



Universität Regensburg

FACULTY OF HUMAN SCIENCES

Chair of Cognitive Neuroscience

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Guest Lecture

Thursday, 29.01.2026, 16:15 – 17:45

Room H23

Title: Layers of primary visual cortex as a window into internal models about predicted environments. Human fMRI with monkey and rodent neuroscience

Speaker: Lars Muckli, PhD, Professor of Visual and Cognitive Neurosciences,
University of Glasgow

Abstract.

Normal brain function involves the interaction of internal processes with incoming sensory stimuli. We have created a series of brain imaging experiments (using 7T fMRI) that sample internal models and feedback mechanisms in early visual cortex. Primary visual cortex (V1) is the entry-stage for cortical processing of visual information. We can show that there are 3 information counter-streams concerned with: (1) retinotopic visual input, (2) top-down predictions of internal models generated by the brain, and (3) top-down imagery acting independently of the perception and prediction loop. Internal models amplify and disamplify incoming information, but there is also mental imagery not interfering with visual perception. Our results speak to the conceptual framework of predictive coding. Healthy brain function will strike a balance between the precision of prediction and prediction update based on prediction error. Our results incorporate state of the art, layer-specific ultra-high field fMRI and other imaging techniques. In a multi-species Multimethod approach, we replicate our results in rodents and monkeys and learn more about the neuronal cortical microcircuitry underlying top-down processes in visual cortex.