



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

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2nd report on enhancement of IPC research quality

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I. OVERVIEW:

This document contains **description of the courses and effects of events intended for the whole IPC society, and – in particular – the synergetic groups** (i.e. research groups selected by the ERA Chair holder for collaboration and development of research goals adopted by the ERA Chair holder), i.e.:

- Laser Centre, prof. Czesław Radzewicz / dr. hab. Angulo Gonzalo
- Microfluidics and Complex Fluids, prof. Piotr Garstecki
- Soft Condensed Matter, prof. Robert Hołyst
- Surface Nanoengineering for chemo- and bio- sensors, dr hab. MEng. Joanna Niedziółka-Jönsson

It includes mentoring and tutoring actions which took place between M21 – M40.

Tutoring and mentoring activities of ERA Chair holder towards his employees are not within the scope of this deliverable, and are reported separately under a deliverable 2.4: *"1st report on tutoring and mentoring activity of ERA Chair holder towards his/her employees"* (M30) and will be updated under a deliverable 2.5: *"2nd report on tutoring and mentoring activity of ERA Chair holder towards his/her employees"* (M60).

In total, under the given period, the following no. of actions aimed at development of the research IPC staff (excluding members of the new department – i.e. the Department of Physical Chemistry of Biological Systems) were organized:

- **14 lectures:**
 - **11 scientific lectures**
 - **3 "Innovation source" lectures**
- **7 person/conferences and/or trainings.**

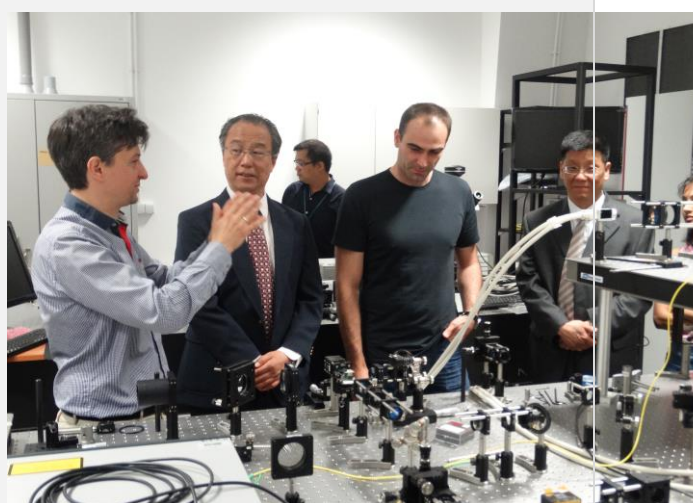
II. ENHANCEMENT OF SKILLS & KNOWLEDGE OF IPC SOCIETY:

• Scientific lectures (11):

Name:	Prof. Luyuan Li
Position/Institution:	Professor of Pharmacology, Nankai University College of Pharmacy, Director, State Key Laboratory of Medicinal Chemical Biology, Tianjin, China
Date:	20/06/2017

Aim of the visit:

- ✓ deliver seminar lecture on his studies and trends in scientific research in China,
- ✓ participate in meetings with synergetic teams to support mentoring activity of the ERA Chair holder,
- ✓ take part in the consultations on cooperation between IPC and State Key Laboratory of Medicinal Chemical Biology at Nankai University.



“The Surging Tide of Scientific Research in China”

Abstract of the seminar

China has caught up with the advancing tide of modern science in the last two decades. The amount of scientific publications increases markedly each year, now second only to the United States in total numbers annually. Improvement in the quality of the research is also evident as a rising number of important discoveries authored by Chinese scientists now frequently appear in most highly influential journals, especially in the fields of chemistry and biological sciences. The surge is likely driven by increasingly sizable government spending on science and technology development as well as by the repatriation of tens of thousands of Western-trained scientists. One essential component of the infrastructure of the Chinese scientific community is the system of the State Key Laboratories, more than 250 strong and covering a wide range of research fields. Most of the SKLs are affiliated with major research universities and the Chinese Academy of Sciences. An example is the State Key Laboratory of Medicinal Chemical Biology at Nankai University. Inaugurated in 2011, the SKLMCB is a multidisciplinary research laboratory currently consisting of a faculty of 54 Principal Investigators interested in disease mechanisms, medicinal chemistry, bio-analysis, and nanomaterials. Their research is supported mainly by funds from the Ministry of Science and Technology and the National Science Foundation of China in the form of program grants and investigator-initiated research grants. The researchers in the SKLMCB have achieved considerable advances in the areas of mechanisms of cancer development, stem cell biology, multimode probes for bio-imaging, and biomimetic polymers, among others. They collectively published more than 800 papers in 2011-2015 in international scientific journals, with the Impact Factors averaging 5.07. The publications were apparently influential, averaging 13 citations per paper in

the five years, with more than 100 of these papers cited 10 or more times each year, and 8 of them being among the top one percentile of the most cited papers world-wide. Additionally, a first-in-class anti-glioblastoma new drug is being tested in clinical trials, and two investigational new drug applications are recently approved by the Chinese Food and Drug Administration.

