

# SINERGY SEMINAR SERIES

NUS Synthetic Biology for Clinical and Technological Innovation (NUS SynCTI)  
Member of Singapore Consortium for Synthetic Biology (Sinergy)



## Professor Paul Freemont

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### In vitro Synthetic Biology – Using Cell Free Systems to Rapidly Access to Xenobiotics in a Test-Tube

Cell-free transcription/translation systems (known as CFPS or TX-TL) have recently been re-evaluated as a promising platform for enabling synthetic biology research and applications. In particular CFPS has been shown to provide a reproducible prototyping platform for regulatory elements where measurements in vitro are in part consistent with similar measurements in vivo. The advantage of being non-GMO allows rapid automated assays for characterizing parts and genetic circuit designs for pathway engineering, natural product discovery and biosensor designs. My lab has been interested in exploring cell free extracts from different organisms and I will present our most recent work on cell-free systems. I will also present our recent studies on combining in vitro geno-chemtic strategies to allow rapid access to xenobiotic compounds which may provide improved therapeutic activity. By focusing on the violacein biosynthesis pathway and using seven different substrate analogues, we have been able to generate 66 new to nature analogues of violacein. Furthermore, 20 new derivatives were generated from brominated analogues via Suzuki-Miyaura cross-coupling reaction directly using the crude extract without prior purification. I will also discuss the generality of this approach.

*Professor Paul Freemont is the co-founder of the Imperial College Centre for Synthetic Biology and Innovation (2009) and co-founder and co-director of the National UK Innovation and Knowledge Centre for Synthetic Biology (SynbiCITE; since 2013) and Director of the London BioFoundry (since 2016) at Imperial College London. He is also currently the Head of the Section of Structural and Synthetic Biology in the new Department of Infectious Diseases at Imperial. He was previously the Head of the Division of Molecular Biosciences at Imperial (2005-2012), Head of the Imperial College Centre for Structural Biology (2000-2005) having joined Imperial from Cancer Research UK London Research Institute (now known as the Crick Research Institute) where he was a Principle Investigator and Head of Group. In 2019, he led the establishment of the Global Biofoundry Alliance (GBA) comprising 23 institutions on four continents aimed at building and sharing open technology platforms for synthetic biology and currently the chair of the GBA. His research interests span from understanding the molecular mechanisms of human diseases and infection to developing synthetic biology foundational tools for specific applications including automation. His research group has pioneered the use of cell free extract systems for synthetic biology prototyping and biosensor applications and he is the author of over 240 scientific publications (H-index 74). He is an elected member of European Molecular Biology Organisation and Fellow of the Royal Society of Biology, Royal Society of Chemistry and Royal Society of Medicine and is an Honorary Fellow of the Royal College of Art. He was a co-author of the British Government's UK Synthetic Biology Roadmap and was a recent member of the Ad Hoc Technical Expert Group (AHTEG) on synthetic biology for the United Nations Convention for Biological Diversity (UN-CBD). He has also appeared regularly on radio and television broadcasts on the subject of synthetic biology and has successfully co-supervised Imperial iGEM teams since 2006.*

Thursday, 17<sup>th</sup> October 2019 | 3.30pm  
MD7-02-03 Seminar Room

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Hosted by: A/Prof Yew Wen Shan

