possible pathways in the whole animal. We are at present trying to adapt the chromium release assay of cytotoxicity for this purpose.

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Transfer of learning across the somatosensory cortex

It has long been known that the somatosensory cortex in the human brain contains a ‘map’ of the human body. The map is made up of columns of cortical tissue within which the cells respond best to stimulation of ‘their’ designated body part. Such body maps have been seen in virtually all animals that have been studied. The maps have been shown in some cases to be dynamic, in the sense that experience can alter their precise structure. It appears that the brain at birth is given a particular map, which it then adjusts according to what it experiences in its lifetime.

If this is true one can ask, Do neighbouring regions of the cortex share their information? To address this question, Justin Harris at the University of New South Wales, Australia and Mathew Diamond and Rasmus Petersen at the International School of Advanced Studies, Trieste, Italy, decided to utilize the well-studied rat whisker system. The rat’s whiskers are arranged on the side of its snout in a neat five by seven matrix. Correspondingly there is five by seven matrix of cortical tissue columns in the somatosensory region of the rat’s cortex.

The rats were firstly trained in the Gap Cross Task. This task required rats placed in the dark on a platform to detect the edge of a second platform using only a single whisker (all the rest were clipped off). Once the rats had mastered this task – or, in a manner of speaking, once the whisker had mastered this task – the single whisker was clipped off, and it was glued onto the stub of some other whisker. Now the rats were immediately tested for their ability to perform the Gap Cross Task. Rats that had their 'prosthetic' whisker on the stub of the original (trained) whisker, could perform the task as well as before. Rats with the prosthetic whisker on a neighbouring stub needed a few trials to perform the task well. Rats with prosthetics on whisker stubs further away could not perform well at all, and they took as many trials to re-learn the task as did naïve rats. Interestingly, when the 'prosthetic' whisker was on the stub corresponding to the trained whisker, but on the *opposite* side of the snout, the rats could once again perform the task very well.

The next step was to develop a simple test to look at such a transfer of learning in humans. Blindfolded human subjects were taught to discriminate a smooth and a rough surface by using just one finger. Subsequently, still blindfolded, they were presented with either of the discriminanda at the tip of the trained finger, and asked to judge if it was the rougher or the smoother one. The task was said to have been learnt when the subjects got ten correct answers in a row. To examine the transfer of this learning, the same task was repeated, except that the subject now had to use a different finger. It turned out that, as in the case of the rats' whiskers, nearby fingers performed quite well; the subjects made fewer errors with fingers adjacent to the trained finger. Even more strikingly, the trained finger's equivalent on the opposite hand did as well as a finger adjacent to the trained finger in discriminating the surfaces correctly.

This is a remarkable example of a principle of cortical organization that is shared between species well separated by evolutionary time. Work in progress involves an attempt to use electrodes implanted in the whisker-cortex of rats in order to monitor in real-time the dynamical changes that accompany experience-dependent plasticity in the cortex.

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