Name:	Prof. Carlos Drummond
Position/Institution:	Professor at Centre National de la Recherche Scientifique CNRS, France, Bordeaux, France
Date:	10-13/10/2017

Aim of the visit:

- ✓ deliver seminar lectures on his studies;
- ✓ participate in meetings with synergetic teams to support mentoring activity of the ERA Chair holder;
- ✓ take part in the consultations on possible changes in IPC and give their recommendations for the Institute.



"From fire ants to graphene: some considerations on water-hydrophobic interfaces"

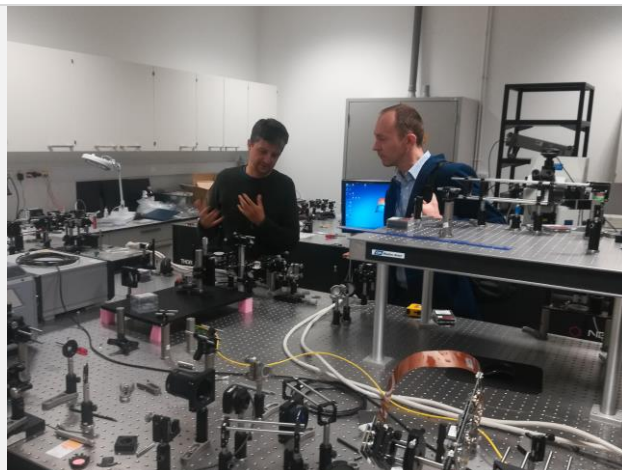
Abstract of the seminar

The interface between water and hydrophobic surfaces plays a central role in a number of important subjects like proteins folding, surfactant self-assembly, detergency or oil recovery. These interfaces show a complex behavior not always well-understood, often determined by (apparently) secondary actors like ionic species or gases dissolved in the aqueous phase. In this seminar I will describe few examples illustrating the complexity of these interfaces. More precisely, I will discuss the interaction between ions in water and hydrophobic polymers, the behavior of single layer graphene or carbon nanotubes in water, and ion-specific effects on the behavior of temperature-responsive Poly(N-isopropylacrylamide). Finally, I will discuss some examples of how the complexity of water-hydrophobic interfaces can be of use to manipulate the properties of materials.

Name:	Dr Bartłomiej Waclaw
Position/Institution:	Research Fellow at School of Physics and Astronomy, The University of Edinburgh, UK
Date:	19/10/2017

Aim of the visit:

- ✓ deliver seminar lectures on his studies;
- ✓ participate in meetings with synergetic teams to support mentoring activity of the ERA Chair holder;



„The physics of drug resistance”

Abstract of the seminar

Resistance to drugs is now recognized as one of the most important medical and societal problems. Bacteria can become resistant to antibiotics in a matter of hours, making many antibiotics used to treat human and animal infections increasingly ineffective. Similarly, cancer cells often develop resistance to chemo- and targeted therapy that eventually leads to cancer recurrence. A better understanding of these processes is necessary if we want to improve the therapy outcome and make the existing and newly discovered drugs useful for as long as possible.

In this talk I will first briefly recapitulate my research trajectory through the physics of drug resistance. I will show some interesting parallels between the evolution of resistance in populations of bacteria and cancerous tumours. I will explain how physical processes such as mechanical interactions between cells and heterogeneities in the distribution of the drug affect the rate with which resistant cells spread. I will also show how little is still known about molecular mechanisms of drug action and drug resistance, and how this can be improved by combining experiments and mathematical modelling.

Lastly, I will discuss some intriguing possibilities for future research: how experimental and theoretical models could be used to optimize antimicrobial and anticancer treatment, and how physics and chemistry could help to limit the growth and evolution of resistance in microbial biofilms

Name:

Dr Egidijus Aukorius

Position/Institution:

Institut Langevin, Paris, France

Date:

20/10/2017

Aim of the visit:

- ✓ deliver seminar lectures on his studies;
- ✓ participate in meetings with synergetic teams to support mentoring activity of the ERA Chair holder;



“Full-field optical coherence tomography: from micro to macro imaging”

Abstract of the seminar

Optical coherence tomography (OCT) has become an established tool in biomedical imaging. Standard OCT is a point-scanning interferometric technique capable of fast in vivo visualization of tissue architecture. Full-field optical coherence tomography (FF-OCT), on the other hand, uses a camera instead of a point detector and a conventional incoherent light source instead of a laser that enables parallelized detection, and thus, fast en face imaging. FF-OCT can be useful in a range of applications that require either high resolution or/and en face imaging. Thanks to its high isotropic resolution ($< 1 \mu\text{m}$ in 3D), it can be used in applications that normally require the preparation of histology slides, such as in studying the enteric nervous system. Spatial resolution can be traded-off for a larger field-of-view ($>1 \text{ cm}^2$) that is necessary, for example, in subsurface fingerprint imaging.

Images of subsurface fingerprints are of great interest in biometrics since they contain more details than the surface fingerprints and, most importantly, can be partly free of imaging artifacts caused by damage, moisture or dirt on the surface. We have built an FF-OCT subsurface fingerprint sensor based on a novel silicon camera that allowed acquisition of high quality subsurface fingerprints, and subsequently, identification of individuals with high accuracy from a single finger.

