

Thursday, 23<sup>th</sup> March, 12.00 pm, Seminar Room

*Host: Dr. Ralf Richter*

## **Close Encounters of the Virosphere: viruses, pathogens and miniaturised wonders**

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Viruses permeate the entire biosphere. Some of them are pathogens to humans and animals while others are allied to humans in infecting and controlling bacteria proliferation. Our research aims to understand viral pathogenesis, the virus-cell recognition mechanisms and the assembly principles of viruses. Major targets of the investigation are viruses with an internal membrane and biomedically relevant human and animal enveloped viruses.

In this lecture we will illustrate some of our most recent findings on viruses that possess an internal membrane vesicle, whose interplay with the viral proteins unravel novel mechanisms for genome protection and virus assembly. In the former case, in a collaborative endeavour we investigated bacteriophage PRD1 using atomic force microscopy and biophysical modelling to grasp additional roles that the internal membrane vesicle may play during the virus lifecycle beyond the formation of a proteo-lipidic tube used for cell infection.

In the case of virus assembly, capitalizing on the immense advances in high-resolution cryo-EM and its democratization as a technique, we have been able to visualize the large (800 Å edge-to-edge) and membrane-containing archaeal halophilic virus HHIV-2 at 4.4 Å. The near-atomic-resolution has allowed the model building de-novo of the two MCPs, spike complex proteins and ancillary proteins in the context of the internal membrane vesicle. The unfolding picture provides the principles governing the assembly mechanism of vertical single  $\beta$ -barrel viruses, which had remained so far unexplained.

Finally, in an integrative-approach to understand the Virosphere we will conclude by presenting our ongoing cDNA vaccine and structural studies on Schmallenberg virus, an animal pathogen recently discovered in Europe and with the potential for serious impact on farm economies.