

ICB PhD public presentations**DEVELOPING NON-EQUILIBRIUM
APPROACHES TO CONTROL THE
SELF-ASSEMBLY OF FUNCTIONAL
SUPRAMOLECULAR SYSTEMS****James Nicholas**

ICB / deMello group

Supervisors: Prof. Dr. Andrew deMello and

Prof. Dr. Josep Puigmartí-Luis

Co-examiner: Prof. Dr. Salvador Pané Vidal

**20/12/2023, 12:45 h****ETH Hönggerberg, HCI G7 and on Zoom****(<https://ethz.zoom.us/j/64260764783>)**

Project Summary: Self-assembly in living systems is a dynamic process, with the formation of hierarchically assembled structures commonly occurring out-of-equilibrium, enabling spatiotemporal control in response to external stimuli. Inspired by this, supramolecular chemists are investigating ways to achieve similar complexity in synthetic systems, towards obtaining functional supramolecular materials with more life-like properties. In this work we have developed three systems containing suitably functionalised building units – metal-organic cages, silica nanoparticles, DNA receptors – which can assemble into hierarchical multicomponent structures using stimuli-responsive non-covalent interactions. We aim to understand and control self-assembly in these systems, investigating the potential for obtaining non-equilibrium structures through pathway selection, or dissipative self-assembly behaviour through controlled addition of chemical fuels, and we describe the fabrication of microfluidic devices and automated setups that can be used to control fuel addition, through continuous infusion and controlled diffusion techniques.

CV. James received a BA in Natural Sciences from the University of Cambridge in 2017 and completed an MSc by research at the University of York in 2019. He began his doctoral studies at ETH in 2019 in the group of Prof. Andrew deMello, supervised by Dr. Josep Puigmartí-Luis and Dr. Alessandro Sorrenti, and working at the University of Barcelona from 2020.