To increase the sensor's performance further in terms of the signal-to-noise ratio (SNR) dark-field detection can be implemented in the FF-OCT configuration. It can reject spurious signal, such as specular reflections from a sample and other optical elements, that effectively allows a more efficient use of camera's detection bandwidth. Since some of the genuine signal is also rejected in the process, a brighter light source or a configuration that utilizes the limited light budget more efficiently is thus needed. To this end, I will present a configuration that involves an asymmetric interferometer with a 10:90 beamsplitter allowing near $\times 4$ more efficient signal detection. The developed instrument could be used in a number of other en face deep-tissue imaging applications thanks to its high sensitivity and speed. Naturally, it could be used for imaging various skin conditions, such as cancer and other dermatological diseases.

Name:

Prof. Wilhelm Huck, *ERC grant holder*

Position/Institution:

Professor of Physical Organic Chemistry at the Institute for Molecules and Materials, Radboud University, The Netherlands

Date:

20/10/2017

Aim of the visit:

- ✓ deliver seminar lectures on his studies;
- ✓ participate in meetings with synergetic teams to support mentoring activity of the ERA Chair holder;



“Building a Synthetic Cell”

Abstract of the seminar

A cell is the common unit structure shared by all living organisms, but even ‘simple’ prokaryotic cells are extremely complex chemical reactors.

One of the grand fundamental challenges of modern science is to reveal the basic operating principles of life. While we have extensive knowledge about the molecular building blocks that form the basis of modern life, we do not understand how these building blocks collectively operate to define life as we know it. Cellular life, which provides the fundament of all organisms, appears to be the result of a collection of highly controlled, energy consuming, dynamic self-assembly and self-organization processes that lead to autonomous entities that can reproduce, transfer information, interact, and evolve.

Understanding the physical-chemical principles of these collective processes poses a formidable challenge, which needs to be overcome if we want to be able to understand life itself, and influence biological processes in a rational way in the future. Truly understanding life from the bottom-up will bring huge intellectual, scientific, and technological rewards. At the same time it will raise fascinating philosophical and ethical questions about how society may cope with new opportunities that result from this fundamental insight.

In our research, we use microfluidic techniques to create cell-like environments that allow us to probe the impact of the physical aspects of the cell on key biochemical processes such as transcription and translation. I will also give an overview of our current attempts to reconstruct a living cell.

Name:

Prof. Jochen Blumberger, *ERC grant holder*

Position/Institution:

**Department of Physics and Astronomy, University College
London, UK**

Date:

22/02/2018

Aim of the visit:

- ✓ deliver seminar composed of two parts:
 - current studies of Prof. Blumberger and his group,
 - the art of leading a research group,
- ✓ participate in meetings with synergetic teams to support mentoring activity of the ERA Chair holder,
- ✓ take part in the consultations on required changes at IPC to improve our performance.



“Inorganic Interfaces, Organic Materials and Energy Converting Enzymes: The Power of Computational Chemistry”

Abstract of the seminar

In the last few decades we have witnessed tremendous progress in Computational Chemistry and

Physics due to more refined and efficient theoretical algorithms that enabled us to solve, albeit still approximately, some of the most fundamental equations that govern chemical and physical processes. As a result, Computational Chemistry has penetrated many sub-disciplines of the Natural Sciences in the last thirty years, from Astrochemistry to Material Science and Biological Physics as a complementary tool that aids our interpretation and understanding of Chemistry and Physics at the molecular level. In his talk, Prof. Blumberger surveyed a number of studies where his group used modern electronic structure calculations as well as state-of-the-art molecular dynamics simulations to gain mechanistic insight into a diverse range of chemical and physical processes. He presented results on the atomistic structure and dynamics of transition metal oxide/liquid water interfaces relevant for electrochemical water splitting. Prof. Blumberger also explained challenges one faces when it comes to describing charge transport processes in organic materials that form the active layers of organic light emitting diodes and organic solar cells, and simulations of electron flow in some of the most intriguing enzymes that have evolved to export electrons from the inside of the cell to extracellular space. Finally, Professor described how small inhibitor molecules diffuse to active sites of hydrogen-converting enzymes (hydrogenases) and the theoretical method they have put forward for prediction of mutations that could interfere with ligand diffusion and binding.

“The Art of Leading a Research Group”

Abstract of the seminar

Leading a research group requires some of the skills we thought we would never need when we decided to become a scientist. After years of post-doctoral work where scientific reasoning, realism and painstaking attention to detail counts everything, we are suddenly confronted with writing ambitious grant proposals that promise to solve the many problems of this world. After a 10-minute conversation with the interviewee we should be able to tell if he/she makes a successful PhD student or Postdoc or if most of the answers given were just hot air. We are supposed to motivate our group members, comfort them if experiments give zero results after years of preparations and encourage them to become the leaders of the future. The “human component” that comes into play when leading a group should not be underestimated - it is (almost) as important as the science itself. I will give a (necessarily) personal view on some of the issues a scientific group leader faces, including best practices in leading a group, optimal group size, hints about hiring and interviewing, publishing and writing of grant applications.

