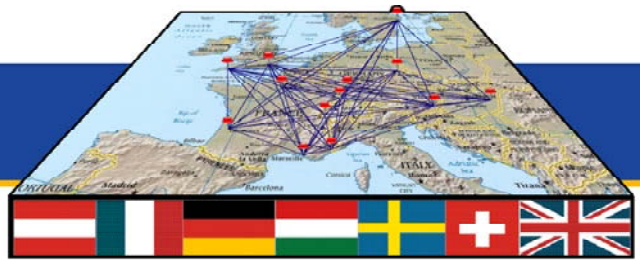
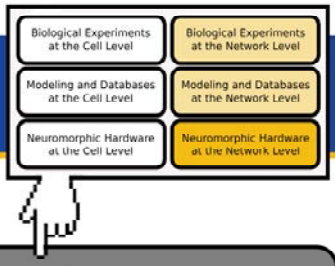




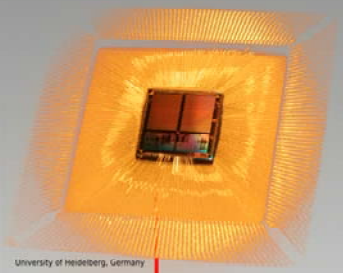
Biological Experiments

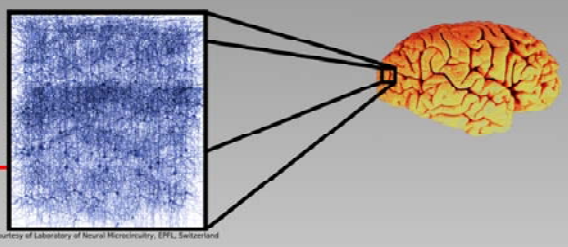
Theoretical Studies and Computer-based Models

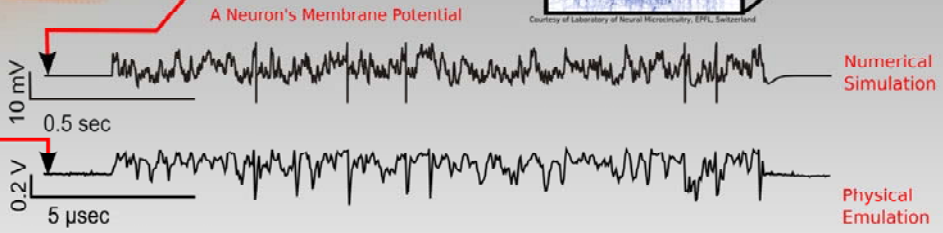
High Precision Neuromorphic Hardware Systems

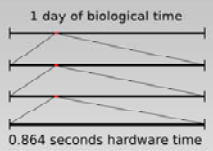
Large Scale Neuromorphic Hardware Systems

Building and Using Highly Accelerated Hardware Models to Study Cortical Circuits



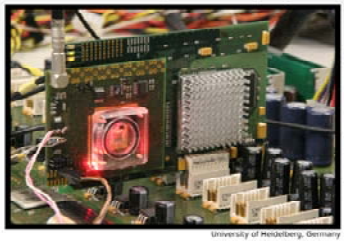




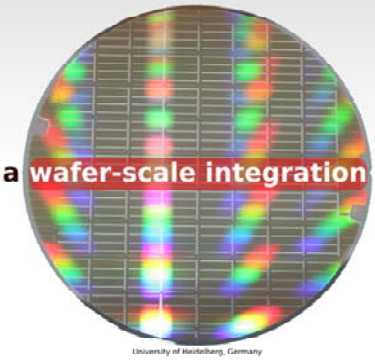


Speedup: the shown prototype hardware system works up to 100.000 times faster than biological real time

From a single-chip prototype...

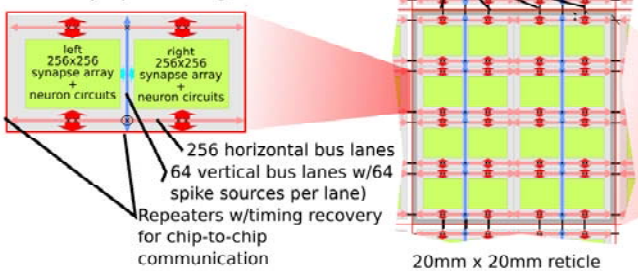


... towards a wafer-scale integration system



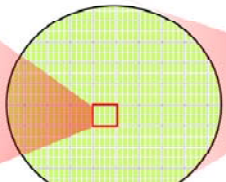
Neural Network Chip

- Conductance-based integrate-and-fire neuron model
- Low-power analog VLSI implementation
- 131,072 synapses, to up to 512 neurons
- ~10,000 x faster than biological real-time
- Built-in synaptic learning

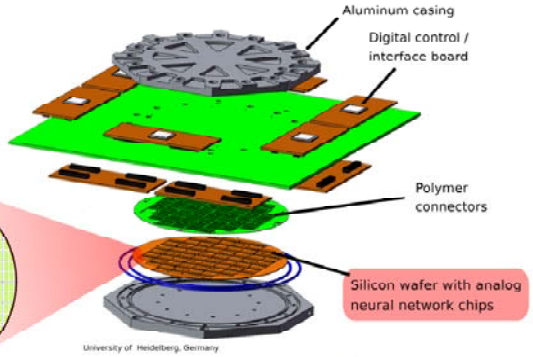


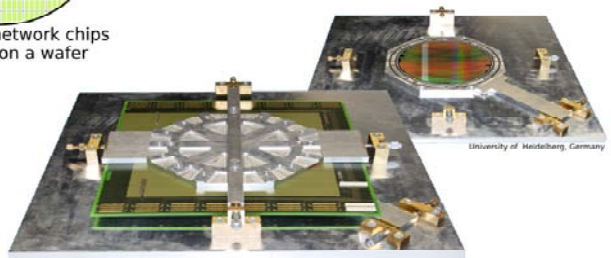
Wafer-Scale Integration

- 8 network chips per 20mm x 20mm reticle
- High-bandwidth connections between chips via parallel LVDS continuous-time bus system
- Signalling across reticle boundaries realized by separate **post-processing** metal layer



System Design





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