**Grant summary.**

Top-down modulation of visual processing: mechanisms and functions.

Principal Investigator: Pierre-Olivier Polack, DVM, PhD

**The National Institute of Health and the National Eye Institute awarded a $2 million Research Project Grant (R01) to the *Cortical Neuronal Networks* laboratory led by Pierre-Olivier Polack at the Center for Molecular and Behavioral Neuroscience (Rutgers University-Newark). The goal of this five-year project (2020-2025) is to advance our knowledge on the neuronal activities responsible for visual perception.**

**Our vision seems to provide a faithful account of what is happening before our eyes. Yet, is visual perception that trustworthy? Vision can be fooled by optical illusions, can be influenced by the behavioral context such as a stressful experience or can be trained to improve visual acuity. It is now well established that visual processing is highly influenced by cognitive processes such as learning, attention, expectation… but also by locomotion, touch, or audition! This meddling of non-visual processes into visual processing is very pervasive: neurons in the visual cortex receive as many connections providing visual information from the retina (bottom-up connections) than inputs from neurons of other brain regions sending feedback (top-down connections). What kind of information is sent to the visual cortex via those top-down connections? How is this information interfering with visual processing? What would be the benefits of controlling perception? The hypothesis at the core of the project is that the information sent to the visual cortex via the top-down inputs is necessary to select and extract the visual information most pertinent for the task being performed, such as what to look for when searching for a familiar face in the crowd. To test this hypothesis, the researchers at the Polack lab will use functional imaging to record the activity of hundreds of neurons in the visual cortex of mice performing visual discrimination tasks. They will also investigate how neurons in the visual cortex combine top-down and bottom-up information using state-of-the-art *in vivo* electrophysiology techniques.**

**In the long-term, the knowledge generated by this project will be used to investigate the pathological mechanisms underpinning neurological disorders such as autism spectrum disorders, schizophrenia and prodromal Alzheimer’s disease that are associated with dysfunctions in sensory processing. Indeed, converging evidence indicate that the top-down control of sensory processing is most likely compromised in patients suffering those disorders.**