IN THE NEWS

Plane thinking

A clump of rat neurons in a Petri dish might not have the glamorous image that we usually associate with airline pilots, but thanks to research at the University of Florida, it might soon be able to do their job just as effectively. Biomedical engineer Thomas DeMarse has "created a living 'brain' of cultured rat cells that now controls an F-22 fighter jet flight simulator" (*Discovery Channel*, USA, 22 October).

DeMarse seeded a grid of 60 electrodes with 25,000 rat neurons, which were allowed to grow and form a neural network. This network was connected to a flight simulator, and the electrodes were used both to record the activity of individual neurons and to provide 'feedback' on their performance in the form of electrical stimuli. According to DeMarse, "over time, these stimulations modify the network's response such that the neurons slowly (over the course of 15 minutes) learn to control the aircraft" (*Discovery Channel*).

Although it sounds like the stuff of science fiction, it is believed that this technology will one day have real practical applications. Mandayam Srinivasan from the Massachusetts Institute of Technology said, "there are certainly things that biological systems can accomplish that we haven't been able to do with electronics". For example, "animals have no problem recognising different textures or telling the difference between two different pieces of furniture, whereas computers find this very difficult" (*New Scientist*, UK, 25 October).

DeMarse admits, "we're just starting out. But using this model will help us understand the crucial bit of information between inputs and the stuff that comes out. And you can imagine the more you learn about that, the more you can harness the computation of these neurons into a wide range of applications" (*Discovery Channel*).

Heather Wood

SENSORY TRANSDUCTION

A great TRP for hair cells

The long search for the mechanosensitive transduction channel that allows hair cells in the mammalian inner ear to function might be over. Corey *et al.*, writing in *Nature*, provide evidence in support of the idea that the channel, or at least a component of it, is the transient receptor potential (TRP) channel TRPA1.

Although it has been clear for some time that auditory transduction in vertebrates depends on the mechanical deflection of bundles of stereocilia on hair cells, and that this deflection opens ion channels in the tips of the stereocilia that are mechanically gated, the identification of these channels has proved tricky. However, the known permeability and conductance characteristics of the mechanosensitive channel are consistent with those of TRP channels, which are responsible for sensory transduction in other modalities including taste, thermal sensation and insect hearing.

Therefore, Corey and colleagues used *in situ* hybridization for all of the TRP channels in the mouse genome to search for one that was expressed in the mouse inner ear. TRPA1 was expressed in hair cells of both the cochlea and the vestibular system in mice, and its expression peaked at the developmental time point when these hair cells first become mechanosensitive. Antibody labelling showed that the cellular distribution of the channels was consistent with a role for TRPA1 in mechanotransduction in the stereocilia.

To test the idea that TRPA1 was involved in transduction, the authors used various methods to inhibit its expression. In zebrafish hair cells they used morpholino oligonucleotides, which inhibit the translation or splicing of mRNA, and in mouse hair cells they used adenoviruses to introduce small inhibitory RNAs (siRNAs) that targeted the TRPA1 message. In both cases, channel function was reduced, as measured either by dye accumulation or electrical responses (decreased microphonic potentials in zebrafish and decreased transduction currents in mouse cells).

In zebrafish, another TRP channel, Trpn1, is also required for hair-cell transduction, but this channel is not found in mammalian genomes. Corey *et al.* suggest that the two channels might form heteromeric channels in zebrafish. Interestingly, although they are not closely related phyogenetically, both TRPA1 and Trpn1 contain many ankyrin domains close to their amino termini. The authors propose that these repeats form a spring that could correspond to the 'gating spring' that has been biophysically identified as functioning in the hair-cell transduction channel complex. Yet another function for this versatile protein could come from its ability to undergo fast adaptation after opening. The rapid

SYNAPTIC PLASTICITY

Steps to lasting plasticity

A new study, reported in *Science*, shows how two proteins that are known to be important for long-term plasticity are linked. According to the results, tissue plasminogen activator (tPA) activates plasminogen to form plasmin, which cleaves the precursor of brain-derived neurotrophic factor (BDNF) to release the mature neurotrophin.

This process seems to be crucial for the late, protein-synthesis-dependent phase of long-term potentiation (L-LTP).

Both BDNF and tPA have previously been found to be necessary for L-LTP in the hippocampus, but until now it has been unclear how they are related. There is *in vitro* evidence that plasmin, which is produced by tPA, can generate the mature form of BDNF by cleaving its precursor, proBDNF. So Pang *et al.* proposed that these two cleavage events, culminating in the production of BDNF, might be important stages in the expression of L-LTP.

Consistent with this idea, the authors found that the ability of protein synthesis inhibitors to