

PHYS847/492 Possible Projects:

1. Origin of genetic code. Why are there 4 letters?
 2. RNA folding landscape – neutral evolution studies.
 3. Protein folding: lattice models – kinetics of folding.
 4. Biopolymer mechanics – actin networks
 5. Molecular motors – Feynman ratchets
 6. Membrane biophysics – what limits on cell shape and size?
 7. Molecular mechanism of hearing
 8. Analyze a set of micro-array data. Classification and prediction.
 9. Machine learning applied to biological data
 10. Scaling laws in biology. Limits on animal size, metabolism, etc.
 11. Network analysis – graph classification and network generation models.
 12. Boolean nets applied to biological networks – when are they appropriate?
 13. Noise in biochemical networks – what mechanisms limit it? Is it ever useful?
 14. Olfaction? What is the combinatorial code for smell?
 15. Synthetic biology: design your own biological circuitry for a given task. iGEM – Genetically Engineered Machines competition @ MIT.
 16. Physical models for transcriptional logic and gene expression
 17. Pattern formation in biological system – cell signaling and fate decisions
 18. Neural networks. What is memory? Models for cognition. Image processing.
 19. Ion channels. Physics of charge flow through pores.
 20. Digital organisms. Cellular automata
- And a tonne more