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

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Visit of prof. Yoon-Kyoung Cho - report

[WP5]

Level of dissemination: PUBLIC

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INTRODUCTION

At the invitation of the ERA Chair Holder Prof. Yoon-Kyoung Cho paid a visit at IPC on the 31st October 2019. The goals of the visit were:

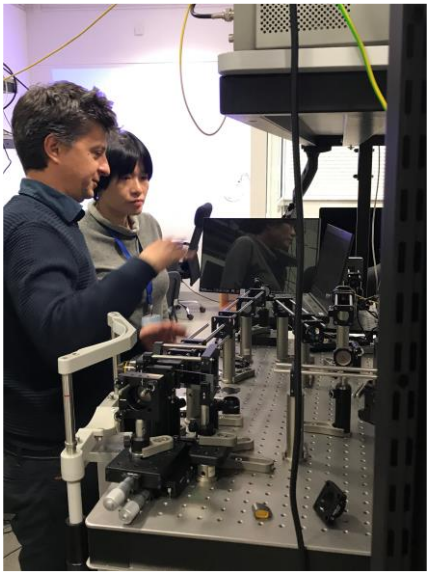
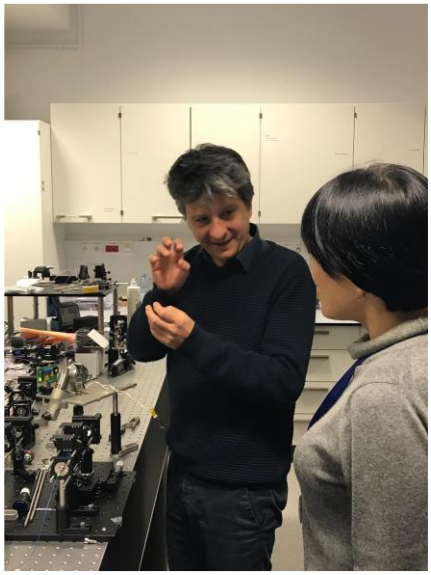
1. Delivering a lecture *"Microfluidic chips to study cell to cell communication and translational research towards precision medicine"* under a series of lectures *"Innovation source".*
2. Visiting the Department of Physical Chemistry of Biological Systems, its optical laboratory, meeting the ERA Chair holder, prof. Maciej Wojtkowski.

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 the development of 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 COURSE OF THE VISIT

[see annex 1 for the agenda]

The visit of prof. Yoon-Kyoung Cho began with the meeting with prof. Maciej Wojtkowski, the ERA Chair holder. Prof Yoon-Kyoung Cho visited optical laboratory which is a main scientific base of POB Group (Dept. of Physical Chemistry of Biological Systems) at IPC PAS. Prof. Wojtkowski presented several research projects currently carried out by his group, and their most important achievements and results. Also future research and application possibilities were highlighted. At the end experimental optical sets built by POB group were demonstrated.

Visiting the Department of Physical Chemistry of Biological Systems and meeting with prof. Maciej Wojtkowski.

After the meeting with prof. Maciej Wojtkowski, prof. Yoon-Kyoung Cho delivered a seminar entitled ***"Microfluidic chips to study cell to cell communication and translational research towards precision medicine"***. The seminar was held in the assembly hall of IPC PAS. All IPC PAS researchers, incl. PhD students were invited to participate in this seminar.

Abstract of the seminar

In the tumor microenvironment, various tumor-associated cells such as vascular, fibroblast, and immune cells interact with tumor cells to promote the development of cancer cells, indicating ***the importance of understanding the communication between these different cell types in developing cancer therapeutics***. In this presentation we will discuss our recent studies on extracellular vesicles (EVs)-based cancer diagnostics inspired by widespread recognition that EVs may be pivotal in intercellular communication. We examine clinical samples by analyzing multiple kinds of proteins and RNA of EVs from cancer patient's plasma or urine samples and show that the EVs could be a potentially useful biomarker in cancer diagnostics. Next, we introduce the microfluidic chip equipped with biologically interfaced platelet membrane-cloaked surface (PLT-Chip), which could specifically capture EVs from multiple types of cancer cell lines than the normal cell-derived EVs and clearly distinguish the plasma of cancer patients from that of normal healthy controls. We believe that this revolutionary method can contribute to

accelerate the acceptance of CTC or EV-based cancer diagnostics as a standard practice in clinical settings. ***Based on the presented academic research, the key technologies including lab-on-a-disc systems equipped with the fluid-assisted separation technology (FAST) are now translated into liquid biopsy products commercialized by two start-up companies. In this talk, the personal experience of translational research both at industry (Samsung) and academia (UNIST) will be discussed***. Taken all together, we believe understanding the critical role of cell-to-cell communication in cancer progression will provide insights critical to not only the development of improved cancer therapeutics (societal impact) but to basic science of cell biology (basic science).

The seminar of prof. Yoon-Kyoung Cho.

After the seminar prof. Yoon-Kyoung Cho visited one of the synergic groups, supporting the ERA Chair holder, namely - **Microfluidics and Complex Fluids research group.** The aim of this visit was to familiarize with IPC PAS, research conducted by this group and discuss possibility of the future cooperation.

During the meeting prof. Yoon-Kyoung Cho discussed with prof. Piotr Garstecki lab-on-a-disc systems, which use centrifugal force to pump biological fluids such as blood or urine to analyze cancer related biomarkers. Prof. Yoon-Kyoung Cho noticed that lab-on-a-disc systems – isolating and detecting liquid biopsy markers such as circulating tumor cells (CTCs), circulating tumor DNA (ctDNA), and Extracellular vesicles (EVs) - are developed and tested using clinical samples such as blood or urine from cancer patients. She also discussed the fluid-assisted separation technology (FAST), which enables ultrafast, uniform, clog-free, and highly efficient filtration with pressure drop much less than in conventional filtration. Next, prof. Garstecki and prof. Yoon-Kyoung Cho discussed a hand-powered centrifugal bacterial isolation device to determine the bacterial load. This diagnostic tool is designed for the usage in resource-limited settings for ruling out unnecessary antibiotic usage. They agreed that this innovative point-of-care microfluidic tools can accelerate its application to real clinical settings and directly impact patient care.

ANNEX 1.

Agenda of the visit of prof. Yoon-Kyoung Cho

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"Innovation source" lecture

The Institute of Physical Chemistry of the Polish Academy of Sciences

Thursday, October 31st, 2019

9.00	**lab visits** (part I) **prof. dr hab. Maciej Wojtkowski** – ERA Chiar holder, Head of Physical Optics and Biophotonics Group
10.00	**Prof. Yoon-Kyoung Cho – seminar lecture** ***„Microfluidic chips to study cell to cell communication and translational research towards precision medicine"***
12.00-13.00	lunch
13.00-15.00	**lab visits** (part II) **prof. dr hab. Piotr Garstecki** – head of Microfluidics and Complex Fluids Group

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