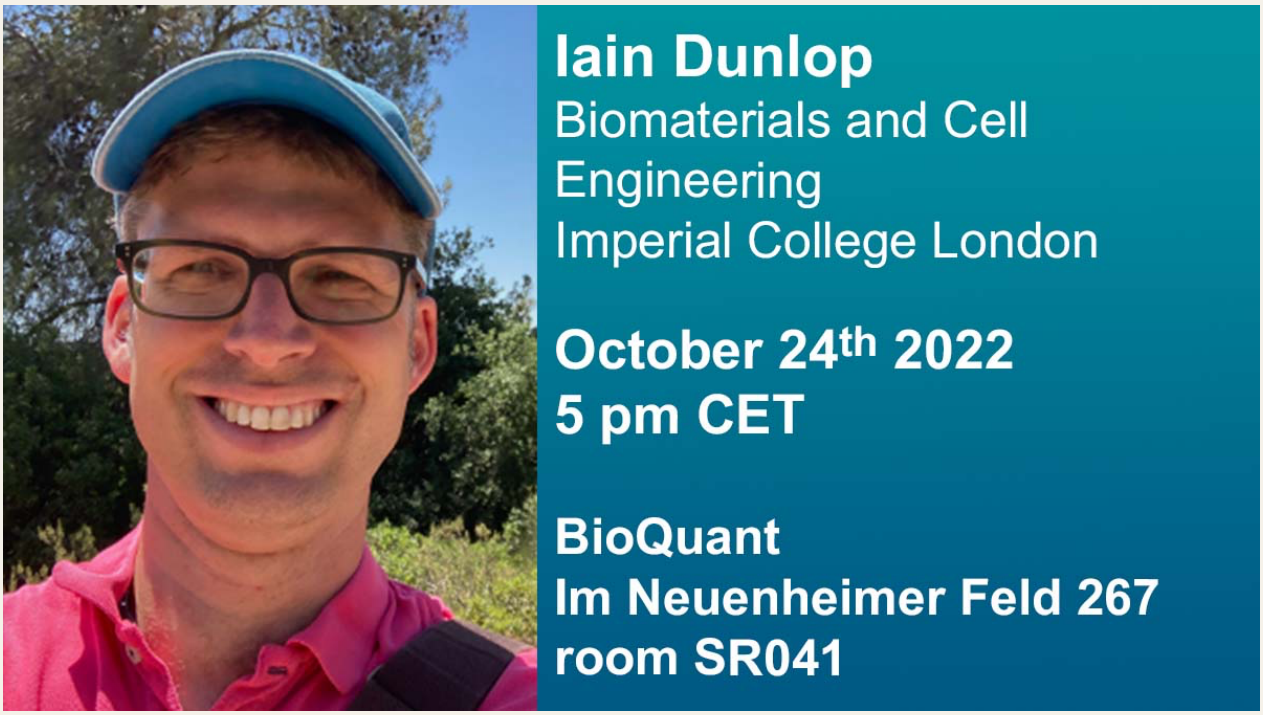
FLAGSHIP INITIATIVE
ENGINEERING
MOLECULAR SYSTEMS

UNIVERSITÄT
HEIDELBERG
ZUKUNFT
SEIT 1386

COLLOQUIUM
ENGINEERING MOLECULAR SYSTEMS
- In Person -

IAIN DUNLOP will talk about **BIOMATERIALS FOR IMMUNOTHERAPY AND INFLAMMATORY DISEASE MODELLING** in the "Engineering Molecular Systems" colloquium on **October 24th 2022** at **5 p.m.** (CET) hosted by the Flagship Initiative Engineering Molecular Systems of Heidelberg University. The colloquium will take place at the BioQuant (Im Neuenheimer Feld 267 room SR041).



ABSTRACT:

The immune system is central to health and disease, with therapies that modulate the immune system making up a large fraction of new and in-development medicines. This ranges from cancer therapies where the aim is to activate and target immune responses against disease, to autoimmune and chronic-inflammatory diseases that are caused by

dysregulated immune responses. Importantly, it is becoming clear that biophysical processes play a key role in immune system regulation, creating an opportunity for biophysical research to contribute to therapy development. Here we present two cases where we used the physical properties of biomaterials to impact signalling in disease-relevant systems. In a first study, we used graphene-oxide templated molecular nanoclusters to activate Natural Killer (NK) cells: a key component of the body's defences against cancer. Mimicking the natural receptor clusters that activate NK cells, we showed that such nanotechnology approaches can enhance the potency of molecules that resemble NK cell-activating drugs. In a second study we are investigating the mechanobiology of chronic inflammatory lung disease (COPD) using organoids grown from healthy and diseased tissue. We have developed a hybrid natural-synthetic hydrogel whose stiffness is increased by green-light photocuring, mimicking the stiffening of matrix that occurs during disease progression. By measuring how gene expression dynamically changes in response to this stimulus, we are testing the hypothesis that matrix stiffening is a driver of disease progression, potentially leading to new therapeutic approaches.

BRIEF CV:

Iain Dunlop is Reader in Biomaterials and Cell Engineering, Department of Materials, Imperial College London. Earlier in his career, he has worked as an Alexander von Humboldt Fellow in biomaterials at the Max-Planck-Institut fuer Metallforschung. This followed his doctoral studies in soft matter chemistry in Oxford and an undergraduate physics degree in Cambridge. His research group develops biofunctional nano- and soft-materials for research into fundamental physiology and disease. Key directions include the mechanobiology of the ovary and lung airway, as well the role of nanoscale effects in the immune system. More broadly, he has developed nanomaterials systems for applications from targeting the blood-brain barrier, to 3D imaging in soil.