Name:	Prof. Benjamin Judkewitz,
Position/Institution:	Head of the Bioimaging and Neurophotonics Lab at Einstein Center for Neurosciences, NeuroCure Cluster Excellence, Charité–Universitätsmedizin Berlin, Germany
Date:	18/05/2018

Visit of Professor Benjamin Judkewitz was organized within the frames of CREATE 1st Scientific Symposium titled ***“Physical Chemistry in biological systems – breaking barriers”***. This event was organized in cooperation with the Warsaw University of Technology and was a part of the 10th Anniversary Symposium of the Photonics Society of Poland, combined with the International Day of Light 2018.

Programme of the CREATE symposium included an invited talk from the prominent international speaker, several short talks from POB Group Members, representatives of synergetic groups and collaborators from different institutions. The purpose of the event was to engage scientists from diverse research areas to share their expertise and insights on the projects they execute, what will serve as a knowledge exchange platform, setting up new relations between young scientists in interdisciplinary research.

Besides the main goal of this visit – delivering a scientific seminar during the CREATE symposium, Prof. Judkewitz participated in several meetings, with synergetic teams to support mentoring activity of the ERA Chair holder and with CREATE project representatives, for suggestions on possible development directions and improvements at IPC PAS.



Within the frames of CREATE symposium Prof. Benjamin Judkewitz, delivered a lecture titled **“Deep imaging with time-reversed light”**. Seminar was held in the assembly hall of the Warsaw University of Technology, Physics Building and it was attended by IPC PAS researchers and PhD students, who were invited to join this CREATE event, as well as outside guests.

Prof. Judkewitz seminar was focused on describing several strategies to address one of the main optics challenges - imaging through scattering tissues, using techniques based on wavefront engineering, in order to enable optical imaging at unprecedented depths in biological tissues. Furthermore, he introduced the principle of F-SHARP microscopy, as a promising solution to this challenge.

Name:	Prof. Pablo Artal, <i>ERC grant holder</i>
Position/Institution:	Full Professor of Optics, founder and director of the Laboratory of Optics at the University of Murcia, Spain
Date:	22/05/2018

Aim of the visit:

- ✓ deliver a scientific seminar,
- ✓ participate in meetings with synergetic teams to support mentoring activity of the ERA Chair holder,
- ✓ take part in the consultations on required changes at IPC to improve our performance.



“Optics for better vision”

Abstract of the seminar

The human eye is a simple optical system, but very well adapted to the special requirements of our visual system. A better understanding of the optical physics properties of the eye allowed to develop new technologies to improve vision in many people.

Topics: presentation of several recent results ranging from the nature of the lens movements, the development of new types of intraocular lenses to new opto-electronic instruments for the correction of cataracts and presbyopia.

Name:

Prof. Krzysztof Palczewski,

Position/Institution:

Case Western Reserve University, Cleveland, USA

Date:

19/06/2018

Aim of the visit:

- ✓ deliver a scientific seminar,
- ✓ participate in meetings with synergetic teams to support mentoring activity of the ERA Chair holder,
- ✓ take part in the consultations on required changes at IPC to improve our performance.



“Chemistry of Vision”

Abstract of the seminar

Considerable progress has been made towards understanding how light is converted through a series of biochemical events into neural signaling (phototransduction), and how visual chromophores are regenerated

(visual cycle), permitting sustainable visual perception. My laboratory studies both processes through multidisciplinary approaches to obtain a comprehensive view of the visual system in health and during disease. Once elements of these signaling pathways have been identified, key contributions from structural biology at different levels of resolution, as attained with classical and time-resolved crystallography, cryo-electron microscopy, cellular cryo-electron tomography, and two-photon *in vivo* and *ex vivo* microscopy, will deliver a precise structural account of the participating retinal cells and their intracellular organization. We can make quantum leaps using innovative approaches unavailable 3 years ago and thereby provide relevant structural information in a relatively short period. Although we are looking beyond “one molecule at a time” approaches, individual proteins of the visual system will nonetheless need to be studied at atomic resolution to understand their mechanism of action and to advance pharmacological interventions. Development of new treatments based on a comprehensive understanding of phototransduction and the visual cycle, including gene expression and transcriptional regulation, will be essential to combat genetic defects, metabolic aberrations, and environmental insults leading to blindness. Our groundbreaking advances for two-photon imaging in the eye to recognize biochemical perturbations for the early diagnosis of ocular diseases and the stratification of patients for treatment will lead to the discovery and validation of such treatments that can prevent retinal degenerative diseases. Involving such approaches as visual chromophore supplementation, detoxification of harmful retinoids, and systems pharmacology, we will be able to advance toward the treatment of common retinal diseases. “Proof of concept” studies in humans are now required to move pharmacological approaches beyond preclinical studies of rodents and other animal models.

