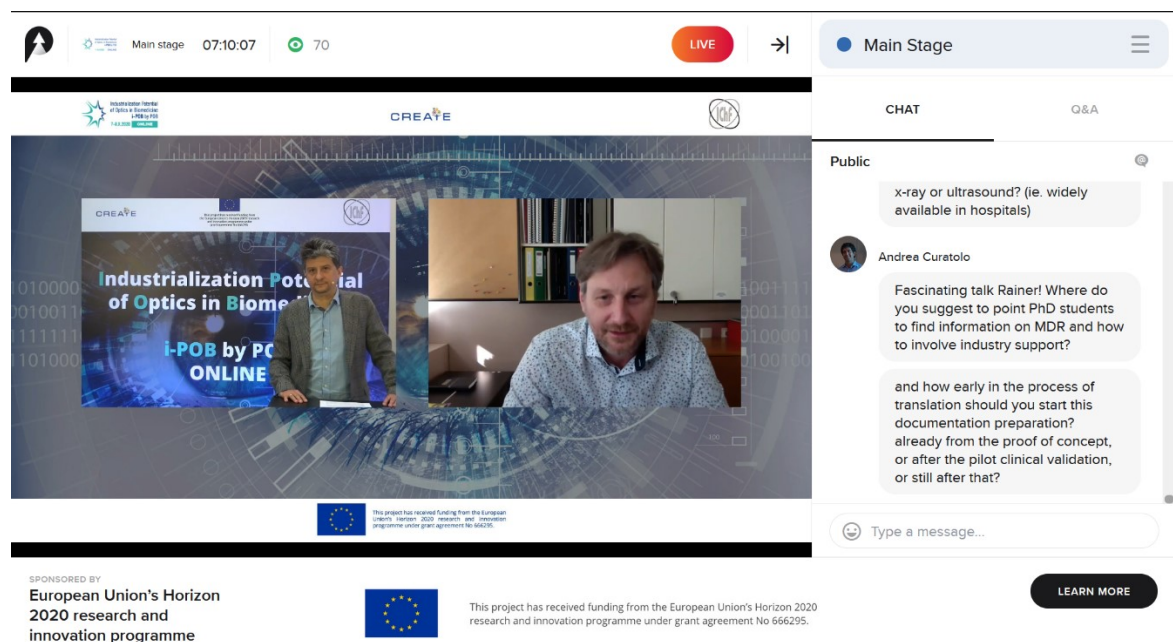
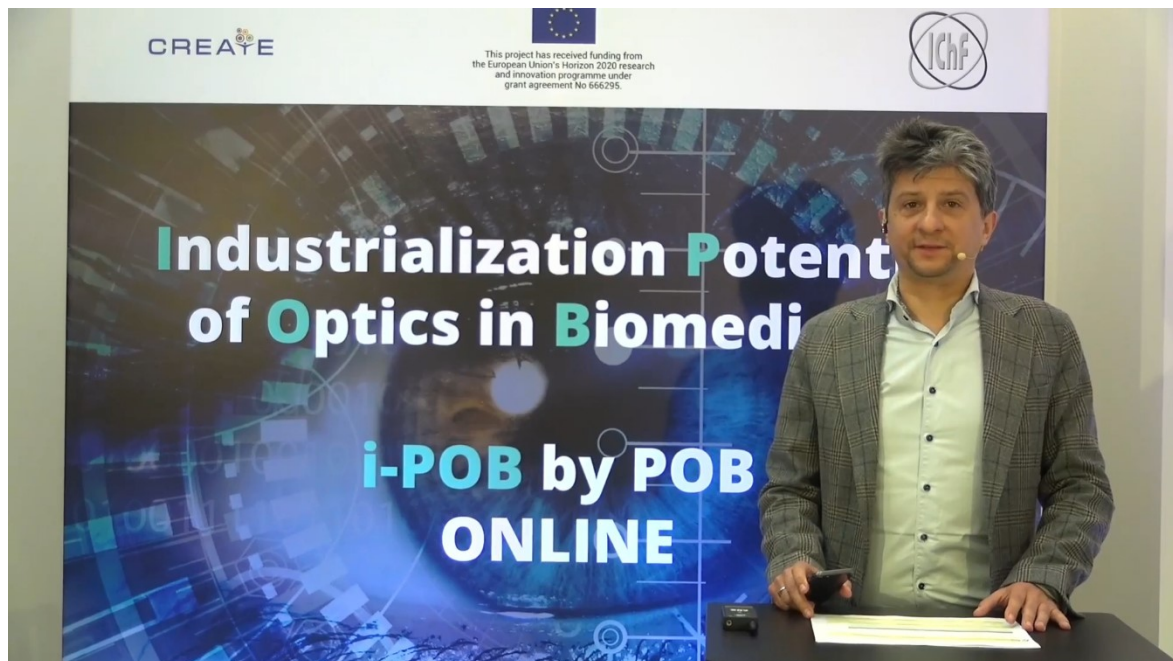
- Prof. Maciej Wojtkowski - ERA Chair holder (IPC),
- Prof. Małgorzata Kujawińska (Faculty of Mechatronics, Warsaw University of Technology),
- Prof. Christophe Gorecki (International Center for Translational Eye Research, Warsaw)
- Prof. Krzysztof Palczewski (Gavin Herbert Eye Institute, UCI).



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The conference focused on the past, current and future developments of optical biomedical imaging techniques. The i-POB conference programme provided an opportunity to share the experience and tribulations of taking discovery to the global market, successfully implementing new technologies and

running the high-tech company. The event provided a platform for interaction between scientist, innovators and entrepreneurs. It was especially instructive for junior researchers and inventors interested in the development of novel imaging technologies.



