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

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Report on the visit of prof. Prof. Erwin Reisner

[WP3]

Level of dissemination: PUBLIC

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INTRODUCTION

On November 26th, 2020 an open lecture under the series of cyclical lectures on interdisciplinary emerging research was delivered by prof. Erwin Reisner. Due to the pandemic situation, the lecture was delivered online via zoom platform. All researchers and PhD students employed at IPC were invited to participate in this seminar.

Erwin Reisner is the Professor of Energy and Sustainability at the University of Cambridge and a Fellow of St. John's College in Cambridge. He completed his Doctorate in 2005 at the University of Vienna. His PhD studies in the Keppler group were focused on 'redox activated ruthenium anticancer drugs'. As a postdoc, he changed interest from medicinal inorganic chemistry to different aspects of bio-inspired energy conversion. In the Lippard group at MIT, he studied synthetic models of the diiron(II) active site of soluble Methane Monooxygenase, which selectively converts natural gas to methanol. He subsequently joined the Armstrong group in Oxford to work on solar hydrogen production with enzyme-nanoparticle hybrid systems.

His independent career started with an EPSRC research fellowship at The University of Manchester, followed by a University Lectureship at the University of Cambridge. Currently, prof. Reisner is coordinating the UK Solar Fuels network, which organises the national activities in artificial photosynthesis, and the Cambridge Creative Circular Plastics Centre.

Professor Reisner has received numerous grants, prizes and awards. Among others, he received ERC Consolidator Grant in 2016.

THE COURSE OF THE VISIT

The online visit of prof. Erwin Reisner took place on November 26th 2020. Prof. Reisner delivered seminar entitled ***"Solar-driven Synthesis of Fuels and Chemicals from Biomass and Plastic Waste"***. The seminar was delivered via Zoom platform, and all researchers and PhD students employed at IPC were invited to participate in this seminar.

Abstract of the seminar

Artificial photosynthesis is a sustainable process that utilises solar energy to drive endothermic multi-electron chemical reactions for the production of fuels. A common drawback in photoelectrochemical systems is their reliance on expensive materials and device architectures, which challenges the development of ultimately scalable devices. Particulate photocatalysts provide a potentially lower-cost alternative, but their low efficiencies and common reliance on costly sacrificial redox reagents limit their commercial prospects.

This presentation will give an overview about our recent progress in developing semiconductor suspension systems to perform efficient full redox cycle solar catalysis using inexpensive components, and our approach for sustainable photo-reforming of waste biomass and plastics (Figure 1). The principles and design considerations for the solar-driven photo-reforming process will be compared to traditional artificial photosynthetic systems and benefits and disadvantages discussed.

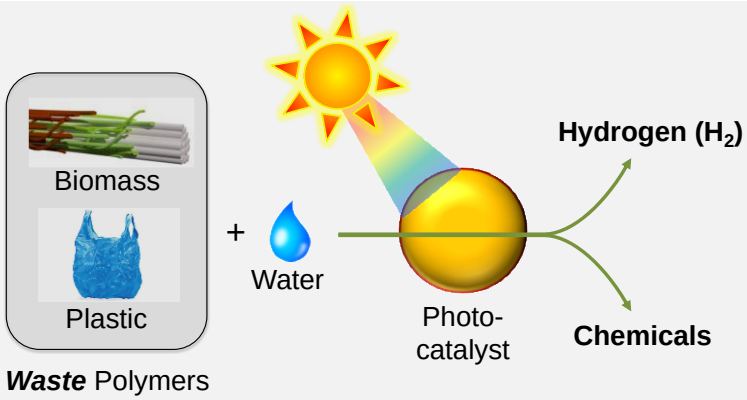
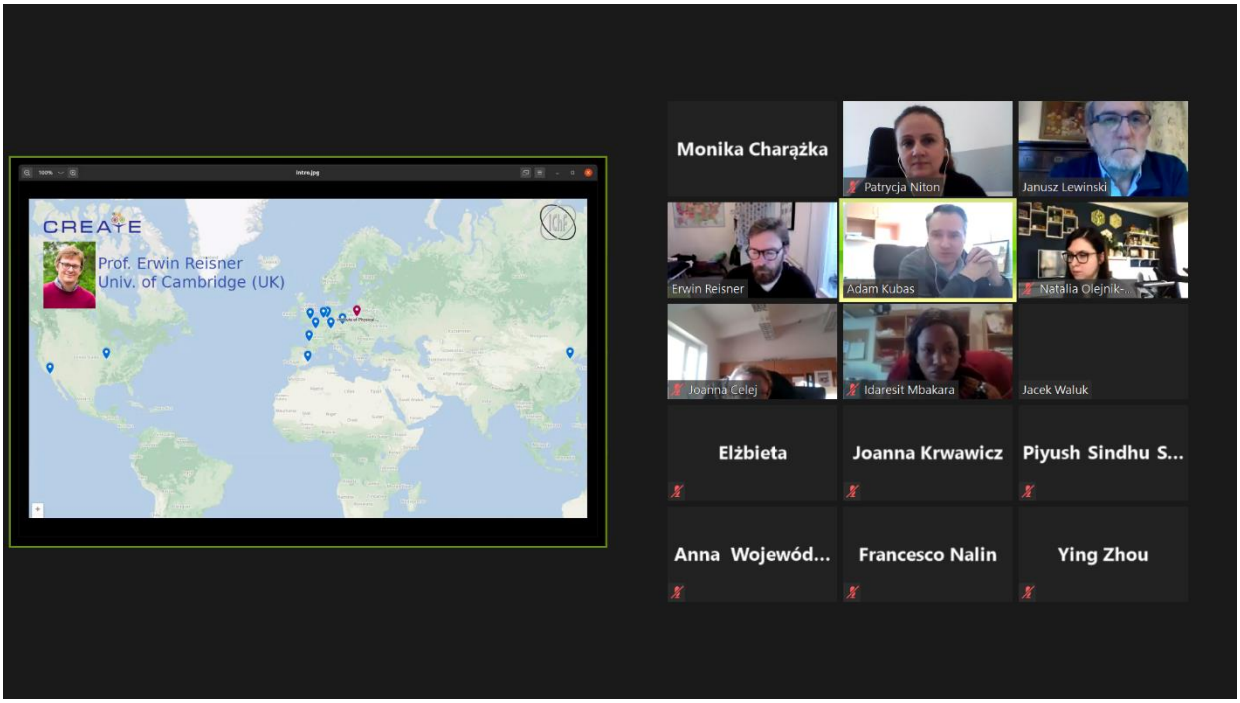


