

Development of robust methods
to identify common regulatory
factors between pathways or
networks and elucidate pathway
interactions and modulations

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Questions

- How can genomics help us move from information about components in individual pathways to discover additional constituents of related networks, or common regulators?
- How can we identify coordinately-controlled networks, or optimize desired metabolic outputs under specific conditions?

You saw the following talks:

- Michael Laub – protein phosphorylation
- Lucy Shapiro – cell cycle and regulation
- Andrew Emili – functional proteomics
- David Hill - interactome
- Tim Gardner – transcription and metabolic networks

Why should we care?

- Basic science
 - Organism-organism interactions and interactions of organisms with their environment
 - Stress response
 - Cell cycle
- Production of metabolites
 - Makes pathway regulation difficult
 - Reduces product formation
 - Understanding interactions could improve product titers/yields

Discovery

- Bioinformatics
 - Sequence homology
 - Network learning approach
 - Metabolic modeling?
- Experimental methods
 - Omics
 - Transcript profiling
 - E.g., Lucy Shapiro's array work on cell cycle
 - E.g., Tim Gardner's work on *E. coli*
 - Protein profiling
 - Metabolite profiling

Discovery

- Experimental methods (continued)
 - Protein-DNA interactions
 - DNA footprinting
 - Chromosome Immuno-Precipitation (ChIP)
 - Protein-protein interactions
 - Protein tagging with fluorescent proteins
 - Protein complex pull downs (TAP tags)
 - Knock-outs and overexpression
 - Protein phosphorylation
 - Two-hybrid

Missing data/methods important for metabolic engineering

- Methods have been developed for deducing protein-protein interactions, protein-DNA interactions, etc.
 - Little information on interactions of proteins in metabolic pathways
- Few methods for protein-metabolite interactions, which may be the most important for regulating metabolism.
 - How would you deduce these interactions in high throughput ... or even in low throughput?

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