During the two-day conference, participants could choose from six sessions presenting different facets of optics in biomedicine. As the whole event was interactive, participants could listen to lectures and ask questions and voice their personal opinions on presented subjects. The detailed agenda of the conference is available on the conference website: <http://i-pob.edu.pl/>.

Lectures and talks of keynote speakers that enriched the conference (each talk gather ca. 200 participants):

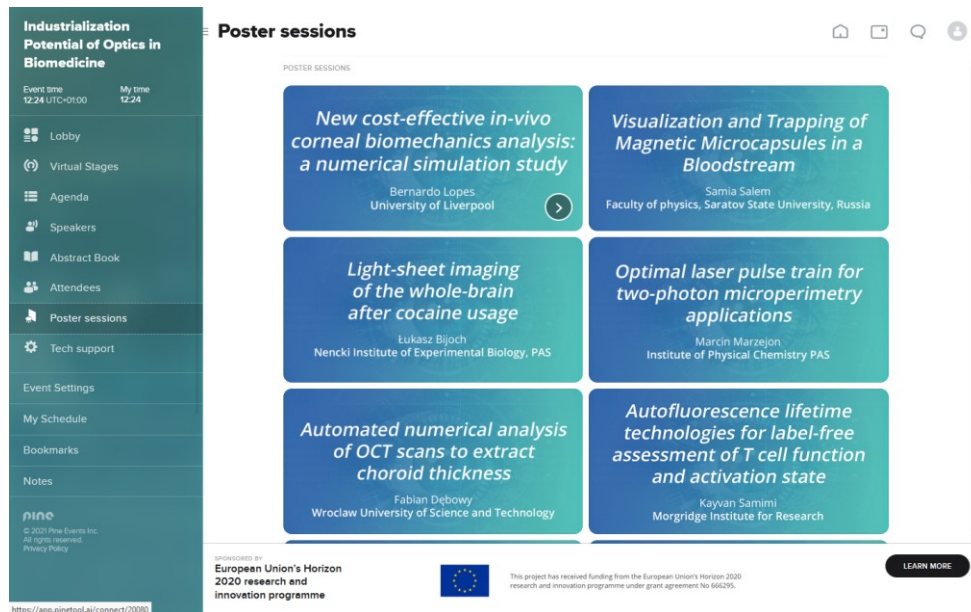
Prof. Brett Bouma	Title: The development and commercialisation of endoscopic OCT technology
	Profile: Professor of Dermatology and Health Sciences and Technology at Harvard Medical School, Director of the Center for Biomedical OCT Research and Translation. He has published over 230 manuscripts that collectively accumulated over 53,000 citations, reflecting an h-index of 67 (Web of Science) and 106 (Google Scholar). Prof. Bouma’s research has led to over 300 issued/allowed patents, with over 100 additional patent applications pending. Many of his patents have been licensed to four different companies, resulting in 5 distinct medical devices on the market. In addition, he serves on the scientific advisory boards of several companies
	Abstract: The lecture included overview of the clinical challenges associated with esophageal adenocarcinoma and its precursor condition Barrett’s Esophagus. The requirements for screening and surveillance were identified as primary motivators that drove the development of endoscopic OCT. The image features associated with dysplasia and intramucosal cancer were presented, and the strategy for imaging and laser marking was discussed. The pathway of commercialization that has resulted in the clinical availability of OCT systems for endoscopic use was reviewed.
Dr. Eric Buckland	Title: Romancing the Start-up: Starting the Entrepreneurial Journey on the Right Foot
	Profile: Founder and CEO of Translational Imaging Innovations, Inc. He has 30 years of experience in developing and commercialising optical technologies for imaging, metrology and telecommunications. He is a founder and CEO of Bioptigen, an international brand recognised for superior imaging systems in translational research, pediatric, and surgical ophthalmology, sold to Leica Microsystems in 2015. Dr. Buckland has 70 patents, 5 Phase II SBIRs.
	Abstract: Start-ups are romantic, even mythical. There is perhaps nothing more exciting in a career than capturing a Unicorn with the better-mousetrap we invented during our Ph. D. programs. The problem is that Unicorns are rare, and better mousetraps seem to be everywhere. To succeed with sanity intact, we need to come down to earth and get real. Taking the right steps from the beginning maximises our chance at building not just a better mousetrap, but a business worthy of growing into that elusive Unicorn. We will discuss the earliest stages of business formation, starting with our co-founders, and proceeding through our first phases of funding, development, and market validation. We will discuss essential topics such as founder agreements, intellectual property rights, and negotiating licenses from our institutions, establishing product-market fit, and early-stage financing. Our objective is to remove the mythology from the start-up experience. We can retain the romance.
	Title: Label-free Optical Sensing of Cell State During Biomanufacturing

