Central clock circuits regulate the timing of behavior and physiology by integrating daily and annual fluctuations in light. Light impacts brain function, affecting creatures' health either positively or negatively. Tracking irradiance therefore provides a survival advantage, and mammals do so in order to control functions that are as diverse as sleep regulation, hormonal adjustment, neuromodulation, and pupillary constriction. Irradiance is also the principal cue for synchronizing the circadian clock with the solar day, and thereby helps to maintain appropriate patterns of gene expression throughout the body; clock dysregulation is linked to disorders that range from metabolic to psychiatric in nature. The suprachiasmatic nucleus (SCN) lied at the bottom of hypothalamus, which is the central daily clock and annual calendar in mammals. Photic inputs from Melanopsin expressing intrinsically photosensitive retinal ganglion cells (ipRGCs) are processed and transmitted to the broader SCN circuit to regulate circadian and photoperiodic responses to light, then ultimately the larger circadian system to influence the phase, period, and waveform of daily rhythms. The characters of SCN have been studied more than two decades, however how the SCN neurons that regulate circadian responses to light in live animal have not been fully mapped. Therefore, we aim to understand how neurons within the SCN regulate responses to light stimuli, thus impacting physiological functions. To investigate the SCN neurons in the single-cell resolution, we combined a set of GCaMP7f calcium imaging, gradient-index (GRIN) lens and two-photon microscopy. Our result showed that the SCN neurons were responsive to light onset. Our study can deeper our understanding of SCN functions and provide additional insights into the SCN networking compared to previous in vitro works.

中文題目：利用梯度折射率透鏡進行視交叉上核的活體神經元活動研究

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