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RELIABILITY OF SPIKE INITIATION IN NEOCORTEX. Z.F. Mainen* and T.J. Sejnowski. Howard Hughes Medical Institute, Salk Institute, La Jolla, CA 92037.

Chemical and electrical signalling in the central nervous system appear remarkably variable, yet it is not known whether this variability carries meaningful information or simply reflects the intrinsic unreliability of underlying mechanisms. We have assessed the reliability of one process critical to neural signalling, the generation of action potentials. Whole-cell recordings were made from rat neocortical pyramidal cells *in vitro* and spikes were elicited by somatic current injection in the presence of synaptic transmission blockers (DNQX, AP5, BMI). Shown below are two examples of 10 consecutive responses (superimposed) to repetitions of identical stimuli (scale bars: 50 msec, 0.5 nA, 50 mV). A constant current step (0.2 nA) produced spike trains (f=11-12 Hz) with individual spike times that drifted from trial to trial (top). In contrast, repetition of a stimulus with transients resembling synaptic activity (filtered gaussian white noise, μ=0.2 nA, σ=0.05 nA) evoked trains (f=12 Hz) with highly consistent spike times (bottom). Our experiments suggest that spike generation is under some conditions an extremely reliable process able to faithfully translate an input signal into a sequence of nerve impulses, and that synaptic transients may enhance the fidelity of spike coding. (ZFM is an HHMI Predoctoral Fellow.)