Dr. Melissa Skala	<p>Profile: Associate Professor of Biomedical Engineering at the University of Wisconsin – Madison and an Investigator at the Morgridge Institute for Research. She received her Ph.D. in Biomedical Engineering at Duke University in 2007. Her lab uses photonics-based technologies to develop personalised treatment plans for cancer patients, including breast, pancreatic, colorectal, neuroendocrine, oral, and other cancers. She was honoured with the OSA Fellowship.</p> <p>Abstract: Cell-based therapies have the potential to treat, or even cure, a myriad of diseases. However, these complex biological products display intrinsic variability within a tightly regulated industry. Process optimisation and thorough product characterisation prior to clinical development is critical. Typical quality assessments require labels to characterise functional subsets of cells, however standard analytics are laborious, time-consuming, susceptible to reagent quality variability, and may potentially alter cell function. To improve the fidelity of quality assessments, we have developed a label-free, nondestructive optical detection approach to quantify overall cell state, viability, and activation with single-cell resolution. The technology is based on the autofluorescence lifetime of the metabolic co-enzyme NAD(P)H. T cells isolated from human peripheral blood and activated in culture using tetrameric antibodies against the surface ligands CD2, CD3 and CD28 showed specific activation-state-dependent patterns of autofluorescence NAD(P)H lifetime. Logistic regression models and random forest models classified T cells according to activation state with 97–99% accuracy, and according to activation state (quiescent or activated) and subtype (CD3+CD8+ or CD3+CD4+) with 97% accuracy. The hardware, optics, and analytical algorithms are readily integrated into a variety of quantitative imaging technologies, such as flow and image cytometry, enabling non-destructive assessment for early stage cell manufacturing process optimisation and streamlining product development as therapies transition to commercial scale manufacture.</p>
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The speakers shared their knowledge, expertise, and personal experience in optics and transferring scientific knowledge into well-prospering businesses. The event was also a unique opportunity for junior scientists and inventors interested in developing novel imaging technologies to interact with more experienced colleagues and entrepreneurs.

On the second day of the conference, a poster session was organised during which early stage researchers could present their scientific achievements and projects in the form of short (few slides) presentations. It was an excellent opportunity for them to discuss their research results with more experienced scientists and obtain expert opinions on how to successfully conduct commercialisation projects, start the company, and enter the global market.

During the poster session, a competition for the best online poster took place. Evaluation committee composed of prof. Brett Bouma, dr. Melissa Skala, dr. Eric Buckland and prof. Christophe Gorecki awarded **two main prizes – for Kayvan Samimi and Michał Ziemczonok.** The winners received diplomas (see **Annex 1** for an example of a diploma) and **an invitation to an internship at the Physical Optics and Biophotonics Group.**



Poster session, PINE platform, 2nd day of the conference

A complete list of the lectures delivered during the conference and the titles of the presented posters are shown in **Annex 2**.

Undoubtedly, the conference was a great success and the participants left with not only new knowledge but also valuable contacts. The video reportage from the i-POB conference is available on YouTube: https://www.youtube.com/watch?v=uT95u_Svkk

Full conference recordings are available here:

Day 1 – <https://www.youtube.com/watch?v=IxQWSGfwRgo&t=2256s>

Day 2 – <https://www.youtube.com/watch?v=iaok1UukKVw&t=6s>

3. "Innovation source" lectures

Under WP5 we have continued organising a series of lecture, "Innovation source". The purpose of these lectures is to update scientists' knowledge of current technological trends and innovation in chemistry-related sectors, support researchers interested in the commercial application of their own ideas, as well as the establishment of relations with industry.

In the period between M41 – M66, eight open lectures under the series of "Innovation source" were held:

3.1 Rafał Bator "How to deal with the investment of a Venture Capital fund"

The lecturer, **Rafał Bator specialises in technology investments**. He worked at Enterprise Investors, the leading private equity fund in CEE, for 17 years. Among his most significant projects are investments in AVG Technologies, PBKM and Intive. He invested in AVG Technologies (antivirus software provider) in 2005 when the company had revenue of \$10 m. At the time of an IPO (entering the NYSE's main floor) in 2012, the company grew up to \$400 m. AVG became the market leader in the US by the number of protected computers. The IPO of AVG was the first IPO of a technology company from CEE in the US. PBKM is the largest European stem cell bank. Rafał Bator led this investment, starting from a small based in Poland company through a series of acquisitions to become the leader in Europe. Intive is a software house specialising in bespoke software for large international companies (automotive, bank, telecommunication). The company employees 1,500 developers in Poland, Germany, Argentina and in the U.S. From 2008 to 2019 Rafał Bator was the president of Enterprise Venture Fund (managed by Enterprise Investors), providing capital expansion of EUR 2 – 10 m. for companies in CEE. The fund was fully invested and, as such closed in 2019. He has managed 20 investment and exits (including 5 IPOs).



Rafał Bator during the lecture, IPC assembly hall, the 31st May, 2019.

In his lecture, Rafał Bator stressed that the company's performance in the period preceding product market launch had become the key factor in determining the early-stage companies' success. This success is understood as winning a leading position in the global market. The company's growth can be accelerated by external financing, including one offered by venture capital (VC) funds.

Lack of knowledge of how VC works and what they expect in financial and managerial terms is the main cause of misunderstanding between young entrepreneurs and VCs.

Rafał Bator explained that VCs achieve the average internal return rates amounting to 4.4%, while MBO ca. 13-17%, which means that there are only few good projects and/or investors at the market. Different goals and expectations of VCs and companies owners are obvious. Contrary to the companies owners, VCs main goal is to maximise profit, and minimise loss taking into account an investment horizon of 3 – 5 years. Dependence of the company upon the company owner is the main risk of an investor, particularly taking into account that their long-term goal is to sell the company to generate a cashflow and reinvest the money in another venture. Thus, VCs' most interesting investments are those with high gross margin or promising rapid growth of revenue. They pay special attention at the team standing behind the venture in terms of their competence concerning technology, sales and finance. The record of cooperation with financial investors and/or company/projects sold can prove the team value.

Rafał Bator explained that the investors expect the founder to allocate 100% of their time to the venture and make a cash investment. It guarantees that a VC's goals and the company founder become convergent, at least to some extent.

