**Developing a bio-inspired fingerpad based on MEMS and NEMS force transducers to mimic the resolution, sensitivity and dynamics of spatial touch in the human finger.**

Eurohaptics 2010 half-day symposium
Convened by Alan Wing and Mike Adams, University of Birmingham

Biological tactile sensing is a key area of sensory processing in which the brain uses frequency and intensity coded neural signals from nanoscale receptors in the skin to determine the nature of environmental surfaces. This information is important for the perception through touch of surface features, for discriminating between surfaces in terms of their microgeometry (ie local shape and texture) and for the efficient control of grip, in which contact surface properties, together with forces normal to the surface, determine the tangential frictional forces that limit sliding of the digit. The overall goal of the current project, Nanobiotact, is to design and construct a bio-inspired artificial finger with a biomimetic sensor based on an array of MEMS/NEMS force transducers that will mimic the resolution, sensitivity and dynamics of spatial touch in the human finger. Meeting this goal has involved the development of a scientific understanding of the mechanoreceptors and their neural coding of mechanical events at the skin surface. Biological tactile processing of specifically designed texture stimuli are being assessed using psychophysical and neurophysiological techniques. Psychophysical measures define the relation between experimentally manipulated variation in textures presented to the finger and behavioural responses including explicit (conscious) or implicit (automatic) effects on decision and action. Neurophysiological techniques include recording neural activity in peripheral nerves (microneurography) and the brain (EEG and functional imaging) and documenting behavioural impairments resulting from lesions in the peripheral or central nervous system. A theoretical model of the neuromechanical elements of the tactile process is being developed to enable simulation of the neurophysiological response to a tactile stimuli varying in surface microgeometry. The information from the psychophysical, neurophysiological, and computer simulation activities are being processed using various forms of artificial neural networks. Technological approaches based on MEMS and NEM sensors with synthetic materials have resulted in the development of a bio-inspired fingerpad that can encode tactile roughness. These are leading to an improved description of the neural coding of surface texture, and provide design strategies for NEMS arrays for spatial tactile processing.

Draft programme
**14.00 A Wing (chair) Welcome**
14.05 M Adams Introduction and overview
14.15 A Wing Human psychophysics
14.35 J Wessberg Microneurography
14.55 M Adams Tribology
15.15 T Rodic Finite element modelling
15.35 Tea
16.00 C Osendorfer Haptic sensor analysis with machine learning
16.20 M Ward Sensory array fabrication
16.40 L Beccai Bio-inspired tactile finger
**17.00 Finish**