**Project Title:** Visualizing Fluid Dynamics of the Inner Ear  
**Code:** BMRI1

**Host School/ Institute**  
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**Project Type:** Laboratory based

**Project Category:** Otolaryngology

**Project Keywords:**  
1. Cochlea  
2. Vestibular  
3. In Vivo Physiology  
4. Light Sheet Fluorescence Microscopy  
5. Electrophysiology

**Project Description:**

The inner ear contains mechanically-sensitive hair cells that sense sound and movement, housed in a complex fluid-filled membranous labyrinth which can bloat, leading to symptoms such as dizziness, tinnitus and hearing loss. These symptoms characterise the disorder called Ménière's Disease, which afflicts approximately 50,000 Australians. The most debilitating symptom of this disease is sudden attacks of severe rotational vertigo, suggesting that the semicircular canals (which sense rotation) are affected by this increased fluid volume. How this occurs is currently unclear, but our laboratory is working with an animal model to examine various theories.

By injecting artificial fluid into the membranous labyrinth of anaesthetised guinea pigs whilst monitoring measures of hearing and balance, we have recently demonstrated unusually abrupt changes in function, which we think may involve a morphological valve in the inner ear. What occurs to semicircular canal function during these experiments is currently unclear, but is likely to explain the sudden vertigo attacks experienced by Ménière's sufferers.

This project involves measuring single-neuron activity of the semicircular canal nerve in anaesthetised guinea pigs, using glass micro-electrodes, during the injection of artificial inner ear fluid. Experimental techniques will include gross and cellular electrophysiological recordings, along with post-mortem imaging using a custom-built Light Sheet Fluorescence Microscope.