The seminar met with great interest from the audience. It ended with a long discussion that proved that some plots touched by Rafał Bator were new for the audience, and some of them were a bit shocking. The audience expressed a wish to continue similar topics in the future.

59 persons attended the lecture.

3.2 **Tomasz Ciach** *“From labs to hospitals, a long and complex journey”*

Tomasz Ciach is a professor at the Warsaw University of Technology, head of the BioMedLab and Biotechnology and Bioprocess Engineering division at the Faculty of Chemical and Process Engineering. He has broad experience in applying scientific knowledge in practice. He founded his first company during his doctoral studies. The profile of the company was design and manufacture of custom made electronic equipment for laboratories worldwide. Some results of his PhD thesis served as base for the water filter production facility at Amazon UK. His scientific carrier has focused on medical biotechnology and biomedical engineering.

He has developed a few technologies that were launched into the European medical market. The first of these technologies was the coating technology for drug eluting coronary stents that prevent stent restenosis. This technology was introduced at Balton company - a manufacturer of disposable medical equipment for anesthesia, dialysis, surgery, gynecology, cardiology, radiology and urology. Products developed using this technology are sold in and outside the EU. The second technology was a biocompatible coating for urological catheters, this coating eliminates pain during catheterisation and prevents bacterial infections of the urinary tract. This technology was introduced at Galmed - company specialising in the production of disposable medical equipment. The catheters produced by this technology are sold in the EU, mainly in Germany and the UK.

Professor Ciach has also funded or co-founded a few university spin-off and start-up companies. Among others:

- NanoVelos developing polysaccharide nanoparticles for cancer treatment and nucleic acids delivery (multinational patent protection) - the company has currently been preparing to start human trials.
- NanoThea, company developing nanoparticles for early diagnosis of cancer.

- NanoSanguis, developing synthetic oxygen nano-carriers for long-term storage of human organs and production of synthetic blood replacement for humans.

Some of the Nano start-ups were introduced on the Warsaw Stock Exchange as a holding - NanoGroup.



The lecture of prof. Tomasz Ciach, IPC assembly hall, the 11th June, 2019.

Prof. Ciach described the current situation in knowledge transfer from academic and scientific institutes to industrial practice and hospitals. He presented typical routes: patenting, licensing, founding spin-off and other start-up companies to make use of scientific research results in industry and business. He also described the driving force for the process of knowledge transfer – national and private money sources as well as universities and companies incomes and licensing rates. The lecture mainly focused on problems and examples from medical biotechnology and bioengineering areas. Prof. Ciach compared America, Europe and Polish scientific and business environments and gave examples of successful and unsuccessful stories of researchers and companies from these markets.

After the seminar discussion between dr Jan Paczesny, prof. Tomasz Ciach and prof. Robert Holyst took place. The discussion focused on possible applications of nanocomposite coatings developed at IPC. These type of coatings was published in ACS Applied Materials & Interfaces (2015, 7(7), p. 3931) and patented in PCT/EP2013/075709 (patent obtained in November 2018). Professor Ciach suggested applying this nanocomposite coating inside the catheters to reduce the risk of biofilm formation. The scientists agreed to conduct preliminary research in the cooperation between IPC and the Warsaw University of Technology.

61 persons attended the lecture.

3.3 Leon Gradoń “From phenomenological investigations towards industrial applications. Production of CCV filters for automotive industry”

Professor Leon Gradoń is a specialist in the field of chemical engineering. He has a 1969 Diploma in Chemical Engineering from Warsaw University of Technology, Poland, and in 1975 Diploma in Mathematics and Mechanics, Warsaw University. He has a 1976 PhD from Warsaw University of Technology. Leon Gradoń is in the faculty of the Warsaw University of Technology from 1976, from 1990 as a tenure professor. He published 280+ papers, 20+ monographs and chapters and 60+ patents. Leon Gradoń has intensively cooperated with the chemical industry in Poland and abroad. It resulted in the establishment of numerous small companies, which use Leon Gradoń’s technological solution in filtration and separation and inhalation drug delivery. He is the author and co-author of several types

of designed “easy breath” dust-masks (produced by Secura BC Inc. with the rate of production 1 mln/year), liquid filters (made by Amazon Filters Ltd, England) - used in water treatment, food, electronics and fine chemical industries, and the filter used for protection of nano-membranes during the oil production in the offshore facilities. Recently his solutions were used in the construction of the technological line for production of the CCV coalescers used in Diesel en-gines by the largest producer of such engines – Cummins Company (USA) with production ability 3 mln filters/year.



The lecture of Leon Gradoń, IPC assembly hall, the 19th June, 2019.

During the seminar, Prof. Gradoń described filtration process and discussed the production path of CCV filters for the automotive industry. Separation of the liquid droplets from the stable mist system is crucial in industrial technologies, natural gas cleaning, crankcase ventilation CCV systems in Diesel engines, and many other applications. Professor Gradoń, in his lecture, presented the steps that led him to building a technological line for the production of coalescers (with the production capacity of 3 mln filters/year) for the biggest producer of Diesel engines – Cummins Inc. (USA).

The seminar aroused great interest from the audience. The lecture ended with a discussion, mainly arising from PhD students. After the seminar, professor Gradoń participated in a meeting with prof. Robert Hołyst – Coordinator of the CREATE Project, and dr Jan Paczesny. The discussion lasted about 1 hour. During this meeting, professor Gradoń mentioned that a filter's life-time increases when covered with an antibacterial layer preventing the formation of biofilms, which usually clog filters. Prof. Hołyst and dr Paczesny proposed such coverage for prof. Gradoń's filters. During the meeting, they have also discussed at large an education path for PhD students, which would prepare them for being entrepreneurs. Prof. Gradoń recognised the benefits of the "Innovation source" lecture series organised under CREATE project as a proper way to encourage and prepare young researchers to set up their own spin-off companies.

