There are many newsworthy items in the abstracts but a quick survey has turned up the following that might be of more general interest. But first a few introductory notes and then the summaries

ANS 2009 Meeting

Australian Neuroscientists perform well above their size internationally and their key representative body, the Australia Neuroscience Society (ANS), is having its 29th annual meeting in Canberra. The meeting is being hosted by the large Neuroscience community at the Australian national University. Over 700 Australian and international scientists will participate in the ANS meeting. Those scientists will make 535 presentations including 13 Symposia and 4 Plenary sessions in which many international attendees will participate. Canberra is an interesting venue for ANS because its first official meeting occurred there in 1980.

Why Neuroscience?

Neuroscience is the study of all components of the nervous system and brain. The nervous system controls our movement and senses, and also automatic functions like breathing, our blood pressure and the beating of our hearts. Shorter range communication within the nervous system is conducted by chemical messages, but longer range communication is done by electrical signals that can travel from our toes to our heads in just milliseconds. The nerve cells that do the initial sensing of things like pressure, sound and light also use electrical signals. Each of our 100 billion or so nerve cells, are living organisms. This means they are subject to the same genetic control and metabolic requirements as all cells. Therefore all manner of diseases can affect neurons and this leads to diverse problems including abnormal blood pressure, and changes in circadian rhythms, motor coordination, memory, and the senses. Many drugs also target neurons because they are involved in controlling so many bodily functions. Neuroscience is a diverse field because it encompasses everything from genetics and cell biology to topics like information theory, normally he province of electrical engineers. Means of stimulating or monitoring the activity of neurons often involve various kinds of electromagnetic radiation. For example tiny currents induced by brain atoms spinning in magnetic fields can be used to monitor brain activity, as can the absorption and scatter of infrared light, and the decay of radioactive tracers. Now nerve cells can be genetically modified to emit light when they are active. Overall neuroscience is a highly multidisciplinary study with wide impact for the health sciences.

Plenary talks

Wilson MA – When we do things parts of our brain respond with lengthy sequences of identifiable activity. Wilson reports on recent discovers that indicates that while we are incorporating memories of these activities that these sequences can replayed in parts of our brain, sometimes at faster than normal tempo and sometimes in reversed order. These replays and can occur while we sleep or while we are quietly contemplative. Will Cavines, Phone: 617-452-4107 and email: caviness@mit.edu

Symposia

Rietze R.L. – Brain stem cells are important to maintained brain health. Brain health is presumably related to cognitive ability. Reitze demonstrates that while neural stem cells decline in number with age, that exercise increases their number in all but the oldest mice, where exercise has the opposite effect. Importantly they report that by activating growth hormone receptors in mice the restorative effects of exercise on stem cell number is maintained even into old age. In a related presentation **Faull R.L.M.** demonstrates that the rate of generation of new human stem cells increases with disease severity in Huntington's Disease (HD). This suggests a natural stem cell mediated repair system is activated by HD and possibly other degenerative diseases that might be able to be enhanced. 07 3346 6351, rietze@uq.edu.au; 64 9 373 7599, rlm.faull@auckland.ac.nz

Andersen O.M. et al. Late on-set or sporadic Alzheimer's Disease (AD) is characterised by a reduction in the sorLA protein. Andersen et al. demonstrate that problems with sorLA can lead to the production of plaques, small protein bundles, found in abnormally extensive abundance in the brains of AD patients. The results suggest a new target for treatment of late-onset AD. 45 8942 2871, o.andersen@biokemi.au.dk

Johnson B.W. et al The visual brain consists of a hierarchy of separate areas and these make up a large proportion of our brain. Input from the eyes proceeds sequentially up the hierarchy although there are also strong connection between areas at each level and also feedback from higher areas to brain areas closer to the input from the eyes. Paradoxically the largest visual brain areas are those at the input stage. Johnson et al use a new high resolution magnetoencephalograph to show that the lowest and largest brain area is very active while humans do mental rotation of objects presented to the eyes. This strongly suggests that these "input" areas of the brain are not large for nothing and in fact form a major part of the visual thought process. The study provides a higher time resolution confirmation of this idea. 02 9850 6879, bjohnson@maccs.mq.edu.au

Leamey CA Inputs from each of our two eyes go to both sides of the brain. A mystery surrounds how the hundreds of thousands of tiny nerve fibres from each tiny part of the eyes grow to the correct locations in the brain so that left and right eye images exactly register. Dr Leamey describes a new protein that appears to determine the registration process. She also shows that when new protein is not operating that near normal development can be obtain by masking one eye, a treatment used in lazy eye and related developmental disorders. 02 9351 4352, cathy@physiol.usyd.edu.au

Foster R The larger animal kingdom is frequently divided into vertebrates (mammals, birds, reptiles, amphibians and fish) and invertebrates (molluscs, crustaceans, insects, etc.). Within the vertebrateslight is transformed into neural signals by the rod and cone cells of the eye and these signals are conveyed to the visual brain by the optic nerves. Invertebrates have different light detecting cells. Recently, another form of light reception has been found within vertebrates, including humans. This new system appears to service some parts of the responses of our pupils and also synchronisation of our bodies to the day/night cycle. Dr Foster describes aspects of this new system that indicate it is evolutionally linked to light detection in invertebrates, closing a long standing gulf in our understanding of evolution within these disparate groups. 44 1865 234 777, Russell.Foster@eye.ox.ac.uk

