

Visual Cortical Dynamics

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Vision is an active and dynamic process. The strategy our brain uses to parse scenes and recognize objects depends on our previous experiences. Our interpretation of visual scenes requires an interaction between internal representations of object properties acquired through experience and the immediate information coming from the retina. These internal representations enable the brain's analysis of scenes to be subject to top-down influences of attention, expectation, perceptual tasks, perceptual learning, working memory and motor commands. At the level of brain circuitry this process involves an interaction between long range and intrinsic cortical connections and causes neurons to act as adaptive processors that are able to assume different functional states according to the task being executed. Each cortical area represents an association field, whereby bits of information are dynamically linked via a plexus of long range horizontal connections. Although each neuron receives 10^5 inputs from other neurons, neurons are capable of selecting a small subset of task relevant inputs and suppressing the influence of task irrelevant inputs. The circuitry of the adult cortex therefore is under a continual long term process of modification as we assimilate new experiences, and short term dynamics as we analyze the constituents of visual scenes. These mechanisms are common to all regions of the brain, and when disrupted may account for behavioral disorders such as autism and schizophrenia.