33 persons attended the lecture.

3.4 Jakub Gołąb “Academic exploring industry - a case study”

Professor Jakub Gołąb graduated from the Faculty of Medicine, Medical University of Warsaw (MUW) in 1998. He obtained his Ph.D. in 1999 in the Institute of Biostructure Research, MUW. He had postdoctoral training in Harvard Institutes of Medicine and University of Texas Southwestern Medical School. Since 2009, Prof. Jakub Gołąb heads the Department of Immunology at the Medical University of Warsaw.

His research has focused on experimental oncology, especially on improving the anticancer activity of various therapeutic approaches, including proteasome inhibitors and statins. He is an expert in the

fields of photodynamic therapy and monoclonal antibodies. Prof. Golab has also been active in privately funded drug development initiatives.



The lecture of prof. Jakub Gołqb, IPC assembly hall, the 25th June, 2019.

During the speech, Prof. Gołqb described his career path oscillating between academia and industry. In 2012, he co-founded OncoArendi Therapeutics, a company that has become one of the most successful Polish drug discover companies that develop drugs for asthma, chronic inflammatory diseases and cancer. Two years ago, he left the company to stay in academia. Then he joined Jacek Jemielity, Joanna Kowalska and Dominika Nowis with a new idea to develop personalised cancer vaccines based on cap-modified mRNA delivery. They have started ExPLORNA Therapeutics, a spin-off company from Warsaw University that will soon deliver new therapeutics to cancer patients. During the presentation, Prof. Gołqb discussed the factors needed to start (and succeed) R&D company and gave evidence to the lesson learned from his experience with the pros and cons from an academic perspective.

The audience appreciated the seminar. It was an excellent opportunity for many participants to understand and discuss the advantages and disadvantages of involvement in the industry. The seminar also brought an interesting perspective on possible career paths for researchers, especially for young researchers.

The seminar ended with a discussion between professor Gołqb and IPC researchers. The discussion focused on professor Gołqb's advice on how to get the first money to open a start-up and begin industrialisation. Prof. Gołqb shared his experiences and described how he handled such issues to succeed finally. IPC researchers appreciated that many of the professor's advices were very useful and shed a new light on the problems they analysed. Critical remarks, such as "you should work 100% of your time in your start-up" or "the investor will never give money for free, you have to give something back", gave them new perspectives and opened new possibilities for future commercialisation and bridging the science-industry gap. All IPC researchers agreed that the discussion with professor Gołqb was fascinating and instructive as well.

51 persons attended the lecture.

3.5 Sarai Kemp and dr Nitza Kardish, "How to become an entrepreneur" course

On October, 28 a course on "***How to become an entrepreneur***" was held under "***Innovation source***" open lecture series. The event consisted of **two seminars** and a **workshop**, delivered by **Sarai Kemp**, and **dr. Nitza Kardish** – representatives of **Trendlines**, an Israeli company offering commercialisation services at the field of life sciences. **Dr. Nitza Kardish** has 20 years of experience working at senior management positions at life science companies. **Sarai Kemp** has experience in business

development, including fund-raising strategies for early-stage companies developing innovative technologies and products. In particular, this event aimed to support a transfer of ideas generated at our institute to business.



The lectures of Sarai Kemp and dr Nitza Kardish, IPC assembly hall, the 28th October, 2019.

The first lecture, entitled ***“Israeli ‘Startup Nation’ landscape and what it takes to become a successful entrepreneur”***, was delivered by **Sarai Kemp**.

Sarai described the Israeli entrepreneurship environment and gave an overview of key parameters contributing to the opinion that Israel is a Startup Nation. She also explained what it takes to become a successful entrepreneur. She started with examples of start-up companies such as *Waze (universal navigation software)*, *Mobileye (vision-safety technology)* and a description of their path to success – i.e. acquisition by global companies like Google or Intel. Israel is in the top 12 Most Innovative Economies. It is a worldwide leader in innovation. Sarai Kemp indicated components of such a flourishing ecosystem. The seminar ended with a discussion in which Polish researchers' real problems engaged in commercialisation were thoroughly discussed. The government's role in supporting inventions was emphasised.

The second lecture: ***“The process of tech transfer from academia to a start-up”*** was delivered by dr. Nitza Kardish. She gave a detailed overview of the feasibility study of a technology developed in academia. Dr. Kardish shared her experiences in moving the invention from academia to start up and explained, ***“How much academia change the world”***. She stressed the great importance of basic sciences in the innovation process. She also emphasised that academia is the engine of a global transformation. She also listed the main challenges for innovation. Dr. Kardish stressed that it is crucial to assess the innovation at its early stage quickly. For the implementation factor, dr. Kardish indicated that people and their professionalism are the most critical elements.

The last part of the event was a **workshop** on how to turn research into a start-up. The lecturers conducted a feasibility study of two technologies: Sensitive and Siliquan, which developed at IPC. 61 persons attended the event.

