



## Rigorous, Relevant Research

## Cognitive and Perceptual Systems

### ► Introduction

The organization and operation of our brains defines what we see, hear and understand but study of observe changes inside a functional human brain poses many problems! Instead, researchers at Aston University have developed theoretical models to improve understanding of perception and cognition which have been confirmed by experimentation. In parallel, researchers have measured signals from the brains of individuals as they perceive changes in the environment using sensitive human, non-invasive brain imaging techniques. Our research aims to advance understanding of human vision, hearing and cognition and to apply this knowledge in the development of improved clinical methods in optometry, audiology, and neuropsychology.

The approaches adopted by our team of cognitive psychologists and neuroscientists include:

- Behavioural studies;
- Functional brain imaging (EEG, MEG, fMRI);
- Theoretical development;
- Computational modelling.

### ► Sponsors and funders

The Wellcome Trust, MRC, BBSRC, EPSRC, RCUK and the ESRC.

Academic collaborations are an important aspect of the group's activities and in collaboration with Monita Chatterjee in the University of Maryland USA, funding has been successfully obtained from EPSRC to improve cochlear implants.

### ► Key projects

- Determining how the development of the brain impacts on a child's ability to understand and communicate and investigating brain damage-induced speech and language impairments;
- Understanding how the human brain uses binocular vision;
- Examining the brains of patients with visual impairment and children with developmental disorders using various neuroimaging techniques;
- Examining the reasons for late development of object recognition skills in some children and its impact into adolescence;

- Understanding the relationship between genetic make-up and developmental disorders.

### ► Key significant findings

1. Visualised brain rhythms using magnetoencephalography in the human visual cortex. *NeuroImage* (2003), 28, 98-113.
2. Identified a quantitative-trait locus on chromosome 18 which influences dyslexia, *Nature Genetics* (2002) 30; 86-91.
3. Defined auditory processing of specific sound frequencies and amplitudes which relate to developmental dyslexia. *Journal of Cognitive Neuroscience* (2002), 14; 866-874.
4. The temporal binding deficit hypothesis of autism. *Development and Psychopathology* (2002) 14; 209-224.
5. Described how the brain adapts to blurred images. *Nature Neuroscience*, 5(9), 839-840. 58.

### ► Recent publications can be viewed in the following journals

- *NeuroImage*, 2007 34, 371-383.
- *Journal of Vision* 2007, 7, 1-21.
- *NeuroImage* 2006, 32, 352-367.
- *International Journal of Psychophysiology* 2007, 63 164-172.
- *Journal of the Acoustical Society of America* 2007, 121, 3655-3665.
- *Journal of Child Psychology and Psychiatry* 2006, 77, 1159-1166.
- *Brain Research* 2006, 1077 90-98.

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