

## Neural Foundation of Working Memory

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Working memory is the active, “on-line,” retention of information for a prospective action intended to solve a problem or to reach a goal. It is a form of sustained attention focused on an internal representation to be used in the near future. Working memory is essential for goal-directed behavior, speech, and reasoning. Electrophysiology in the primate – especially single-unit recording-- has established that working memory depends on the persistent activation of a network of widely distributed cortical neurons. That network is composed of smaller associative long-term memory networks (*cognits*) updated and modified for impending use. Posterior (parietal-temporal) networks represent perceptual memories; anterior (frontal) networks represent executive memories. Both posterior and frontal memories and their networks are hierarchically organized, from the simplest to the most complex, in progressively higher cortices of progressively more recent --phylogenetic and ontogenetic– development. In a goal-directed behavioral sequence, the organism dynamically interacts with the environment by way of a continuous and circular flow of information: the perception-action cycle. At peripheral levels, the cycle is closed through the environment by sensory receptors and motor effectors. At high levels of the nerve axis, the cycle is closed by connections between posterior (perceptual) and frontal (executive) cortical networks. Whenever there is a temporal discontinuity in the sequence, working memory closes the cycle by the sustained reciprocal activation of those networks, thus bridging the time gap. Functional imaging in the human and nonhuman primate highlights that activation at the top of the perception-action cycle.