

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Emergent Criticality from Co-evolution in Random Boolean Networks¹ MIN LIU, KEVIN E. BASSLER, Department of Physics, University of Houston — The co-evolution of network topology and dynamics is studied in an evolutionary Boolean network model that is a “coarse-grained” model of a gene regulatory network. We find that a critical state emerges spontaneously from the interplay between topology and dynamics when the network is updated by a rule that rewires its internal connections based on the activities of nodes and changes the dynamical functions. The final evolved state is shown to be critical and independent of initial conditions. The network appears to be driven to a random Boolean network with uniform in-degree of 2 in the large network limit. However, for biologically realized network sizes, significant finite-size effects are observed including a broad in-degree distribution and an average in-degree connection between 2 and 3. These results may be important for explaining the formation of heterogeneous topology in real gene regulatory networks. Detailed work is discussed in the paper Phys. Rev. E **74**, 041910 (2006).

¹Acknowledge the support by NSF Grant No. DMR-0427538. Min Liu is thankful for Santa Fe Institute 2005 Complex Systems Summer School.

Bogdan Danila
The University of Houston

Date submitted: 17 Nov 2006

Electronic form version 1.4