EMERGENCE OF MODULARITY IN BIOLOGY. M. W. Deem[1], [1]Departments of Bioengineering and Physics & Astrononmy, Rice University, 6100 Main St, MS 142, Houston, TX, mwdeem@rice.edu.

Introduction: I will discuss the emergence of modularity in examples from the natural world. Dynamical systems typically evolve in a changing environment, and I will show that the level of modularity correlates with the rapidity and severity of environmental change [1-4]. Emergence of modularity is driven by noise in the environment and is facilitated by horizontal gene transfer [5]. This mechanism is evident in a number of systems, from viruses and bacteria to development and physiology. Bacterial metabolic networks show increasing modularity as the physical environment or horizontal gene transfer rate increases, and experimental protein interaction data shows that protein networks have become increasingly modular over the last four billion years. More recently, modularity provides early warnings in the evolution of influenza flu strains and in heart rate anomalies in physiology. I will describe a principle of least action that governs the emergence of modularity in certain limits [6].

References:

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