Name:	Prof. Joanna Cichy
Position/Institution:	Professor at the Department of Immunology, Jagiellonian University, Cracow, Poland
Date:	28/06/2018

Aim of the visit:

- ✓ deliver seminar lectures on his studies;
- ✓ participate in meetings with synergetic teams to support mentoring activity of the ERA Chair holder;



„Biologists, Chemists and Physicists crosstalk over the skin”

Abstract of the seminar

Skin interfaces directly with the outside world and as a result is equipped with a variety of strategies to cope with environmental challenges, such as microbial infection. These strategies include a multilayered structure that comprises uppermost epithelium (epidermis), the lowermost fat tissue, as well as infiltrating immune cells (leukocytes). Host must coexists with a myriad of useful microorganisms at portals of pathogen entry but must be sufficiently alerted to prevent potential infection. While the skin environment is clearly restrictive to microbial infection a few mechanisms are known. Therefore, the nature of the signals that orchestrate defensive mechanisms at body barriers, including skin remains a critical question in immunological research.

Here I review the currently known key mechanisms underlying skin barrier defense and discuss how disruption of these mechanisms can manifest in skin inflammatory diseases. Complete understanding of skin barrier defense would require collaboration of biologists with chemists and physicists to overcome critical technological challenges such as: i/ generation of in vitro skin models that reproduce the structure and physiological functions of this organ, including its interaction with skin microbiota, ii/ measurement of body temperature at tissue level, iii/assessing protein redox changes in tissue microenvironment and iv/ analysis of production of reactive oxygen species at subcellular levels.

Name:	Prof. Chris Dainty
Position/Institution:	Professor at the Institute of Ophthalmology, University College London, UK
Date:	1-3/10/2018

Aim of the visit:

- ✓ deliver scientific seminar lectures on his studies;
- ✓ deliver a lecture dedicated to PhD students;
- ✓ participate in meeting regarding possible improvements in IPC PAS;
- ✓ participate in short meetings with synergetic teams to support mentoring activity of the ERA Chair holder.



“Fundamental Limits of Mobile Phone Cameras”

Abstract of the seminar

Phone cameras have transformed photography: for example, every day around 3 billion pictures are shared on the internet. From an aesthetic design and commercial perspective, there is a drive towards smaller and smaller cameras, but elementary physics tells us that, in imaging, “small is bad”. In this talk, I shall explain what the fundamental limits of phone cameras are, and the steps being taken to mitigate them through new hardware and software.

“Should I stay, or should I go”

The lecture concerned the pros and cons of staying in academia. During the seminar participants (mostly students from International PhD programme at IPC) discussed different aspects of the scientific career, with its cross-sectoral dimension and a high focus on transferable skills. Prof. Dainty gave a lot of examples from his life and lead a discussion about scientific career development, based on his own diversified rich work experience and years he spent at the leading European universities. Among the discussed options were:

- postdoc positions: staying in Poland or going abroad,
- research or teaching - possible career paths,
- switching to industry – postdoc positions within R&D departments.

- “Innovation source” lectures (3):

Name: Justyna Garstecka
Position: CEO of Motherhood company
Date: 10/05/2018



Justyna Garstecka is a founder and owner of the “Motherhood” company. She has been awarded “Businesswoman of the Year” (contest “Success Written in Lipstick”). Before setting own company Ms. Garstecka was a Brand Manager at Warner Bros. In addition to above, she is also a member of ERA Chair Advisory Board for the CREATE project.

The main goal of the visit of Justyna Garstecka was to deliver a lecture **“How to start, and keep (!) your own business”**.

The lecture was focused on practical aspects of running a business and included the following issues:

- ✓ How to start your own business?
- ✓ How to keep it up and running?
- ✓ Why all obvious things are not so obvious while doing business?
- ✓ And how come that running through the nettles can also be motivating?
- ✓ Want to be your own boss? Be aware that you will also be your own employee!

In the course of the lecture, Ms. Garstecka discussed such issues as:

- ✓ focusing on details – paying attention to each element of creation or sale processes; everything must be perfect because everything is important;
- ✓ identifying the target group and determining the best moment to send offers;
- ✓ in house vs. outsourcing – advantages and risks;
- ✓ budget planning – planning expenses, during small and large sales as well;
- ✓ creating the price policy.

The seminar gave an opportunity for active discussion about practical aspects of running your own business. During the presentation there were many questions from the audience. Moreover, when the Q&A session finished, several people asked further questions to the presenter on an informal one-to-one basis.



Name: Dr Radosław Kwapiszewski

Position: R&D Project Manager in the Drug Discovery Department at Adamed Group

Date: 6/06/2018



Radosław Kwapiszewski is R&D Project Manager in the Drug Discovery Department at Adamed Group (pharmaceutical company). On the 6th June, 2018 he delivered a lecture **“Academic scientists and Pharmaceutical R&D: what can they offer each other?”**.

The course of lecture:

- ✓ description of Radosław Kwapiszewski career path;
- ✓ profile of Adamed Group, its most important areas of interest and career development opportunities in this company;
- ✓ differences between pharma and academia structure;
- ✓ indicators which motivate people to do science, like the thrill of new discoveries, stress level, freedom to choose your own directions, money – with discussion which factors could be found doing research in the academy in comparison with pharma;
- ✓ guidance to those wanting to transition between these two sectors;

During the seminar, strengths as well as limitations of both, academia and industry sectors were pointed out.

