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Interaction of Facilitation and Depression in Synaptic Transmission

We use experimental data to construct a simple model of stochastic vesicle release that includes facilitation, and we apply that model to study the interaction of facilitation and depression in synaptic transmission. Depending on parameters and on the rate of arrival of action potentials, we find that the model synapse can process signals in a variety of ways, and these will be discussed both from a linear, frequency-analysis viewpoint that requires consideration of small-amplitude modulation of a regular spike train, and also from a nonlinear perspective in which large-amplitude steplike changes in the rate of arrival of action potentials are considered. (Joint work with Calvin Zhang-Molina, University of Arizona.)