## The concurrence of structure and function in developing networks: An explanation for synaptic pruning

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## Abstract

A fundamental question in neuroscience is how structure and function of neural systems are related. We study this interplay by combining a familiar auto-associative neural network with an evolving mechanism for the birth and death of synapses. A feedback loop then arises leading to two qualitatively different behaviours. In one, the network structure becomes heterogeneous and disasortative and the system displays good memory performance. In the other, the structure remains homogeneous and incapable of pattern retrieval. These findings are compatible with experimental results on early brain development, and provide an explanation for the existence of synaptic pruning. Other evolving networks – such as those of protein interaction – might share the basic ingredients for this feedback loop, and indeed many of their structural features are as predicted by our model.