In a related paper **Dr Lamb** describes how ", by studying the embryological development of the vertebrate eye, by examining the molecular genetic record preserved in our own genes and in the genes of other vertebrates, and through consideration of the imperfections (or evolutionary "scars") in the construction of our eye. Taking these findings together, we suggest that the precursor of vertebrate eyes evolved as bilaterally paired organs similar to the pineal of non-mammalian vertebrates." Other papers on the evolution of light perception mechanisms are also presented. 02 6125 8929, Trevor.Lamb@anu.edu.au

Luty AA et al. Frontotemporal lobar degeneration (FTLD) is the most common cause of dementia after Alzheimer's disease in people aged under 65. A protein called TDP-43 that can connect to DNA has been shown to pathologically define both FTLD and motor neuron disease (MND). The gene responsible for FTLD-MND has been known for some time to be on human chromosome 9 but the actual gene has remained a mystery. Luty et al. report finding the gene, that it controls the location of TDP-43 in cells and that certain drugs mimic the effect of the gene on TDP-43. This discover provides significant information for potential treatments of these diseases. 02 9399 1025, c.dobson-stone@powmri.edu.au

Oral Presentations

01-02 Santosa C. et al Alzheimer's is characterised by the build up of protein plaques in the brain. Santosa et all had previously shown that protein products that lead to the plaque proteins are also found in higher concentration in AD patients. This higher than normal concentration occurs despite the fact that the concentration from messangers from the genes are not increased. One possibility is that the plaque precursor proteins are not transported properly in the brain cells leading to a build up despite normal rates of production. The authors demonstrate for the first time a blocking the transport mechanism. 03 8344 4205, gmevin@unimelb.edu.au

01-03 Lim YA et al report a link between disease mechanisms in Type 2 diabetes and Alzheimer's. 02 9351 0874, limy@med.usyd.edu.au

Oral session 3 - Insect vision. As we speak the US military has hundreds of drone aircraft monitoring the Afghan/Pakistan border. The smallest of these are large scale model aircraft flow by human operators on the ground. The large models are the size of jet fighters, and while they are more autonomous, this is at the cost of hundreds of kilos of computer hardware. How then do can there be autonomous visually guided flying machines that are more acrobatic than any human aircraft but which weigh a fraction of a gram, computers and all? These are the flying insects, especially the predatory ones. Certainly these insects have faster vision, your new rock steady, 100 frame per second, LCD TV looks like an annoying strobe light to any respectable insect. A symposium on insect vision reveals much more about the processing of colour, polarise sunlight, image motion and contrast in these eyes, including how to use 3 very small cameras to eliminate the need for any gyroscope in your aircraft. m.srinvasan@uq.edu.au

04-06 Parish CL et al Transplanting Embryonic Stem Cells (ESCs) into damaged brains hold promise for management and even cures for neuro-degenerative disorders like Parkinson's Disease. A significant risk has been the formation of cancerous tumours rather than healthy new brain tissue. Parish et al. demonstrate that by blocking the activity of a protein call Cripto that the rate of correct incorporation of transplanted ESCs is improved and tumour production is reduced. 03 8344 0143, clare.parish@florey.edu.au

06-02 Lee M et al Paradoxically when people engage in strength training on one side of their body, say their right arm but not their left, the force both limbs can exert is improved. Lee et al. show that this is at least partly due to improved effectiveness of the drive from the cerebral cortex to the untrained muscles. This may be significant for rehabilitatioin of some neurological patients. 02 9385 8710, michael.lee@unsw.edu.au

06-03 In a somewhat related story Tsao et al show that while the representation of muscle groups in the cerebral cortex can change in persons with chronic back pain that mapping, and motor skills, can be restored by exercise training. 07 3365 4567, p.hodges@uq.edu.au

14-04 David DJE Pre-eclampsia is a serious problem affecting 5 to 8 % of pregnancies. There is evidence that the problems of pre-eclampsia result from deficient nervous control of blood vessel diameter in the uterus. David et al. report for the first time that pregnancy itself causes a large reduction in neurons of the pregnant mouse uterous. 08 8204 4709, greta.david@flinders.edu.au

15-05 Maddess et al. To diagnoses and manage blinding diseases such as glaucoma it is necessary to measure visual sensitivity across the visual field of patients, a process known as perimetry. Glaucoma affects about 2% of all people over the age of 50 years, affecting 60 million people worldwide. Perimetry examinations can be quite long and rely on subjects making hundreds of difficult subjective judgments about whether they have seen test visual stimuli. This contributes to poor reproducibility and about 10% of patients fail to complete a proper perimetry test although it is critical to the management or diagnosis of their glaucoma. Maddess et al. introduce a prototype device that objectively measures the visual fields of both eyes concurrently using only responses of the pupils to hundreds of concurrently presented stimuli. The new test is about twice a fast as conventional methods. 02 6125 4099; ted.maddess@anu.edu.au

17-08 Manley GA Fish, amphibians and lizards as a rule have very poor hearing at higher sound frequencies. Manley et al. report on the remarkable hearing of several species of legless Australia gekos. These gekos have unusually structured hearing organs and are able to hear sounds up to 15 Kz, not much less than the highest pitches heard by humans. The mechanisms of the primary hearing organ of all vertebrates, the cochlea, is not well understood. Most of us will be familiar with the cochlear implant that provides limited hearing to those otherwise without hearing. These animals being a remarkable exception may provide significant insights into how the cochlea works. 02 9576 5364, geoffrey.manley@wzw.tum.de