3.6 Yoon-Kyoung Cho “Microfluidic chips to study cell to cell communication and translational research towards precision medicine”

Prof. Yoon-Kyoung Cho is a full professor in Biomedical Engineering at UNIST and a group leader in the Center for Soft and Living Matter at the Institute for Basic Science (IBS), Republic of Korea. She received her Ph.D. in Material Science and Engineering from the University of Illinois at Urbana-Champaign in 1999, after obtaining M.S. and B.S. in Chemical Engineering from POSTECH in 1994 and 1992, respectively. She worked as a senior researcher (1999–2008) at Samsung Advanced Institute of Technology (SAIT), where she participated in developing in vitro diagnostic devices for biomedical applications. 2008, she joined UNIST and was a chairperson of the school of Nano-Bioscience and Chemical Engineering (2008–2014) and the school of Life Sciences (2014–2015), and the director of World Class University (2009–2013) and BK21 (2013–2015) programs. She is an associate editor of the journal ‘Lab on a chip’ and a fellow of the Royal Society of Chemistry. She serves as a scientific advisory board member of Clinomics and Labspinner, S. Korea. Among her currently studied research topics are: lab-on-a-disc for the detection of rare cells and extracellular biomarkers, quantitative analysis of single cells, and system analysis of cellular communication.



The lecture of prof. Yoon-Kyoung Cho, IPC assembly hall, the 31st October, 2019.

During the lecture, prof. Yoon-Kyoung Cho discussed the recent studies on extracellular vesicles (EVs)-based cancer diagnostics inspired by widespread recognition that EVs may be pivotal in intercellular communication. She examined clinical samples by analysing multiple kinds of proteins and RNA of EVs from cancer patient’s plasma or urine samples and showed that the EVs could be a potentially useful biomarker in cancer diagnostics. Next, she introduced the microfluidic chip equipped with biologically interfaced platelet membrane-cloaked surface (PLT-Chip). This chip could precisely capture EVs from multiple types of cancer cell lines than the standard cell-derived EVs and clearly distinguish the plasma of cancer patients from normal healthy controls. Prof. Yoon-Kyoung Cho believes that this revolutionary method can accelerate the acceptance of CTC or EV-based cancer diagnostics as a standard practice in clinical settings. Based on the presented academic research, the critical technologies, including lab-on-a-disc systems equipped with the fluid-assisted separation technology (FAST) have been translated into liquid biopsy products commercialised by two start-up companies.

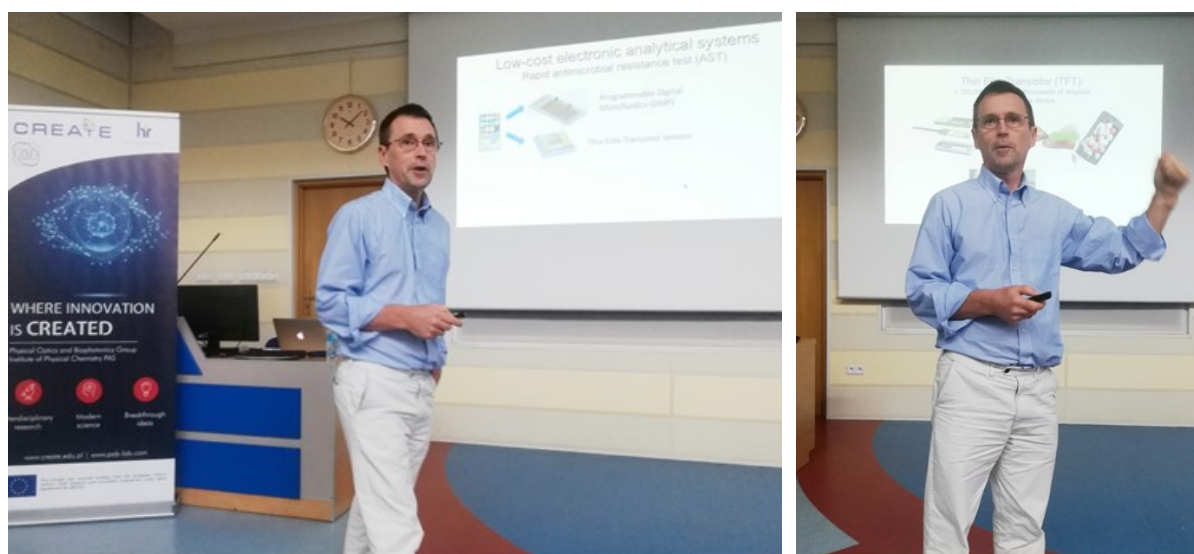
During the lecture, prof. Yoon-Kyoung Cho discussed her personal experience of translational research both at industry (Samsung) and academia (UNIST). In conclusion, the professor understands the critical role of cell-to-cell communication in cancer progression will provide essential insights in

developing improved cancer therapeutics (societal impact) and the basic science of cell biology (basic science). 50 persons attended the lecture.

After the seminar prof. Yoon-Kyoung Cho visited the ERA Chair and one of the synergic groups, supporting the ERA Chair holder, namely - Microfluidics and Complex Fluids research group. These visits aimed to familiarise with IPC, research conducted by these groups, and discuss future cooperation.

3.7 Hywel Morgan “From Smartphones to Diagnostics”

Hywel Morgan is a professor of Bioelectronics in the School of Electronics and Computer Science, University of Southampton. He studied Electronic Engineering at the University of Wales, Bangor, after which he completed a PhD in biophysics, graduating in 1985. After a post-doc at the Hebrew University of Jerusalem, Israel, he moved to the University of Glasgow and was appointed professor in 2001. 2003, he moved to Southampton to take the position of Professor of Bioelectronics. From 2013 till 2017 he was a Royal Society Industry Fellow with Sharp Labs Eu-rope. His research focuses on microfluidics with its applications in medicine and environmental sciences. He published seminal papers in AC electrokinetics. He published over 250 journal papers (H-index = 60) and co-authored a text-book on AC electrokinetics. He is the founder and director of Vi-voplex, a spin-out company that develops implantable wireless sensors to continually record vital signs. 2004, he was awarded the Desty Memorial Prize for Innovation in Separation Science.



