



The University of Chicago  
Department of Statistics

Seminar Series

---

**ALEX REYES**

Center for Neural Science  
New York University

**Cellular Mechanisms Underlying  
Statistical Properties of Neural Networks**

**FRIDAY, December 3, 2010, at 12:00 PM**  
110 Eckhart Hall, 5734 S. University Avenue

**ABSTRACT**

Information about the external world is represented in the brain as electrical impulses, or action potentials, generated in ensembles of neurons. Neural networks typically contain many types of neurons, each of which may respond differently to the same stimulus. Since the ensemble encodes information, it is important to determine which aspects of population activity depend on the properties of individual neurons and conversely, which aspects are emergent properties of the network, independent of cell type. Using a combination of experiments and theoretical analyses, we uncovered two salient features of neural networks. First, the firing statistics of individual neurons are preserved in the population activity. This is in contrast to the common assumption that the firing properties of individual neurons become unimportant in the limit of large networks. Second, correlations in the activities of neurons increase in a non-trivial manner with the level of activity. The relation between correlation and firing rate is robust and applies generally to neural systems whose elements meet very minimal requirements. These results have important implications for interpreting neurophysiological data and for constructing biologically plausible coding schemes.

---

For further information and about building access for persons with disabilities, please contact Laura Rigazzi at 773.702.8333 or send email ([lrigazzi@galton.uchicago.edu](mailto:lrigazzi@galton.uchicago.edu)). If you wish to subscribe to our email list, please visit the following web site: <https://lists.uchicago.edu/web/info/statseminars>.