Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Rhythmogenic Neuronal Networks and k-Core Percolation DAVID SCHWAB, ROBIJN BRUINSMA, Department of Physics, UCLA, ALEX LEVINE, Department of Chemistry and Biochemistry, UCLA — The *preBötzinger Complex* (pBC) is a small ($\sim 10^2$) network of identical excitatory neurons that collectively generate a temporally stable pattern of firing bursts interspersed by quiescent periods. The voltage output of this system is essential to the control of the mammalian breathing rhythm under certain physiological conditions. The network is also remarkable in that a small set of coupled identical neurons can generate a collective behavior that is not inherent in any one of them: individual neurons do not exhibit rhythmic bursting. We develop a simple model of interacting excitatory neurons that demonstrates this behavior as one of its dynamical regimes, and show that while some of its dynamical transitions can be understood in terms of mean field theory, others cannot. The non-mean-field behavior can be understood in terms of purely topological properties of random networks.

David Schwab
Department of Physics, UCLA

Date submitted: 30 Nov 2008 Electronic form version 1.4