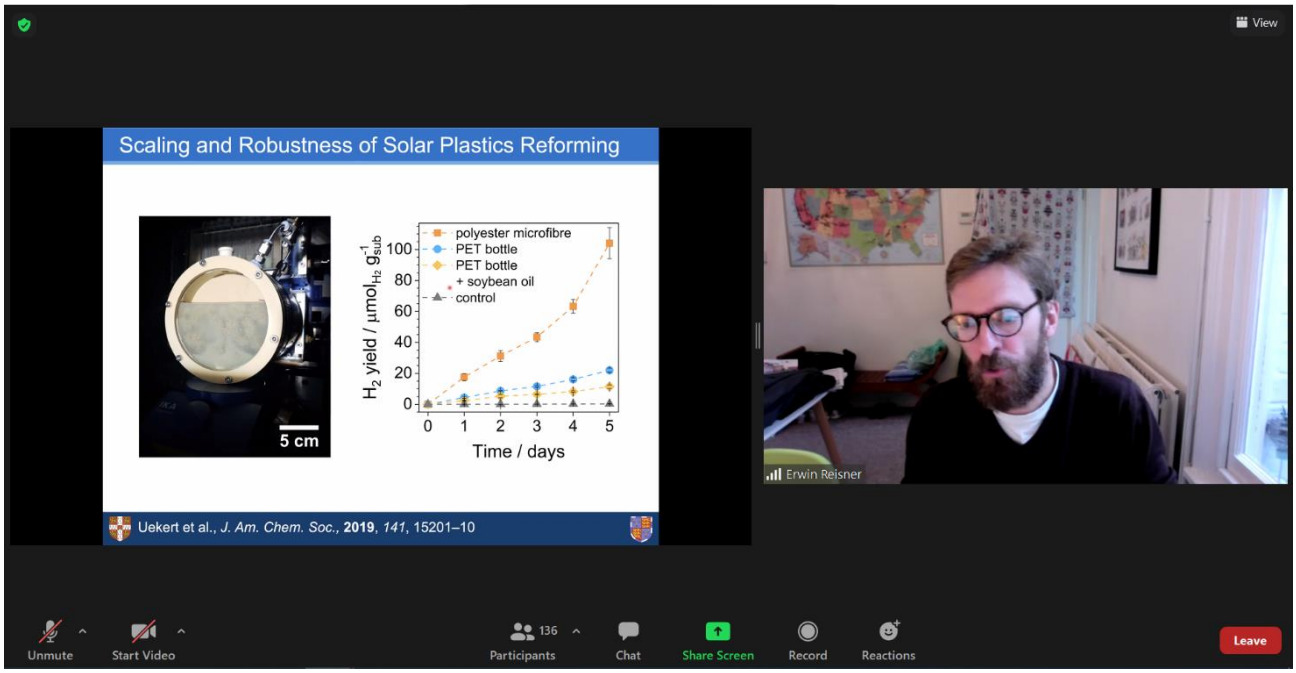
Figure 1: Solar-driven reforming enables the conversion of waste biomass and plastics into H_2 fuel and bulk chemicals.

