1014-92-1362 **Brent Doiron*** (bdoiron@cns.nyu.edu), Center for Neural Science, Courant Institute of Mathematical Sciences, New York, NY 10003, **Alex Reyes**, Center for Neural Science, New York, NY 10003, and **John Rinzel**, Center for Neural Science, Courant Institute of Mathematical Sciences, New York, NY. *Finite size effects in feedforward neural networks.*

Cortical function requires channels over which to propagate signals between separate sub-regions. A simple framework to study signal propagation is a layered feedforward network of sparsely connected integrate-and-fire neurons. A common, but open, question within this system is: how do the firing statistics in the first layer shape the firing in subsequent layers? The population dynamics of each layer can be captured by an associated Fokker-Planck equation and the network is coupled via a second order mean field. Eigenfunction expansions of the Fokker-Planck system show, in the limit of infinite layer size, an asynchronous firing probability is a stable solution for all layers. Interestingly, this result does not match numerical and in vitro analogue simulations of feedforward systems, which are by necessity finite size systems. These networks show development with layer depth of a synchronous and oscillatory population firing. The discrepancy between the population density and simulations studies is due to finite size effects. We show that such effects can be included into the Fokker-Planck description which then leads to a stable synchronous population solution. These results impact the understanding of how real finite size networks propagate activity. (Received September 28, 2005)