



The CREAtion of the Department of Physical Chemistry of Biological SysTEms [CREATE]

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

**Report on the visit of Prof. Krzysztof Palczewski
[WP3]**

Level of dissemination: PUBLIC

Warsaw, June 2018



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 666295



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INTRODUCTION

Professor Krzysztof Palczewski visited the Institute of Physical Chemistry of the Polish Academy of Sciences (IPC PAS) under a series of cyclical lectures on interdisciplinary emerging research.

The main goals of this visit were:

- deliver a scientific seminar and 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,
- discuss the idea of joint grant application with ERA Chair holder.

Prof. Krzysztof Palczewski is a Polish biochemist working at Case Western Reserve University in Cleveland, Ohio. In 2012 he was awarded Prize of the Foundation for Polish Science, the most prestigious scientific award for Polish scientists, for characterizing crystal structures of native and activated G protein-coupled receptor, rhodopsin, involved in eyesight. His MSc and PhD are from the University of Wroclaw and Technical University of Wroclaw respectively, working with Dr. M. Kochman. His early posts were at the University of Florida and the Oregon Health Sciences University. Dr. Palczewski completed much of his pivotal research at the University of Washington and moved to become the Chair and John H. Hord professor of Pharmacology at Case Western Reserve University in 2005. In 2016 he was appointed as Distinguished Professor of the Case Western Reserve University.



Krzysztof Palczewski's research focuses on the activation and signalling of the light-sensitive rod and cone cells found in the eye. He is best known for his discovery of the structure of rhodopsin, a light-sensitive receptor protein, and its folding and binding properties. The goals of his research group are to understand the biochemical mechanisms of rhodopsin inactivation; the biochemical similarities and differences in how rod and cone cells generate signals; and the enzymes involved in molecular transformations in the retina. Professor Palczewski is the founder of two drug discovery companies, Polgenix and Retinagenix.

COURSE OF THE VISIT

The visit took place between 19-20 June 2018 [see [annex 1 for agenda](#)] and included planned seminar lecture and several meetings. It was opened with a short welcoming meeting organized by the Director of IPC PAS, to get a general overview of the Institute.

As a main event of the first day of his visit, Prof. Palczewski delivered a seminar titled “Chemistry of Vision”. The seminar was held in the assembly hall of the IPC PAS. All researchers and PhD students employed in the IPC PAS were invited to participate in this seminar - the seminar was attended by approx. 80 people.



The seminar of Prof. Krzysztof Palczewski, assembly hall, 19 June 2018

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.

The seminar was followed by a meeting with ERA Chair project coordinator Prof. Robert Hołyst, ERA Chair holder Prof. Maciej Wojtkowski and Project Manager – Agnieszka Tadrzak. Meeting was dedicated for an exchange of best practices in research and business in the USA and in Poland, as well as discussion regarding future grant applications with Prof. Palczewski.



Meeting with CREATE Management team, 19 June 2018

As an integrated part of the visit, Prof. Palczewski met with selected groups from Institute of Physical Chemistry and Institute of Organic Chemistry PAS. The aim of these laboratory visits was to familiarize Prof. Palczewski with IPC PAS, establish contacts with synergic groups supporting the ERA Chair holder team and discuss the possibility for future cooperation:



*Group of molecular films research,
Department of Physicochemistry of
Supramolecular Complexes - Prof.
Włodzimierz Kutner*

Dr. Piyush Sindhu Sharma and Dr. Krzysztof Noworyta presented Prof. Palczewski with one of the Group’s main research interests: chemical sensors with recognition units using molecularly imprinted polymer (MIP) films for selective determination of substances of biological, environmental, and societal importance.



Computer assisted chemical synthesis, Institute of Organic Chemistry PAS

Meeting with the *Computer assisted chemical synthesis*' PI and group members was focused around the revolutionary chemistry decision-making and synthetic planning software product Chematica, developed by Prof. Grzybowski and his team. Prof. Palczewski was highly interested in the possible applications of the Chematica solutions into his research.



Meeting with Dr. Kubas and Dr. Szumna, 20 October 2018

Initially not planned in the visit, Prof. Placzewski showed interest in meeting Dr. Adam Kubas who does research in Catalysis and Theoretical Chemistry, and Prof. Agnieszka Szumna, whose research focuses around the molecular architecture of chiral porous materials and the possibilities of their use in chemistry and biology.



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ANNEX 1.

Full agenda of the visit



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CREATE lectures

The Institute of Physical Chemistry of the Polish Academy of Sciences

Agenda

19 June 2018

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| 9:30 – 10:00 am | Meeting with the Director of IPC PAS, Prof. Marcin Opallo |
| 10:00 – 10:30 am | Visit to the Institute of Organic Chemistry - Prof. Mieczysław Mąkosza |
| 11:00 – 12:00 pm | Seminar – Prof. Krzysztof Palczewski
<i>„Chemistry of Vision”</i> |
| 12:00 – 1:00 pm | Meeting with ERA Chair Project Coordinator and ERA Chair holder
Short discussion, visit summary and recommendations for IPC PAS |
| 1:00 – 2:30 pm | Lunch break |
| 2:30 – 4:30 pm | Lab visits |
| 2:30 – 3:00 pm | <i>Soft Condensed Matter Group, Department of Soft Condensed Matter - Prof. Robert Hołyst</i> |
| 3:00 – 3:30 pm | <i>Group of molecular films research, Department of Physicochemistry of Supramolecular Complexes - Prof. Włodzimierz Kutner</i> |
| 4:00 – 4:30 pm | <i>Computer-assisted chemical synthesis - Prof. Bartosz Grzybowski</i> |
| 4:30 – 6:00 pm | Work on MAB application |



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20 June 2018

9:00 – 12:00 pm **Work on MAB application**

12:00 – 1:00 pm **Lunch break**

1:00 – 3:00 pm **Lab visits**

Physical Optics and Biophotonics Group (POB), Department of Physical Chemistry of Biological Systems:

1:00 – 1:15 Dawid Borycki, PhD

1:15 – 1:30 Michał Hamkało

1:30 – 1:45 Patrycjusz Stremplewski, PhD

1:45 – 2:00 Łukasz Kornaszewski, PhD

2:00 – 2:15 Jakub Bogusławski, PhD

2:15 – 2:30 Paulina Niedźwiedziuk

2:30 – 2:45 Mounika Rapolu

2:45 – 3:00 Egidijus Auksorius, PhD

3:00 – 5:00 pm **Work on MAB application**



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