Nature Reviews Neuroscience | AOP, published online 18 January 2011

IN BRIEF

BRAIN EVOLUTION

MicroRNAs: big influence in brain evolution

It has been suggested that the rapid evolution of brain gene expression might partly account for the emergence of human cognition. Using microarrays and computational analysis, Somel *et al.* found that the rate of divergence of developmentally expressed genes in humans was 3–5 times faster than in non-human primates, especially in the prefrontal cortex. They also found that microRNAs and their targets showed a faster rate of evolutionary change than other neuron-related genes, suggesting a potential role for microRNAs in the rapid evolution of the human cortex.

ORIGINAL RESEARCH PAPER Somel, M. *et al.* MicroRNA-driven developmental remodeling in the brain distinguishes humans from other primates. *PLoS Biol.* **9**, e1001214 (2011)

ION CHANNELS

Optogenetics gets selective!

Optogenetic targeting of specific cell populations in rats has not been possible until now. A new study demonstrates a method for creating genetically restricted, recombinase-driven rat lines in which opsins can be expressed in specific populations of neurons. Witten *et al.* generated tyrosine hydroxylase–Cre lines to target dopaminergic neurons and created choline acetyltransferase–Cre lines to target cholinergic neurons. Optical stimulation of the dopaminergic neurons was sufficient to induce self-stimulation in a model of positive reinforcement. These findings are a promising indicator of the future utility of this approach in rodent models.

ORIGINAL RESEARCH PAPER Witten, I. B. *et al.* Recombinase-driver rat lines: tools, techniques, and optogenetic application to dopamine-mediated reinforcement. *Neuron* **72**, 721–733 (2011)

NEURONAL CIRCUITS

Mapping the local field potential

The local field potential (LFP) is the low-frequency component of the extracellular voltage detected in the cortex, and changes in the LFP have been linked to many important processes, such as memory and motor function. Several recent reports have suggested that the LFP arises from neural activity within a few hundred micrometres of the recording electrode, but older studies had indicated that the LFP spreads further afield. Kajikawa and Schroeder looked at the extent ('spatial reach') of the LFP and found that the LFP undergoes passive spread that extends well beyond the area of contributing neuronal ensemble activity. The authors concluded that LFPs arise from a combination of local circuit activity and 'volume-conducted' electrical activity that spreads to more distal areas. In a related study, Lindén *et al.* provided potential insight into the nature of the LFP and how this influences its spatial reach. They created a detailed biophysical model of populations of cortical neurons, recreating the circuits and conditions that give rise to the LFP in the cortex. They found that the LFP detected by a single electrode arises from the neurons that surround the electrode up to a certain radius (spatial reach). This radius depended on neuronal morphology, the spatial arrangement of synapses and, importantly, on the degree of correlation between contributing populations of neurons.

ORIGINAL RESEARCH PAPERS Kajikawa, Y. & Schroeder, C. E. How local is the local field potential? *Neuron* **72**, 847–858 (2011) | Lindén, H. *et al.* Modeling the spatial reach of the LFP. *Neuron* **72**, 859–872 (2011)