After the lecture, the business meeting was organized. The aim of which was to summarize the visit and discuss the guest's recommendations for the Institute:

1. possible collaboration patterns (how joint projects are selected and developed);
2. other forms of reinforcing pharma-academia relations;
3. research topics of current interest to pharma industry;

Name: Prof. Christophe Gorecki
Position: Head of the Micro-Opto-Electro-Mechanical Systems (MOEMS) Team at the FEMTO-ST Institute
Date: 19/11/2018



Prof. Christophe Gorecki is the Director of research at CNRS and Head of the MOEMS team at the FEMTO-ST Institute - a mixed research unit associated with CNRS (French National Center for Scientific Research) in the fields of engineering and applied physics. The main goal of his visit was to deliver a lecture „How to convert EU-funded research in MEMS and MOEMS technologies into a success story with market-oriented exploitation?“.

During the seminar Prof. Gorecki discussed the examples of possible and most successful innovation pathways, explaining what can be exploited in EU-funded technologies projects. General factors of successful management were also presented, together with innovation cycle and technology readiness levels.

After the lecture, the business meeting was organized where a short analysis and comparison of French and Polish industry/R&D sectors has been done, with the following conclusions and recommendations:

- ✓ There is a lack of global companies in Poland, investing in “future” R&Ds;
- ✓ In France, by starting a spin-off, there is a significant support for researchers-entrepreneurs from universities: in the first couple of years, such researchers are supported with the salary from University, and only later on one will move to industry in 100%. There is always an option of going back to the same position held at university before switching to industry.
- ✓ Polish science start-ups environment is much more difficult: there is lack of regulations, what results in researchers working at the University and at the same time running their start-ups. There are no policies encouraging researchers to start entrepreneurial activity.
- ✓ After moving to your own company, one loses contact / possibility of using the best world class equipment. To change the R&D landscape in Poland, there is a need for fostering young entrepreneurs.

III. ACTIONS AIMED AT ENHANCEMENT OF IPC PhD STUDENTS & JUNIOR RESEARCH STAFF:

Among recommendations of Professor Wojtkowski was **internationalization of PhD programme and an increase visibility of IPC PhD students at internationally significant conferences, and other events**. As a result, starting from 2016, **a new programme was initialized - “Mobility of young researchers of IPC”**. Under this programme (financed by IPC) young researchers (incl. PhD students) are sent for 1-month secondments to cooperating international research units. PhD students and young doctors are selected based on submitted proposals. In the period related to this Deliverable (M21-M40) 14 young researchers (4 doctors and 10 PhD students) were selected for secondments, and 12 young researchers already paid a visit. List of the visits is presented below:

	Name and Unit	Place of secondment	Date
1	<u>Anna Kelm</u>, PhD student Photochemistry and Spectroscopy Department	Institute of Photonic Sciences, Barcelona, Spain	08/05/2017 – 09/06/2017
2	<u>Marta Janczuk-Richter</u>, PhD student Surface Nanoengineering for chemo- and bio-sensors	Université du Québec en Outaouais, Gatineau, Canada	16/05/2017 – 15/06/2017
3	<u>Urszula Szczepaniak</u>, PhD student Photochemistry and Spectroscopy Department	Kindai University, Osaka, Japan	8/09/2017 – 14/10/2017
4	<u>Kinga Matuła</u>, PhD student Soft Condensed Matter Group	Radboud University, Nijmegen, The Netherlands	22/10/2017 – 21/11/2017
5	<u>Michał Leszczyński</u>, PhD student Coordination Complexes and Functional Materials	Department of Chemistry, University of Cambridge, United Kingdom	29/11/2017 – 13/12/2017
6	<u>Marcin Gronowski</u>, PhD Laboratory astrochemistry	Instituto de Fisica Fundamental, Madrid, Spain	20/11/2017 – 21/12/2017
7	<u>Artur Ruszczak</u>, PhD student Microfluidics and Complex Fluids Research Group	Queen Mary University, London, United Kingdom	5/01/2018 – 2/02/2018
8	<u>Witold Postek</u>, PhD student Microfluidics and Complex Fluids Research Group	École polytechnique fédérale de Lausanne, Lausanne, Switzerland	4/01/2018 – 3/02/2018
9	<u>Łukasz Richter</u>, PhD student Soft Condensed Matter Group	École polytechnique fédérale de Lausanne, Lausanne, Switzerland	15/01/2018 – 12/02/2018
10	<u>Jadwiga Milkiewicz</u>, PhD student Dynamics of photoinduced bimolecular reactions	International Tomography Center of the Russian Academy of Sciences, Novosibirsk, Russia	26/04/2018 – 7/06/2018
11	<u>Katarzyna Szot-Karpińska</u>, PhD Surface Nanoengineering for chemo- and bio-sensors	University of Sannio, Benevento, Italy	3/06/2018 – 30/06/2018

12	<u>Maciej Zieliński</u> , PhD student Dynamics of nanocrystal structure induced by surface chemistry	Université Paris Diderot – CNRS Paris, France	8/09/2018 – 8/10/2018
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Besides the lab visits, to accelerate internationalization of PhD programme, under the CREATE project PhD students were encouraged to take part in different events and lectures delivered by foreign researchers and other professionals. Till now the PhD students took part in **5 “*Innovation source*” lectures (delivered by business representatives) and 12 interdisciplinary lectures (delivered by researchers)**. After each of above-mentioned lecture there were possibility of individual consultations with invited guests of IPC researchers’ own problems related with research or commercialization.

