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# Network Biology

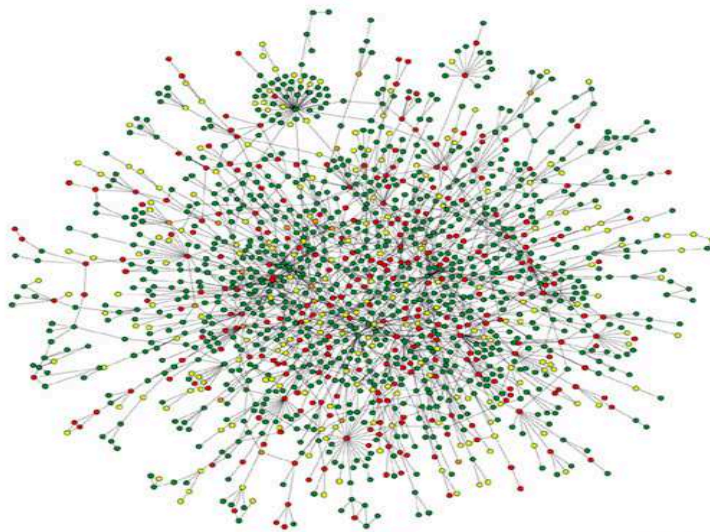
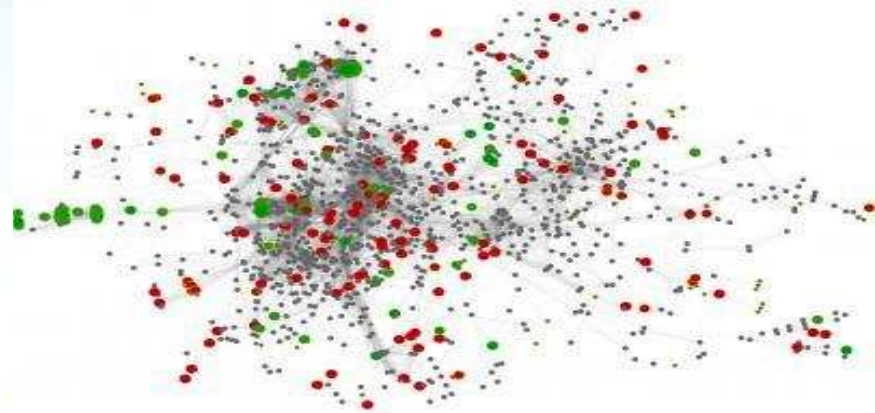
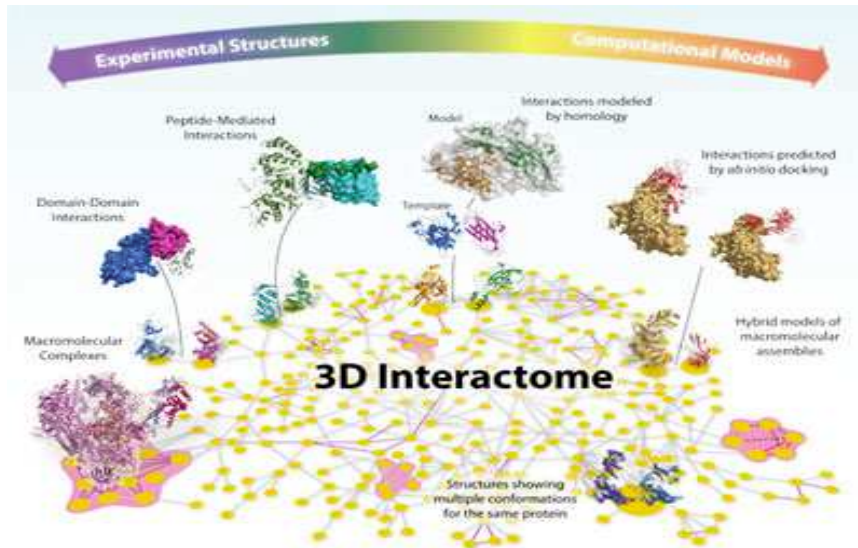
BCH 5101: Analysis of -Omics Data  
March 12, 2014

Theodore J. Perkins

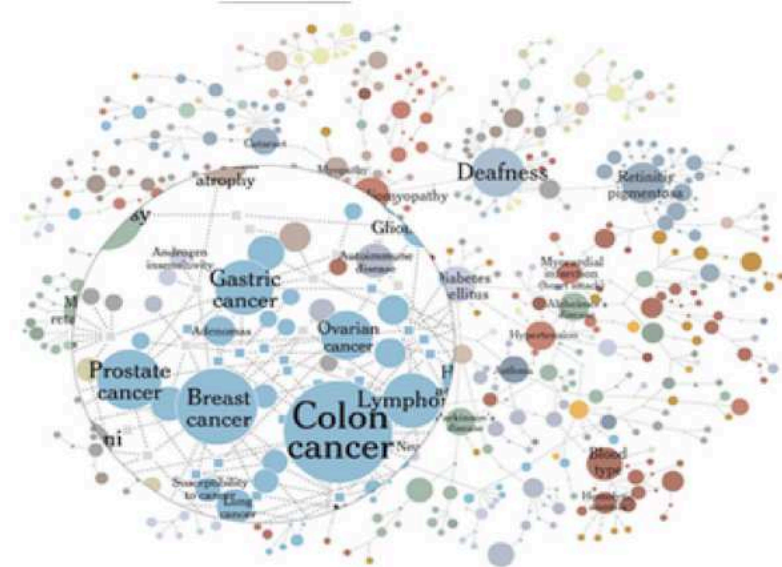
[www.perkinslab.ca](http://www.perkinslab.ca)

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# Why networks?



Nature Reviews | Genetics



# Why networks?

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- No biological entity—a gene, a protein, a complex, an RNA, a  $\mu$ RNA, a genome, a cell, a tissue, a species, etc.—acts in a vacuum.
- The function of biological entities can only be understood when considered in context
- Networks represent the context of an entity, its interactions, and potentially, its dynamics
- Networks are visualizable
- They represent a system at a level of abstract that facilitates reasoning and analysis

# Overview

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- Some kinds of networks we can study using -omics methods
- Biotechnologies that allow us to “measure” networks
  - Genome sequencing, Microarray expression, ChIP-chip, ChIP-seq, Yeast 1 & 2 hybrid methods, Mass spectrometry
- Estimating networks based on expression data
  - Correlation & mutual information networks, Epistatic analysis/networks, Bayesian networks
- Network analysis
  - Genome-scale networks, scale-free networks, network models, network motifs