

Joint life sciences seminar: A Tale of Four Topics

Thursday 3 February 2022, webinar 15:00-17:00

15:00 Piezo channels thrive under the pressure ... and light

Thomas Grutter (CAMB), USIAS Fellow 2019

At the basis of our senses such as touch, pain, proprioception, hearing, and of important physiological functions including blood flow regulation, are mechanosensitive Piezo channels which convert mechanical stimuli into biological signals (electrical and ion flux signals). The discovery of Piezo channels only dates back to 2010, and was an important element in the Nobel Prize in Physiology or Medicine 2021. Studying the molecular mechanisms that control the activation of Piezo channels using nano-optical tweezers, with a central photo-switch enabling control of Piezo channels and measurement of the passage of ions, showed that mechanically-activated Piezo channels can be successfully converted into light-gated ion channels, (literally) shedding new light on the molecular mechanisms involved in Piezo channels.

15:30 High resolution structural analysis of ribosomal RNA modifications

Bruno Klaholz (IGBMC), USIAS Fellow 2018

Using a unique technology, based on cutting-edge high-resolution cryo-electron microscopy, it is possible to witness at the atomic scale the 3D structure of the complete human ribosome and the detailed interactions that occur within it, including with mRNA and regulatory factors. The unprecedented possibility of visualizing the specificity of human ribosomal RNA modifications has resulted in new insights into protein synthesis regulation and dysregulation in humans at the level of the human ribosome machinery. This is opening the way to further exploring the molecular basis of human translation and associated diseases.

16:00 The role of the nuclear pore complex in cell differentiation: from yeast to stem cells

Manuel Mendoza (IGBMC), USIAS Fellow 2019

Nuclear pores are large protein complexes which form channels between the nucleus and the rest of the cell, for molecules to move in and out in a controlled way. Contrary to what was assumed, nuclear pores can be different in different cells, and this can help explain differences in cell division and cell fate. This can reveal novel principles of how human stem cells and tissues are maintained, and how they may become derailed, leading to developmental disorders and cancer.

16:30 A novel approach for the study of bioactive molecules in vivo

Wojciech Krezel (IGBMC) and Alain Wagner (CAMB), USIAS Fellows 2018

Combining expertise in biology and chemistry, a novel approach has been developed to detect, identify and study small exogenous bioactive molecules in vivo. This approach can be applied to *endogenous* small bioactive lipids like retinoids. These play an important role in a range of cellular and molecular processes involved in vertebrate development, health and disease. Using tailored chemo-specific-probes should allow the determination of metabolic fate of target molecules (purposely designed retinoid derivative), identification of relevant metabolic enzymes and receptors, and control of their bioavailability.