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DATE OF DISPUTATION:	9th of May 2018

DISSERTATION TITLE: *Behavioral state and neuronal activity: how the freely moving paradigm can uncover novel response characteristics.*

In order to understand how the brain operates to serve cognitive functions and behavior, it is necessary to monitor brain activity at the single-neuron level. Neural recordings provide descriptions of brain dynamics that can reveal accurate neural correlates of behavior or sensory stimuli. Due to better experimental control, a large proportion of studies of the sensory systems have been conducted using head-fixed or anesthetized animals. However, it is well known that brain activity varies between different behavioral states or anesthesia, and efficient sensory perception need to incorporate information about self-generated movements. Thus to fully understand the complexity of awake information processing, the animal must be able to move freely and interact with their environment. In her doctoral thesis, Ida Aasebø first investigates the functional properties of neurons in the primary visual cortex during different behavioral states and describes how neuronal ensembles recorded in awake animals are affected by anesthesia, which changes visual information processing. Recording from neurons in freely moving animals, Aasebø discovered a new property of a subpopulation of neurons in visual cortex. These neurons keep their tuning specificity to an oriented grating stimulus even during movement, while the majority of neurons fail to display stable visual responses under these conditions. The neurons are located in the deepest layer of the visual cortex and neuronal activity in this layer have previously been shown to exert a powerful inhibiting influence on the remaining layers. The functional role of these neurons described by Aasebø may be fundamental in understanding how visual information processing occurs in the behaving animal. Furthermore, this thesis demonstrates how novel findings on neuronal response properties can arise from experiments that allows the animal to move freely.