The lecture of prof. Hywel Morgan, IPC assembly hall, the 5th November, 2019.

During his talk, prof. Morgan discussed miniature analytical systems developed by his group that exploit low-cost consumer electronics for sample processing/manipulation and sensing.

In collaboration with Sharp Labs, Professor Morgan's group have developed a new generation of digital microfluidic (DMF) platforms for programmable droplet manipulation. Unlike conventional microfluidic systems, DMF manipulates and processes hundreds of discrete nanolitre droplets of liquid. The chips contain thousands of electrodes manufactured using Thin Film Transistor (TFT) technology used in mobile phone screens and laptop displays. The system supports a wide range of different chemical and biochemical assays, for example, immuno-assays and genomic data analysis.

During the lecture, prof. Morgan also described recent developments in electrical impedance cytometry for label-free analysis of single cells and bacteria at high speed. Recently, prof. Morgan's team has developed an impedance-based rapid antimicrobial susceptibility test (AST) that can analyse the infectious agent's resistance profile in 30 minutes compared with the current 48 to 72 hours.

In the end, prof. Morgan described his research in developing miniature wireless and battery-less implantable sensors that continuously monitor biophysical parameters in-vivo and the route to commercialising this product.

The seminar aroused great interest from the audience. The lecture ended with a discussion. During the visit, professor Hywel Morgan has appreciated the engagement of the Institute in industrial collaboration. He was under a great impression of a start-up company Scope Fluidics, co-founded by IPC. Prof. Morgan agreed that such collaborative actions with industrial partners are beneficial to both parties. Additionally, he mentioned that PhD students completing their PhDs should try to go around Europe and deliver talks at various Universities as a form of their training. He invited Krzysztof Bielec (a PhD student finishing his PhD studies) to talk at the University where prof. Morgan works.

49 persons attended the lecture.



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ANNEX 1

Diploma for the winner of the Best Poster Award



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BEST POSTER AWARD CERTIFICATE

The certificate is granted to

Kayvan Samimi

the winner of the Best Poster Award
(ex aequo)
for the poster titled

**"Autofluorescence lifetime technologies for label-free
assessment of T cell function and activation state."**

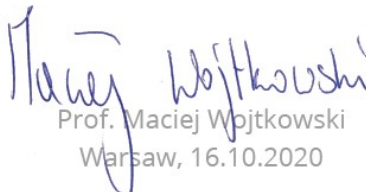
presented at

Industrialization Potential of Optics in Biomedicine Conference

held online by

**the Institute of Physical Chemistry
Polish Academy of Sciences, Warsaw
on 7-8 October 2020**

On behalf of the competition referees:


Prof. Maciej Wojtkowski
Warsaw, 16.10.2020



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HR EXCELLENCE IN RESEARCH



*The **CRE**ation of the Department of Physical Chemistry of Biological Sys**TE**ms [CREATE]*

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ANNEX 2

Conference program incl. a list of the lectures and the titles of the poster presentations



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Conference Programme

Day 1 : 07.10.2020

12:50 - 13:00	Welcome Host: Maciej Wojtkowski
13:00 - 13:30	Special event: dr Yann Cotte , Nanolife SA, Switzerland <i>For registered participants only</i>
13:40 - 15:00	Session 1 Host: Maciej Wojtkowski
13:40 - 14:00	Brendan Kennedy, Harry Perkins , The University of Western Australia / Institute of Medical Research, OncoRes Medical, <i>In vivo detection of residual tumour in breast-conserving surgery using OCT based elastography</i>
14:10 - 14:30	Robert Huber , Institute of Biomedical Optics, University of Lubeck, Germany <i>4-D Megahertz-OCT: Technology and applications</i>
14:40 - 15:00	Egidijus Aukorius , Institute of Physical Chemistry PAS, Poland <i>Crosstalk-free volumetric in vivo imaging of a human retina and cornea with Fourier-domain full-field optical coherence tomography</i>
15:10 - 15:30	Break
15:30 - 16:50	Session 2 Host: Christophe Gorecki
15:30 - 16:00	Brett Bouma , Harvard Medical, School, USA, <i>The development and commercialization of endoscopic OCT technology</i>
16:10 - 16:40	Melissa Skala , Morgridge Institute for Research, University of Wisconsin, USA, <i>Label-free Optical Sensing of Cell State During Biomanufacturing</i>
16:50 - 17:00	Break
17:00 - 18:30	Session 3 Host: Maciej Wojtkowski
17:00 - 17:20	Eric Buckland , Translational Imaging Innovations, USA, <i>Romancing the Startup: Starting the Entrepreneurial Journey on the Right Foot</i>
17:30 - 17:50	Mary Durbin , Zeiss Meditec, USA, <i>Developing and verifying quantification for OCT Angiography</i>
18:00 - 18:20	Grazyna Palczewska , Polgenix, USA, <i>Beauty and power of two-photon excitation</i>