IV. FOSTERING DEVELOPMENT OF SYNERGETIC TEAMS:

Needs in terms of education and development of members of abovementioned research groups (synergetic groups in particular) is addressed under the project. Within the given time period (M21-M40) members of the synergetic groups participated in the following events supported under the ERA Chair project:

- Department of photochemistry and spectroscopy - Laser Centre:

The department close cooperates with prof. Wojtkowski on the development of new light sources dedicated to two-photon eye imaging.

Name: dr habil Yuriy Stepanenko

Place: SPIE Photonics West conference, San Francisco, USA

Type of event: conference

Date: 28-31/01/2018

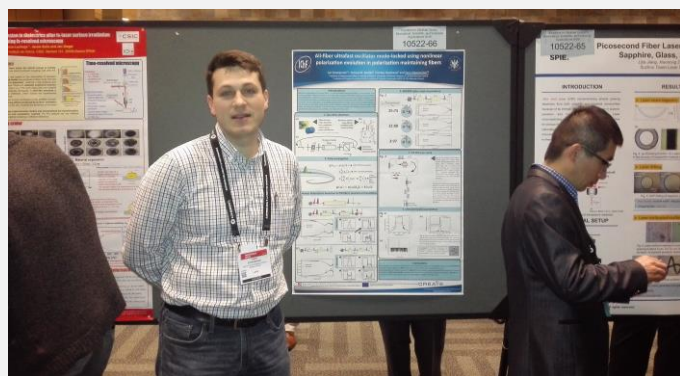


Photonics West 2018 conference is the largest meeting of people from photonics and biomedical optics fields, which gives the great opportunity to discuss and see current progress from these fields. During the conference dr. Yuriy Stepanenko presented the poster entitled: *"All-fiber ultrafast oscillator mode-locked using nonlinear polarization evolution in polarization maintaining fibers"*, Y. Stepanenko, J. Szczepanek, T. Kardaś, M. Nejbauer, Cz. Radzewicz.

Dr. Yuriy Stepanenko was also a co-author of the following papers presented during the conference:

"Modeling noncollinear 3D pulse propagation", Tomasz Michal Kardas, Yuriy Stepanenko, Czeslaw Radzewicz;

"Convenient scheme for efficient generation of mid-infrared CEP-stabilized femtosecond pulses using 1030-nm source", Michal Nejbauer, Marcin Pastorczak, Tomasz Michal Kardas, Yuriy Stepanenko, Czeslaw Radzewicz.



A detailed programme of the conference is [here](#).

- Soft Condensed Matter Group:

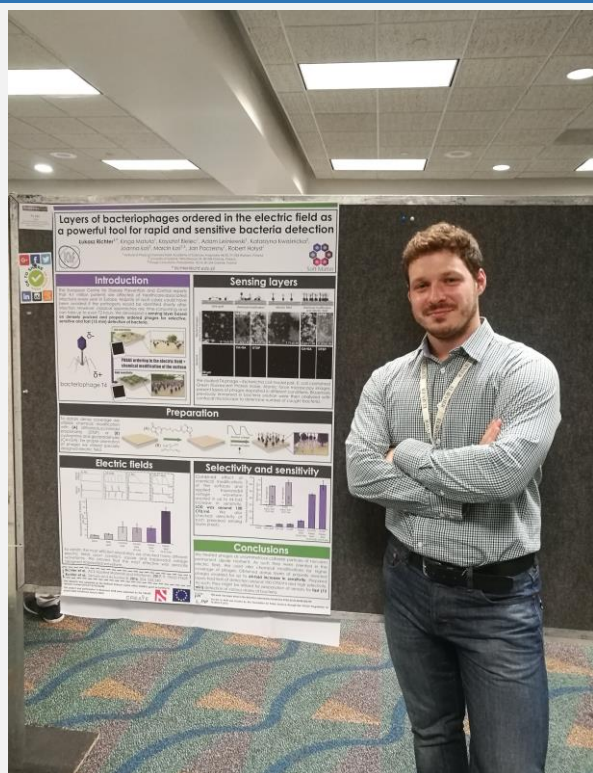
The work of Holyst group researches biochemical processes in living cells using various optical techniques. The group collaborates with Wojtkowski group on further development of these optical techniques for processing of images and also for detection of single photons. A long term goal is to obtain quantitative information about chemical processes in cells from the motion of compounds and cell constituents.

Name: Łukasz Richter

Place: 28th Anniversary World Congress on Biosensors (Biosensors 2018), Miami, Florida, USA

Type of event: conference

Date: 10-17/06/2018



Main goal of the visit was to participate in the **Biosensors 2018** conference organized by **Elsevier** in Miami (Florida, USA). "The Biosensors" is the largest in conference devoted to biosensing and bioelectronics.

