Lecture presentation

Modules in molecular memory

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The cell-signaling and biochemical events in memory form an information-processing network to rival the neural circuits in which they are embedded. One of the first molecular modules to be identified was the NMDA receptor, as a key locus of synaptic associativity. In retrospect, this first module was uncharacteristically simple. Increasingly complex signaling models have since then investigated memory maintenance, trafficking of receptors, interactions between synapses, pattern selectivity, and many other functions or modules in synaptic memory. While this growing list is intimidating, I will attempt to make the case that we have a finite number of key modules to work out, and that the outlines of many of these are emerging. I will discuss our work on a new module, that of activity-dependent control of dendritic protein synthesis. While this may seem suspiciously close to cellular housekeeping, this module turns out to act as a hub for many kinds of neuronal signals in memory decisions. I will make so bold as to suggest that several of the hard circuit-level questions about memory may boil down to the computational functions of these molecular modules.