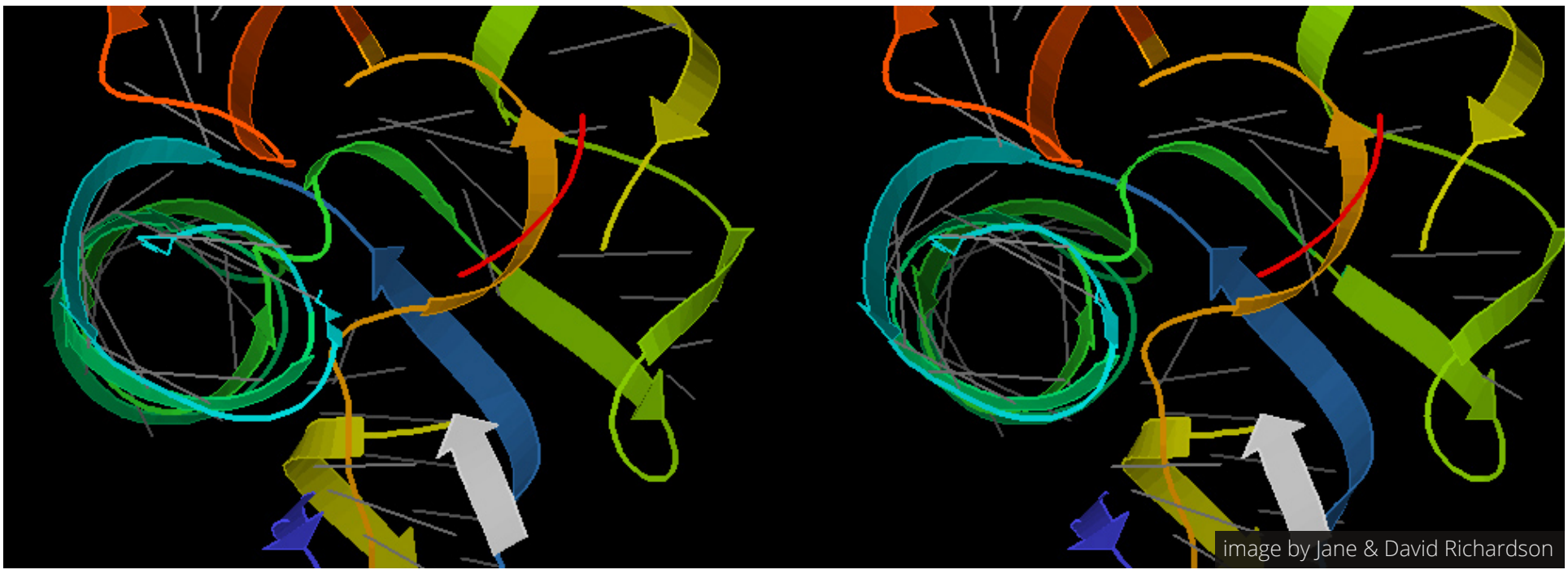
Boston University Physics Colloquium



Statistical Mechanics of the Genetic Code: A Glimpse of Early Life?

Relics of early life, preceding even the last universal common ancestor of all life on Earth, are present in the structure of the modern day canonical genetic code—the map between DNA sequence and amino acids that form proteins. The code is not random, as often assumed, but instead is now known to have certain error minimisation properties. How could such a code evolve, when it would seem that mutations to the code itself would cause the wrong proteins to be translated, thus killing the organism? Using digital life simulations, I show how a unique and optimal genetic code can emerge over evolutionary time, but only if horizontal gene transfer—a network effect—was a much stronger characteristic of early life than it is now. These results suggest a natural scenario in which evolution exhibits three distinct dynamical regimes, differentiated respectively by the way in which information flow, genetic novelty and complexity emerge. Possible observational signatures of these predictions are discussed.

Nigel Goldenfeld

University of Illinois, Urbana-Champaign

February 11, 2014 (Tuesday) at 3:30pm (Refreshments at 3:00pm)

SCI 109, Metcalf Science Center, Boston University

Call: Winna Somers (wsomers@bu.edu) (617) 353-9320

Host: David Campbell