Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Hierarchical, 4-connected Small-World Graph[1] BRUNO GONCALVES, STEFAN BOETTCHER, Emory University — A new sequences of graphs are introduced that mimic small-world properties. The graphs are recursively constructed but retain a fixed, regular degree. They consist of a one-dimensional lattice backbone overlayed by a hierarchical sequence of long-distance links in a pattern reminiscent of the tower-of-hanoi sequence. These 4-regular graphs are non-planar, have a diameter growing as $2^{\sqrt{\log_2 N^2}}$ (or as $[\log_2 N]^\alpha$ with $\alpha \sim \sqrt{\log_2 N^2}/\log_2 \log_2 N^2$), and a nontrivial phase transition $T_c > 0$, for the Ising ferromagnet. These results suggest that these graphs are similar to small-world graphs with mean-field-like properties.

[1]Division of Materials Research at the NSF, grant #0312150

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Date submitted: 04 Dec 2007 Electronic form version 1.4