# PHYSICS 756 - **Special Topics in Biophysics**

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Winter 2013: Mon and Wed 10.30-12.00 ABB272 - First Lecture - Mon 7th Jan

This course will emphasize the links between statistical physics and biology, focusing on the design and use of computational models. Students will write their own programs to simulate models from the literature or of their own design. Previous programming experience is not required, although a willingness to learn scientific programming methods is essential.
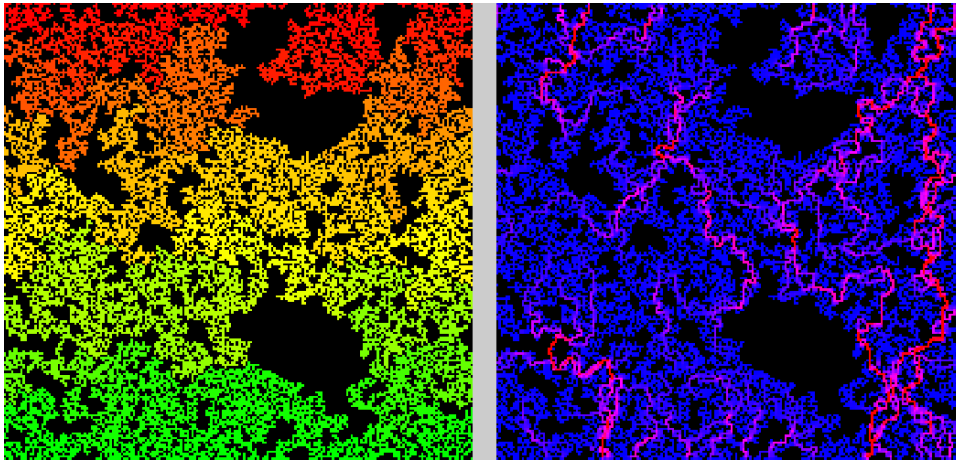
Lecture Contents
1. **Percolation, Graphs and Networks** - Percolation as a phase transition (application to gelation and conductivity in physics). Random graphs (clusters, cycles etc). Small world and scale free networks (applications to social networks, metabolism).
2. **Fractal Growth** - Crystal growth, diffusion limited aggregation, bacterial colony growth
3. **Evolutionary Dynamics** - Mutation, selection and drift in molecular evolution. Relationship between diffusion in physics and population genetics. Quasispecies theory for virus evolution.
4. **Evolutionary game theory** - Evolutionarily stable strategies. Prisoners' dilemma and the Evolution of Cooperation. Spatial games.
5. **The Origin of Life** - Autocatalytic reaction systems. Origin of autocatalytic networks. Cooperation at the Molecular Level.