



# Allgemeines Physikalisches Kolloquium

Donnerstag, 18.04.2024 - 16 Uhr c.t.

## Prof. Pratika Dayal

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### **The emergence of galaxies in the first billion years: implications for reionization, cosmology and gravitational wave astronomy**

Galaxy formation in the first billion years marks a time of great upheaval in our cosmic history: the first sources of light in the Universe, these galaxies ended the 'cosmic dark ages' and produced the first photons that could break apart the hydrogen atoms suffusing all of space starting the process of 'cosmic reionization'. The past few years have seen cutting-edge instruments such as the James Webb Space Telescope (JWST) provide tantalising glimpses of such galaxies assembling in an infant Universe. Puzzlingly, these observations are also yielding a sample of unexpectedly numerous and large black holes (up to a 100 million solar masses) within the first 600 million years, posing an enormous challenge for galaxy formation models. I will show how this data is providing an unprecedented opportunity to pin down the reionization state of the Universe in addition to providing an unrivalled resource for understanding the reionization topology in the forthcoming era of 21cm cosmology. I will also show how these early systems provide a powerful testbed for Dark Matter models beyond "Cold Dark Matter". Finally, I will try to give a flavour of the gravitational wave event rates expected from such early black holes in the Laser Interferometer Space Antenna Array (LISA) era.