

RISE Biomedical and Biobehavioral Research Colloquia

"Combinatorial Complexity in Systems Biology"



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Abstract

The past decades have brought into view a staggering web of protein-protein interactions that collectively give rise to plastic, adaptive and coherent system behavior. What startles about these networks is their combinatorial complexity, which hinges on post-translational modifications, assembly into noncovalent complexes and independent local interactions. Combinatorial systems that are marked by extensive pleiotropy (meaning that a given protein participates in many different complexes) and conflict (meaning that many proteins compete for the same binding site) can exhibit dynamic phenomena that are at times counterintuitive, such as assembly logjams, and at times thought-provoking, such as compositional drift. I will discuss a few themes emerging from glimpses at this vast and barely explored territory, while sketching the computational framework that made those glimpses possible. At the end of the day, combinatorial complexity may cause network "fluidity" and pervasive process interference, suggesting a view of the cell that may not always be aligned with a wide-spread engineering metaphor based on sharply defined circuits.

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