

10 provocative claims

- (1) Humans can recognise visual and auditory stimuli that they have not experienced for decades.
- (2) Recognition after very long delays is possible without ever reactivating the memory trace in the intervening period.
- (3) These very long term memories require an initial memorisation phase, during which memory strength increases roughly linearly with the number of présentations.
- (4) A few tens of presentations can be enough to form a memory that can last a lifetime.
- (5) Attention-related oscillatory brain activity can help store memories efficiently and rapidly.
- (6) Storing such very long-term memories involves the creation of highly selective "Grandmother Cells" that only fire if the original training stimulus is experienced again.
- (7) The neocortex contains large numbers of totally silent cells ("Neocortical Dark Matter") that constitute the long-term memory store.
- (8) Grandmother Cells can be produced using simple spiking neural network models with Spike-Time Dependent Plasticity (STDP) and competitive inhibitory lateral connections.
- (9) This selectivity only requires binary synaptic weights that are either "on" or "off", greatly simplifying the problem of maintaining the memory over long periods.
- (10) Artificial systems using memristor-like devices can implement the same principles, allowing the development of powerful new processing architectures that could replace conventional computing hardware.