VISUAL SCIENCES

Group Leader: Dr Michael Ibbotson

We study the sense of sight (vision). We use a wide range of approaches including electrical recording, perceptual and behavioural analysis and computer modelling.

Research themes consist of studying the neural circuits in the mammalian visual cortex and retina, developing non-invasive techniques to record from the human eye and brain, learning and memory in honeybees and the visual ecology of fiddler crabs.

Medical spin-offs from our work relate to the prevention of short-sightedness and the development of diagnostic tools for the early detection of diseases (e.g. glaucoma). Research activities have led to patents for the design of visually self-guided robots.

What visual information do animals actually process under natural conditions? Fiddler crabs are an ideal model to study the ecology of visual information processing, because we can monitor at the same time their rich behavioural repertoire and what their highly specialized eyes see.

HIGHLIGHTS

- Dr Maleszka and his group participated in mapping the bee genome generating over 11 major publications in journals such as Nature and Science.
- Dr Morgan and researchers in Sydney have shown that increased time spent outdoors prevents the development of myopia - providing a possible public health approach to the control of the epidemic of myopia.
- Dr Zeil and Dr Hemmi have shown that female fiddler crabs recognize males and females by claw and body colour patterns. Some species of crabs can rapidly change body colours, but not claw colours, in response to bird predation.
- Dr James and co-workers published the first concurrent demonstration of the relative mapping of colour signals on the human brain.
- Dr Zhang and his German colleague Juergen Tautz have demonstrated for the first time that honeybees can make two choices simultaneously, which greatly improves their chances of foraging successfully.
- Dr Maddess and Dr James, in collaboration with Seeing Machines Ltd., have demonstrated objective and non-invasive visual field testing for glaucoma using responses of the pupils.
- Mr Letzkus and Prof. Srinivasan have revealed that lateralization of brain function extends to insects. The honeybee is able to learn and discriminate odours better with its right antenna.
- Dr Ibbotson and team have shown that time is not processed in the primate brain in a steady clockwise fashion. Rather, perceived time is warped relative to the actions of the individual. This is revealed by dramatic deformations of time around the time of eye movements.