In order to fit cyclic environmental changes, implied by the Earth rotation around its axis, living organisms established the endogenous mechanism that allows to anticipate and react to daily ambient light changes. This mechanism, named the biological clock, is localised in the subset of neurons in the mammalian brain (exactly in the suprachiasmatic nucleus of the hypothalamus) and controls the majority, if not all, rhythmic physiological and behavioural processes of the organism. Light is the environmental stimulus that strongly synchronise the rhythmic function of the internal clock. This sensory information is received by the photosensitive cells located in the retina of an eye and further processed and interpreted by the number of specialised brain structures: the subcortical visual system. The aim of this project is to describe the activity of subcortical visual structures across the 24h cycle and its modulation by orexins - two hypothalamic neuropeptides that carry information regarding circadian and behaviour-depended brain arousal.

To answer our questions, in this project we are to perform experiments with the use of a broad scope of scientific methods, such as: electrophysiological measurements of neuronal activity in the brain slices (*ex vivo*), immunohistochemical stainings of the brain tissue, neuronal tract tracing, chromatographic techniques or novel methods of RNA hybridisation *in situ*.

During the two decades of intensive studies of orexinergic system, closely related to regulation of circadian rhythmicity, the topic of subcortical visual system modulation by orexins, in order to enhance its excitability needed to process light information, could have been underestimated. Therefore, the results of our study will be valuable for the full understanding of the physiological mechanisms underlying the perception of the cyclic changes of ambient lighting across 24h. Basic research planned in this project could possibly be a cornerstone for further behavioural and pharmacological studies. What is more, the knowledge on endogenous mechanisms of circadian rhythmicity may be useful for the treatment of circadian misalignments as jet lag.