MAR11-2010-008655

Abstract for an Invited Paper
for the MAR11 Meeting of
the American Physical Society

**Sensitive Dependence on Network Structure**

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Much of the recent research in complex networks has been focused on establishing relations between network structure and dynamics and on exploiting these relations to optimize network processes. Using diffusion, consensus, and synchronization dynamics as model processes of broad significance, I will show that optimization can often lead to sensitive dependence of the dynamics on the structure of the network. This sensitivity, which is characterized by cuspy or discontinuous dependence of the fitness function on network structural parameters, is shown to be determined by transitions in the complement graph that are reminiscent of explosive percolation. I will also discuss the prevalence of sensitive dependence. I will argue that this phenomenon is not limited to optimized systems, and may in fact be observed under rather general conditions in systems as diverse as power-grid and laser networks. This phenomenon sets experimental limits but also leads to improved controllability, in which the dynamics can be enhanced by exploiting antagonistic interactions between different fitness-inhibiting network structures.