Day 2 : 08.10.2020

9:00 - 10:30	Session 1 Host: Karol Karnowski
9:00 - 9:20	Andrea Curatolo , Instituto de Óptica "Daza de Valdés", Consejo Superior de Investigaciones Científicas (IO, CSIC), Madrid, Spain, <i>High-frame rate multi-meridian corneal imaging of air puff induced deformation for improved detection of keratoconus</i>
9:30 - 9:50	Thomas Klein , Optores, Germany, <i>High finesse tunable Fabry-Perot filters in Fourier-domain mode-locked lasers</i>
10:00 - 10:20	Huikai Xie , Beijing Institute of Technology, China, <i>MEMS Scanning Micromirror Based Multimodal Optical Endoscopic Imaging</i>
10:30 - 11:30	Session 2 Host: Piotr Ciąćka
10:30 - 10:50	Yves Emery , Lyncee Tec SA, Switzerland <i>From pioneer publications to commercial expansion</i>
11:00 - 11:20	Arkadiusz Kuś , Faculty of Mechatronics, Warsaw University of technology, Poland <i>Single exposure holographic tomography</i>
11:30 - 11:40	Break
11:40 - 13:40	Session 3 Host: Maciej Wojtkowski
11:40 - 12:00	Rainer Leitgeb , Medical University of Vienna, Austria, <i>Research at the edge of translation</i>
12:10 - 12:30	Fergal Shevlin , Dyoptyka, Ireland <i>Successful commercialization of a novel optical technology by a small start-up</i>
12:40 - 13:00	Dawid Borycki , Institute of Physical Chemistry PAS, Poland, <i>Sensorless adaptive optics and angiography in spatiotemporal optical coherence (STOC) retinal imaging</i>
13:10 - 13:30	Nishant Mohan , Photonicare Raleigh-Durham, II, USA, <i>Industrial Advances Enabling OCT Adoption in Primary Care: From Commercial Optimization to Artificial Intelligence</i>
13:40 - 14:30	Lunch break
14:30 - 17:30	Poster session <i>(The Best online poster award competition referees: Brett Bouma, Melissa Skala, Eric Buckland, Christophe Goreck)</i>
18:00 - 18:30	Conclusions, Best poster Award and Closing Host: Maciej Wojtkowski





List of poster presentations

Bernardo Lopes University of Liverpool	<i>New cost-effective in-vivo corneal biomechanics analysis: a numerical simulation study</i>
Samia Salem Faculty of Physics, Saratov State University, Russia	<i>Visualization and Trapping of Magnetic Microcapsules in a Bloodstream</i>
Łukasz Bijoch Nencki Institute of Experimental Biology, PAS	<i>Light-sheet imaging of the whole-brain after cocaine usage</i>
Marcin Marzejon Institute of Physical Chemistry PAS	<i>Optimal laser pulse train for two-photon micropertometry applications</i>
Fabian Dębowy Wrocław University of Science and Technology	<i>Automated numerical analysis of OCT scans to extract choroid thickness</i>
Kayvan Samimi Morgridge Institute for Research	<i>Autofluorescence lifetime technologies for label-free assessment of T cell function and activation state</i>
Agnieszka Zielińska Nicolaus Copernicus University in Toruń	<i>Two-photon pupillary light reflexes</i>
Saeed Samaei Polish Academy of Sciences	<i>Compact time-domain diffuse correlation spectroscopy instrument for depth-resolved blood flow quantification in vivo</i>
Grzegorz Soboń Wrocław University of Science and Technology	<i>Novel femtosecond fiber laser with tunable pulse repetition rate for two-photon excited fluorescence imaging</i>
Maria Baczevska Warsaw University of Technology	<i>Statistical analysis of cell compartments in 2D and 3D QPI tools</i>
Fernando Eleazar García Ramírez FEMTO-ST Institute	<i>SS-OCT probe with a Mirau micro-interferometer and a 2-axis electrothermal micro-mirror scanner for endoscopic applications</i>
Alejandra Consejo Institute of Physical Chemistry PAS	<i>Detection of subclinical keratoconus based on Scheimpflug light intensity distribution</i>
Klaudia Nowacka Institute of Physical Chemistry PAS	<i>Dynamic light scattering improves imaging with optical coherence tomography</i>
Ewelina Pijewska Uniwersytet Mikołaja Kopernika	<i>Estimation of blood circulation in the human retina vessels by spectral and time-domain optical coherence tomography</i>
Krystian Wróbel Institute of Physics, Nicolaus Copernicus University in Toruń	<i>Extracting information from saccades and microsaccades detected with an ultrafast retinal tracking system</i>
Alfonso Jiménez-Villar Nicolaus Copernicus University	<i>Air-puff SS-OCT biometer for non-contact determination of biomechanical properties of the eye</i>
Ebrahim Safarian Baloujeh Nicolaus Copernicus University	<i>OCT-Based Densitography for Objective Determination of Crystalline Lens Opacities</i>
Daniel Rumiński Nicolaus Copernicus University	<i>Image-Based Evaluation of Vitreous Aging Process in the Human Eye</i>





Maciej Nowakowski AM2M R&D Ltd.	<i>Research and development processes in biomedical optics field</i>
Anna Szkulmowska AM2M R&D Ltd.	<i>Quality improvement of OCT images</i>
Michał Meina Nicolaus Copernicus University	<i>Zero-latency retinal movement tracker with a high spatial and temporal resolution</i>
Szymon Tamborski Nicolaus Copernicus University	<i>Fast and precise retinal eye-tracking system for quantification of fixational and saccadic motion</i>
Michał Ziemnoczok Warsaw University of Technology	<i>Test structures for metrology in 2D/3D phase microscopy</i>
Joanna Gorgol Nicolaus Copernicus University	<i>Analysis of eye movements during fixation task using FreeEye Tracker – a pilot study</i>

