Physics
AT QUEENS COLLEGE

Colloquium Notice

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Critical phenomena and biological networks

Most of the interesting phenomena of life emerge from interactions among a large network of more basic units: interactions among amino acids stabilize the structure of proteins, interactions among genes define the states of our cells, interactions among neurons determine our thoughts, and interactions among groups of organisms are responsible for beautiful schools of fish or flocks of birds. For decades, physicists have hoped that these emergent biological phenomena could be described using the ideas of statistical mechanics, but the models that emerged from this work often have been a bit abstract, not so well connected to what can be measured. Recently it has been suggested that one can actually construct statistical mechanics models directly from data on these complex systems, using the idea of maximum entropy. I'll explain how this works, illustrate some of the surprising successes of this approach, and then outline the most surprising development that has come out of this work: many different biological networks seemed to be poised near a critical point in their parameter space. Examples will be drawn from protein molecules, neural circuits, and flocks of birds, and I will point to emerging experiments that will test these ideas much more clearly. I also hope to convey the fun of connecting theory and experiment, physics and biology.

Monday
September 20, 2010
Starts at **12:00 pm**
Coffee at **11:45 am**
Physics Conference Room, SB B326