Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Monte-Carlo Simulation of a Simple Biopolymer Growth Model
JENNY SON, G. ORKOULAS, University of California, Los Angeles, A. KOLOMEISKY, Rice University — Rigid biopolymers, such as actin filaments, microtubules and intermediate filaments, are vital components of the cytoskeleton and the cellular environment. Understanding biopolymer growth dynamics is essential for the description of the mechanisms and principles of cellular functions. These biopolymers are composed of N parallel protofilaments which are shifted at arbitrary distances, giving rise to complex end structures. In this work, we investigate simple biopolymer growth models by Monte Carlo simulations that include the effects of such "end properties" and lateral interactions. The simulations reproduce the theoretical predictions for the simple N=2 model. For the biologically relevant case of N=13, we have found that the simulation results approach the approximate model predictions. The simulations indicate that polymerization events are evenly distributed among N protofilaments, which implies that both end structure effects and lateral interactions are significant.

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Date submitted: 03 Dec 2004 Electronic form version 1.4