

## Summer Scholarship Projects – Physiology, 2012

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### **Visual adaptation: how does what we perceive now depend on what we saw then?**

Our perception of the world is innately coloured by what we have experienced previously. For example, you may have noticed that driving at 60 km/hr can seem ridiculously slow after being on a freeway, but quite fast after waiting at traffic lights. Although less obvious, after driving at 100 km/hr, you actually become more sensitive to small deviations in speed. These perceptual changes probably arise because sensory neurons in the brain dynamically “adapt”, matching their sensitivity to prevailing environmental conditions. This allows the brain to more accurately and efficiently encode the world.

Using psychophysical studies of human observers, this project will characterise how human perception of motion depends on what has recently been seen. This gives us insights into flexibility of motion encoding in the brain, and whether adaptive mechanisms in the brain are likely to have evolved simply to conserve energy, or whether they convey behavioural or perceptual benefits. During this project, you will learn how to design and implement psychophysical tests of human perception and how to perform computational analyses or perceptual performance.

### **Perception in the blink of an eye**

While reading this paragraph, your eyes will make dozens of blinks and tiny movements called saccades. The resulting motion inevitably blurs the image at the eye, making it difficult for the brain to interpret what is happening in the world. This project aims to understand how saccades and blinks affect vision: is visual sensitivity suppressed during eye movements so that we aren't disconcerted by the rapid motion? Further, is visual sensitivity enhanced immediately after the end of an eye movement so that we can quickly process the new scene?

In this project, you will perform psychophysical testing of human visual perception. You will use a video-based eye tracking system to determine where a subject is looking and monitor their perception of simple text or moving stimuli presented on a computer monitor. This will give insights into how visual processing in the brain is affected by eye movements. During this project, you will learn how to design and implement psychophysical tests of human perception, computational analyses, and how to accurately track and quantify human eye movements.