During this event Łukasz Richter had an opportunity to present results from his recent research – his poster presentation was entitled "*Layers of bacteriophages ordered in the electric field as a powerful tool for rapid and sensitive bacteria detection*". Presented results were met with interest from a wide public and initiated a lot of fruitful discussions.

Biosensors 2018 conference allowed him to learn about the most interesting current directions in the field of biosensing, also in context of physicochemical aspects of biological systems. Additionally, it was great opportunity to meet a lot of new people, which can result in potential future cooperation with world-class scientific facilities.

- [Surface Nanoengineering for chemo- and bio-sensors Group.](#)

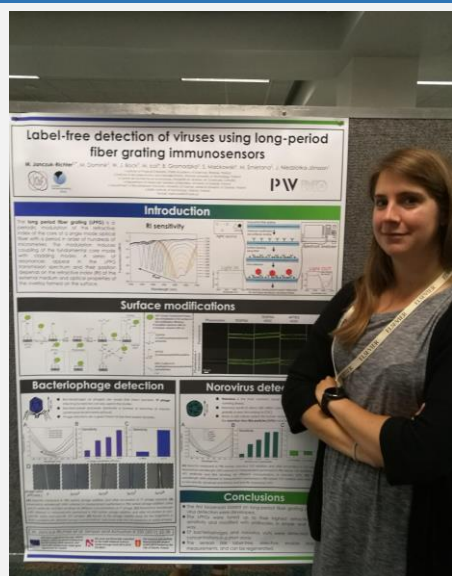
The Surface Nanoengineering Group develops strategies for surface modification of long-period fibre gratings for molecular recognition. Therefore, joint research plans of the ERA Chair holder's team and the Surface Nanoengineering Group include using optic devices for biosensing for the purpose of the Department of Physical Chemistry of Biological Systems.

Name: Marta Jańczuk-Richter

Place: 28th Anniversary World Congress on Biosensors (Biosensors 2018), Miami, Florida, USA

Type of event: conference

Date: 10-17/06/2018



The goal of the visit was to participate in the **28th Anniversary World Congress on Biosensors** (Biosensors 2018) which took place in Miami, Florida, USA. The conference is organized every two years by Elsevier and it is the largest and prestigious event related to new achievements and applications in the field of biosensors. During the event Marta Janczuk-Richter presented a poster entitled "*Label-free detection of viruses using long-period fiber grating immunosensors*". Presented results met with great interest of other participants and became the basis for interesting discussions.

Participation in this conference gave the opportunity to get acquainted with research conducted in the best scientific institutions in the world. The topics discussed during presentations concerned practical applications of new biosensing solutions and recent advances in optical biosensors.

The conference was an opportunity to see the most interesting and various developments in the field of biosensors, as well as to meet scientists from foreign research centers, which in the future may become the basis for international cooperation.

A detailed programme of the conference is [here](#).

Furthermore, other IPC employees, in particular management staff and HR department members were included in the training & mentoring programme, and took part in conferences & trainings such as:

Name: Agnieszka Tadrzak, Patrycja Nitoń, Monika Kuczyńska-Wydorska

Place: MSCA 2018 - Marie Skłodowska-Curie Actions Annual Conference, Vienna, Austria

Type of event: conference

Date: 1-2/10/2018



The aim of the conference was to discuss strategic objectives in the EU research and education policy areas. This two-day conference was divided into: lectures, panel discussions and workshops. Agnieszka Tadrzak, Patrycja Nitoń and Monika Kuczyńska-Wydorska took active part in the workshops:

- 'MSCA enhancing the societal impact of researchers'
- 'Improving and Facilitating Synergies'

During the conference, also the workshop on the **'Managing Researchers' Talents, Skills & Career development'** was held. This workshop was especially dedicated to institutions implementing the provisions of the European Charter & Code, and the aim of this workshop was to discuss importance of human resources, career development and excellence.

Participation in this conference was consistent with ERA Chair Holder recommendations on the activities aimed at improving the qualifications of IPC staff in particular through improving qualifications in the field of management and stimulation of human resources development, and career management.

Name: Anna Pawlus

Place: European Union Framework Programmes Regional Contact Point , Poznań, Poland

Type of event: training

Date: 11-12/12/2017

The goal of the visit was dedicated to attend the "Management of H2020 international projects" training, organized by Regional Contact Point for EU Framework Programs in Poznań. Training was focused on several different aspects of managing H2020 projects, including project management rules, specification of projects in Horizon 2020, consortium agreement, management of tasks, people - partners, finances, and evaluation of good and bad management structure.

Training program was a useful "tool", which corresponds with one of the ERA Chair holder activities in the CREATE project – gaining funds for the research conducted at the Department of Physical Chemistry of Biological Systems. Knowledge and skills obtained during this training will be used in the coordination of the recently started H2020 project *IMaging-based CUSTOMised EYE diagnostics — 'IMCUSTOMEYE'*.