Specifically, CdS/CdO_x quantum dots and carbon-based materials such as carbon nitride have been recently established as suitable photocatalysts for the photo-conversion of lignocellulosic biomass and synthetic polymers such as polyethylene terephthalate (PET) and polylactic acid (PLA) in aqueous medium into H_2 fuel and organic chemicals (in particular organic acids and monomeric building blocks of the polymer substrate).[1-5] Thus, this ambient-temperature photo-reforming process offers a simple and low-energy means for transforming polymeric waste into fuel and bulk chemicals.

Representative publications:

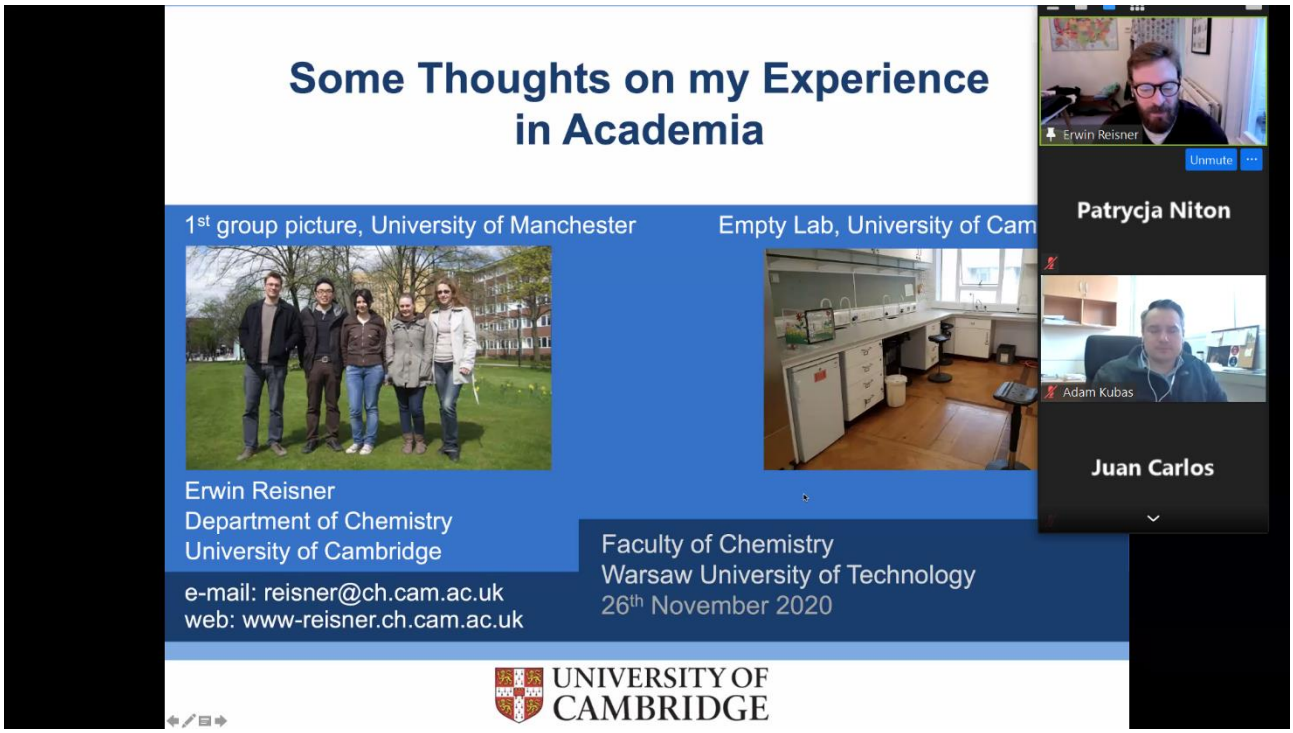
[1] Uekert, Kasap, Reisner, J. Am. Chem. Soc., 2019, 141, 15201.
[2] Kasap, Achilleos, Huang, Reisner, J. Am. Chem. Soc., 2018, 140, 11604.
[3] Uekert, Kuehnel, Wakerley, Reisner, Energy Environ. Sci., 2018, 11, 2853.
[4] Kuehnel, Reisner, Angew. Chem. Int. Ed., 2018, 57, 3290.
[5] Wakerley, Kuehnel, Orchard, Ly, Rosser, Reisner, Nature Energy, 2017, 2, 17021.

