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Large-Scale Compartment Model of a Cerebellar Purkinje Cell. P.C. Bush and T.J. Sejnowski Salk Institute, La Jolla, CA 92037.

Cerebellar Purkinje cells have a variety of active conductances on both the soma and dendrites. These conductances produce a characteristic firing pattern in response to a depolarizing current pulse injected by a microelectrode at the soma. A computer model of a Purkinje cell has been constructed consisting of over 1000 compartments (Shelton 1986) and seven different conductance types. Instead of using Hodgkin-Huxley kinetics, a multivariable system difficult to apply in the absence of exact voltage-clamp data, we used a channel model based on Markov chain kinetics, a system with fewer variable parameters that is easy to understand and manipulate.

The model reproduced the firing pattern of real cells in response to current input as reported by Llinas *et al* (1980); A slow depolarization due to sodium and calcium plateau currents causes an accelerating train of sodium-dependent action potentials at the soma. A high-threshold calcium-dependent spike is triggered in the dendrites just at the point of inactivation of the sodium spike train. Voltage- and calcium-dependent potassium currents then produce a large hyperpolarization which reactivates the sodium spikes, allowing the cycle to begin again. This cyclical firing pattern has a period on the order of hundreds of milliseconds, whereas single synaptic potentials last only for tens of milliseconds. Trains of EPSP's are being modelled to establish roles for these conductances under physiological conditions.

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