The network of protein folding pathways is a particularly interesting one in terms of evolutionary fitness. The number of possible folding states a protein can have during its folding process is huge but the protein is folding extremely quickly, and this is an unsolved problem of today science. Groups of proteins form complexes that generally interact weakly but sometimes the bond can have high specificity. These complexes together can establish a strong structure, but to attain it they need to go through a network of states in a similar manner to protein folding. We are investigating ways to model this in terms of network evolution.

Also not every evolved system is suitable to be expressed as a proper network, but the evolutionary mechanism remains the same. We investigate the fitness of different populations of bacteria forming fractal shaped colonies using an agent based model that simulate the behavior of individual bacteria and the diffusion and sensing of different substances across the medium.

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Axonal and dendritic effects of neurogliaform cells in rat and human neocortex

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Neurogliaform cells have a unique position among cortical interneurons (Kawaguchi 1995) because they can elicit combined GABAA and GABAB receptor-mediated inhibition on pyramidal cells (Tamas et al. 2003). Moreover, they establish electrical synapses with each other and with other interneuron types (Price et al. 2005; Simon et al. 2005).

We measured the pre- and postsynaptic effects of neurogliaform cells applying simultaneous whole-cell recordings in layers I-IV of rat somatosensory cortex and in human association cortex *in vitro*.

Apart from the GABAA receptor mediated component in postsynaptic responses, single action potentials in neurogliaform cells elicited GABAB receptor mediated responses in neurogliaform, regular spiking and fast spiking interneurons in rat cerebral cortex.

Neurogliaform cells recorded in human cortical brain slices evoked GABAA and GABAB receptor mediated slow inhibition in various types of inteneurons and one of them established heterologous electrical coupling. These are the first multiple patch clamp recordings which analyse the functions of neuorgliaform cells in human cortex (Oláh et al. 2007).

These cells can effectively recruit GABAB receptors not only on classical postsynaptic compartments like dendritic spines and shafts but on presynaptic axon terminals as well. This presynaptic inhibitory effect can reduce synaptic transmission and this is reflected in the altered paired pulse ratios and reduced amplitudes of the evoked postsynaptic potentials. In one case we show phamacological dissection of this presynaptic modulation by applying GABAB receptor antagonist.

Our results highlight the peculiar role of neurogliaform cells in cortical circuits and extend their contributions to slow inhibition in cortex.

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