Institut Européen de Chimie et Biologie

I E C B

Looking to the Future

16th workshop of candidates

for group leader positions at IECB

Wednesday 24th September, 2025

IECB Auditorium

2025 pre-selected candidates for Group-leader positions at IECB

Dr. Calum McLAUGHLIN

Centre for Targeted Protein Degradation, University of Dundee, UK.

PhosTACs: Heterobifunctional Molecules Inducing Targeted Protein Dephosphorylation.

PhosTACs (Phosphatase TArgeting Chimeras) are an emerging class of heterobifunctional molecule composed of two ligands, one for a protein of interest (POI) and the other for a phosphatase enzyme or subunit, connected by a linker. PhosTACs enable the selective dephosphorylation of specific targets by inducing proximity between the POI and phosphatase, hijacking the natural enzymatic activity of phosphatases. This alternative complimentary approach to inhibition and degradation strategies has the potential to revolutionise therapy by allowing precise dephosphorylation of a single target protein rather than disturbing upstream kinase cellular signalling pathways.

In this talk, two approaches towards the development of PhosTAC molecules will be described: (i) demonstrating proof-of-concept dephosphorylation of various POI harnessing molecular dimerisers and Tags, and (ii) phosphatase ligand discovery through DNA encoded libraries and covalent fragment screening.

Dr. Aleria GARCIA ROCA

University of Utah, USA and University of Girona, Spain.

Accelerated Discovery in Chemistry: Data Science as a tool for reaction prediction and mechanism rationale.

As industry seeks efficiency and sustainability, data-science methods—statistical modeling, machine learning, and high-throughput analytics—now guide reaction prediction and mechanism-driven design. In this talk, we will journey from traditional methods of reaction mechanism elucidation to state-of-the-art computational techniques, highlighting how these integrated approaches are essential to accelerate the design of innovative, sustainable synthetic methodologies.

Dr. Ani BAGHDASARYAN

Department of Materials Science & Engineering, Stanford University, USA.

Molecular Precision Meets Imaging Power: The Rise of Chiral Nanoclusters in Illuminating the Invisible.

Quantum confinement effects confer discrete electronic states and molecular-like properties in atomically precise metal nanoclusters. Surface ligands not only stabilize these clusters but also modulate their electronic structures and provide avenues for post-synthetic functionalization. In my work, I demonstrated ligand-induced modulation of chiroptical properties in chiral Au38 and achiral Au25 clusters, revealing electronic communication pathways underlying chiral signal transduction. I further advanced gold nanoclusters as NIR-II bioimaging probes in preclinical cancer models. Through surface engineering with biocompatible phosphorylcholine ligands, I developed “stealth” probes with enhanced lymph node imaging performance, enabling precise tumor resection and effective photothermal tumor ablation. Looking ahead, I aim to integrate nanoscale chirality with NIR-II imaging to create next-generation chiral nanomaterials with transformative potential in nanobiotechnology.

Dr. Xi YANG

National Cancer Institute, NIH, Bethesda, USA.

Type IA and IB topoisomerases: novel mechanistic insights and anticancer drug development.

Type IA and IB topoisomerases relax DNA supercoils and resolve DNA/RNA entanglements, essential for cellular processes such as replication, transcription, and translation. Their roles in nucleic acid metabolism make them ideal drug targets, particularly in rapidly dividing cancer cells. My talk will present our recent mechanistic studies revealing how these enzymes modulate nucleic acid topology, through the use of divalent metal ions and dynamic protein conformational changes. I will also highlight our structural insights into clinically used anticancer drugs targeting Type IB enzymes, along with our ongoing efforts to develop novel therapeutics against both Type IA and IB topoisomerases.

Dr. Magdalena SCHACHERL

Institute of Medical Physics and Biophysics, University Berlin, Germany

Seeing the invisible: How modern microscopy uncovers cellular architecture and molecular function.

Modern cryo-electron microscopy offers a wide range of possibilities for investigating cellular processes on different spatial scales. On the one hand, whole cells can be frozen and their ultrastructure visualized using cryo-electron tomography. This can be complemented by insights from light microscopy. On the other hand, macromolecules that control or carry out certain cellular processes can also be isolated from cells and examined for their structure using cryo-electron microscopy and single-particle analysis with near-atomic resolution. We use both methods to shed light on cellular processes, mainly in neuronal cells. We are interested, for example, in how protein synthesis is controlled and influenced in the cell. Furthermore, we investigate how the neuronal process of reactive astrogliosis takes place at the cellular level and how exactly neurotransmitters are released at synapses of neurons.

Dr. Lukasz WIETESKA

Developmental Signalling Laboratory, Francis Crick Institute, London, UK

TGF-β at the switchboard: co-receptor rules and targeted inhibition.

Transforming growth factor-β (TGF-β) regulates tissue development, maintains tissue homeostasis, and is critical for balancing the immune system. Aberrant or elevated TGF-β activity drives fibrosis and enables immune evasion by cancer cells. Using integrative structural biology and cellular approaches, I determined how Betaglycan (TGFBR3), a co-receptor in the TGF-β pathway, potentiates signalling and how it achieves its remarkable selectivity for specific TGF-β family ligands. Building on these advances, I am working on engineering a TGF-β inhibitor designed to be produced in cells and to act with spatial and cell-type specificity.

Looking to the Future Workshop Program

Wednesday 24th September, 2025

13.30 – 14.05 SpPhosTACs: Heterobifunctional Molecules Inducing Targeted Protein Dephosphorylation

Dr. Calum McLAUGHLIN

Centre for Targeted Protein Degradation, University of Dundee, UK

14.10 – 14.45 Accelerated Discovery in Chemistry: Data Science as a Tool for Reaction Prediction and Mechanistic Rationale

Dr. Aleria GARCIA ROCA

University of Utah, USA and University of Girona, Spain

14.50 – 15.25 Molecular Precision Meets Imaging Power: The Rise of Chiral Nanoclusters in Illuminating the Invisible

Dr. Ani BAGHDASARYAN

Department of Materials Science & Engineering, Stanford University, USA

15.25– 16.10 Coffee break

16.10 – 16.45 Type IA and IB topoisomerases: novel mechanistic insights and anticancer drug development

Dr. Xi YANG

National Cancer Institute, NIH, Bethesda, USA

16.50 – 17.25 Seeing the invisible: How modern microscopy uncovers cellular architecture and molecular function

Dr. Magdalena SCHACHERL

Institute of Medical Physics and Biophysics, University Berlin, Germany

17.30 – 18.05 TGF-β at the switchboard: co-receptor rules and targeted inhibition

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