

Abstract Submitted  
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**Understanding ecosystems using statistical physics** IGOR VOLKOV, Penn State, JAYANTH BANAVAR COLLABORATION, STEVE HUBBELL COLLABORATION, AMOS MARITAN COLLABORATION — I will show, based on analytic theory and computer simulations, that ecosystems are organized in the vicinity of a new type of phase transition quite akin to Bose-Einstein condensation but occurring in a living system without quantum features. A special case of our model is akin to neutral theory, which postulates that an ecosystem can be characterized by random birth and death processes influenced by immigration and speciation with the further simplifying assumption that all species behave similarly in terms of their birth and death rates. I will present a theoretical framework for the neutral theory of biodiversity and an analytical solution for the distribution of the species composition both for a large metacommunity and for a semi-isolated local community. I will demonstrate that the analytical solution provides an excellent fit to field data. I. Volkov, J. R. Banavar, S. P. Hubbell and A. Maritan, Neutral theory and relative species abundance in ecology, *Nature* 424, 1035, (2003). I. Volkov, J. R. Banavar and A. Maritan, Organization of ecosystems in the vicinity of a novel phase transition, *Phys. Rev. Lett.* 92, 218703, (2004).

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