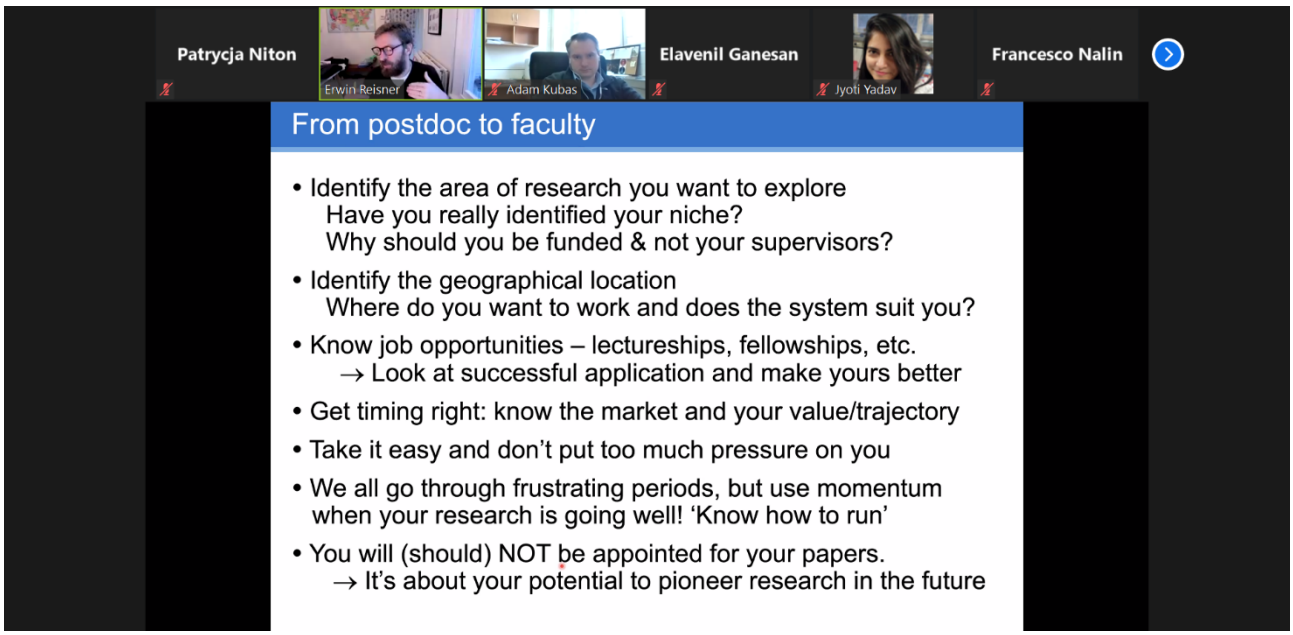




The first part of the seminar of prof. Erwin Reisner, Zoom platform, the November 26th, 2020.

The active and supportive discussions after his scientific talk took place. Professor Reisner subsequently shared experiences from his research career path. He outlined on what young scientists should pay attention to when choosing postdoc positions and what factors they should consider when planning their careers. He also gave valuable tips on how to manage a large research team, Especially during a pandemic.





The second part of the seminar of prof. Erwin Reisner, Zoom platform, the November 26th, 2020

After the seminar, prof. Reisner met with two research teams. These meetings aimed to familiarise with IPC, establish contacts with the groups supporting the ERA Chair holder and discuss the possibility of future cooperation. The zoom meetings with the following research groups were organised:

- **dr hab. Adam Kubas** – leader of the Cooperative Catalysis Group and IPC Deputy Director of Scientific Affairs
- **prof. dr hab. Janusz Lewiński** – leader of the Coordination Metal Complexes and Functional Materials Group

During the meeting with Prof. Lewiński the situation of scientists, in light of the world-wide pandemic, lockdowns and far-going restrictions, was discussed. Methods to motivate the team were named and Prof. Reisner shared his approach towards motivating his team and keeping his research team engaged. At the end of the meeting, it was agreed that once the pandemic is under control and it is safe to travel, a collaboration between both groups should take place through the scientific visit of a PhD student and/or postdoc at the prof. Reisner's lab.

During the meeting with Dr. Adam Kubas the discussion was divided into two parts, one concerning general ideas on the Institute's work organisation and the second part that was more research-focused. Regarding the former, both PIs agreed that there is a high need to create a stable but motivating environment for young scientists. When opening a new research group, it would be very beneficial to provide the leader with an indefinite contract and small grant to hire key persons. Moreover, during the pandemic time, regular online meetings with the entire workgroup (team) are critical for appropriate levels of supervision and mentoring. At the research side, dr Kubas discussed with prof. Reisner current activities in his team, particularly with respect to theoretical calculations.

Professor Reisner agreed to keep in contact with both groups. The meeting was highly beneficial. Both at the scientific and Institutional levels.