



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

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Visit of prof. Hywel Morgan - report
[WP5]

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CREATE lectures "Innovation source"

On November 5th, 2019 an open lecture under the series of "Innovation source" was held at the Institute of Physical Chemistry PAS (IPC). The purpose of this lecture was to update scientists' knowledge on current technological trends and innovation in chemistry-related sectors, as well as to support a transfer of ideas generated at IPC to business sector.



Professor Hywel Morgan was invited to the Institute by the CREATE Project Coordinator, professor Robert Holyst, and the ERA Chair holder, professor Maciej Wojtkowski.

Hywel Morgan is 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 in 1993 and was appointed professor at Glasgow in 2001. 2003, he moved to Southampton to take a position of Professor of Bioelectronics. From 2013 till 2017 he was a Royal Society Industry Fellow with Sharp Labs Europe. His research interests focus on microfluidics with its applications in

medical and environmental sciences. He published seminal papers in AC electrokinetics. He is associate editor of "Microfluidics and Nanofluidics", and "Scientific Reports". He published over 250 journal papers (H-index = 60) and co-authored a text-book on AC electrokinetics. He is founder and director of Vivoplex, a spinout that develops implantable wireless sensors to continually record vital signs. 2004 he was awarded the Desty Memorial Prize for Innovation in Separation Science. He is a fellow of the Institute of Physics, the Royal Society of Chemistry and the IET. He holds as well the Royal Society Wolfson research merit award.

During his visit at IPC, **professor Hywel Morgan** delivered a lecture entitled "**From Smartphones to Diagnostics**". The whole society of IPC, including IPC researchers and doctoral students, was invited.

Abstract of the seminar

We have been developing miniature analytical systems that exploit low-cost consumer electronics for both sample processing/manipulation and sensing. In a collaboration with Sharp Labs, we 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 as used in mobile phone screens. The system supports a wide range of different chemical and biochemical assays, for example immuno-assays and genomic data analysis. The talk will describe recent developments in electrical impedance cytometry for label-free analysis of single cells and bacteria at high speed. The technique has been used to analyse a wide range of cells, but we are now exploring applications in areas such as cell mechanics. We have also recently developed an impedance-based rapid anti-microbial susceptibility test (AST) that can analyse the resistance profile of infectious agent in 30 minutes compared with the current 48 to 72 hours. Finally, I will describe our research in the development of a miniature wireless and battery-less implantable sensor that continuously monitors biophysical parameters in-vivo, and the route to the commercialisation of this product.

The seminar aroused great interest from the audience. The lecture ended with a long discussion, mainly arising from PhD students. After the seminar, professor Morgan participated in a meeting with prof. Robert Hołyst – Coordinator of the CREATE Project.





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

During the visit professor Hywel Morgan has appreciated engagement of the Institute in industrial collaboration. He was under a great impression of a start-up Scope Fluidics co-founded by IPC. He 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 (who is PhD student finishing his PhD studies) to give a talk at the University where prof. Morgan works.