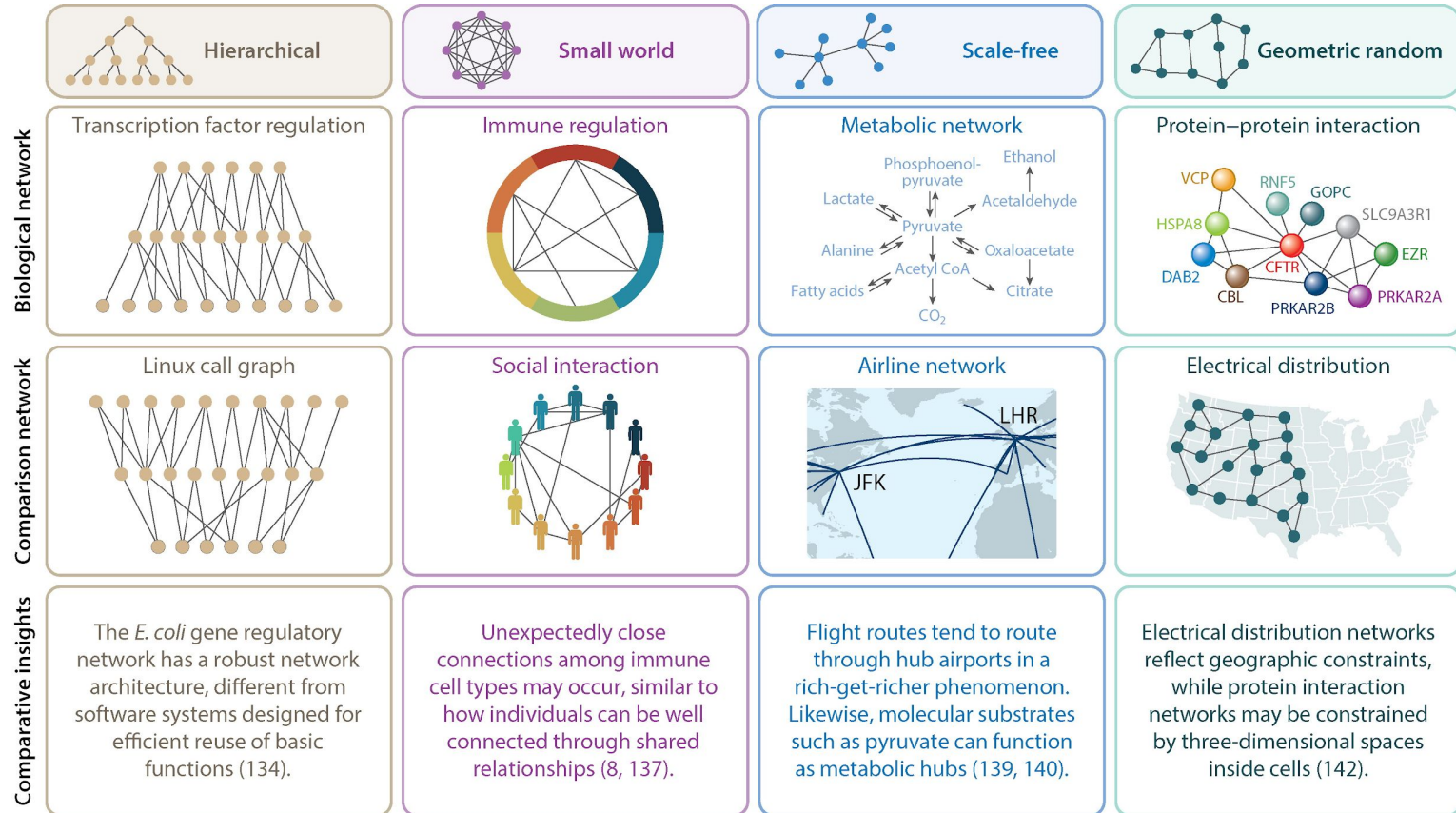


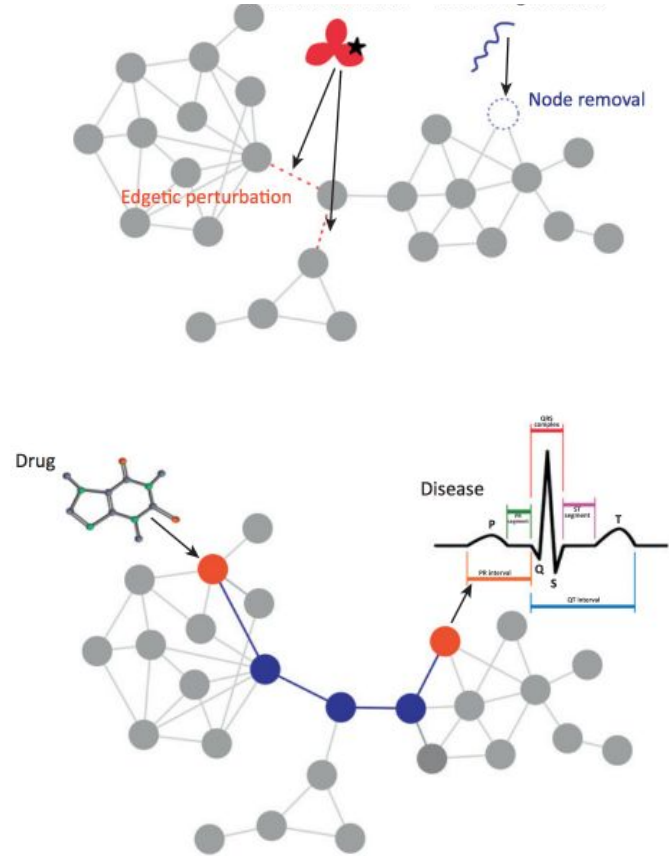
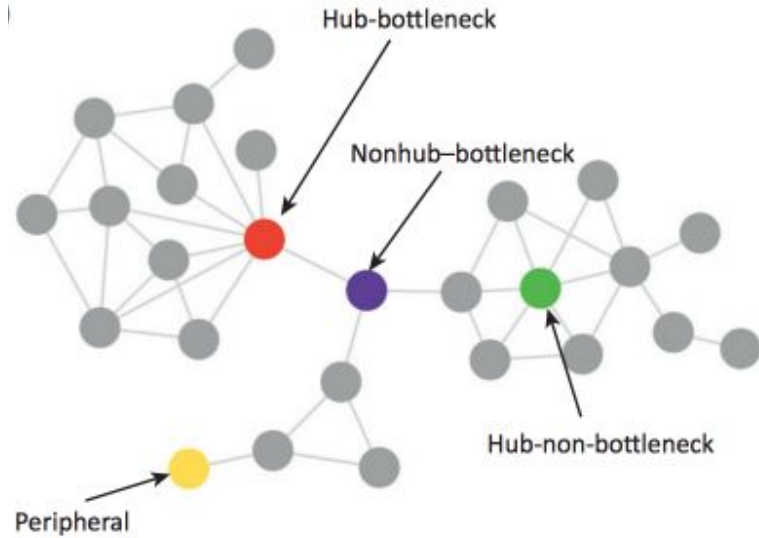
Week 15: Large-scale biological networks

- Network topology
- Network motifs
- Condition-specific networks
- Network reconstruction
- Network propagation

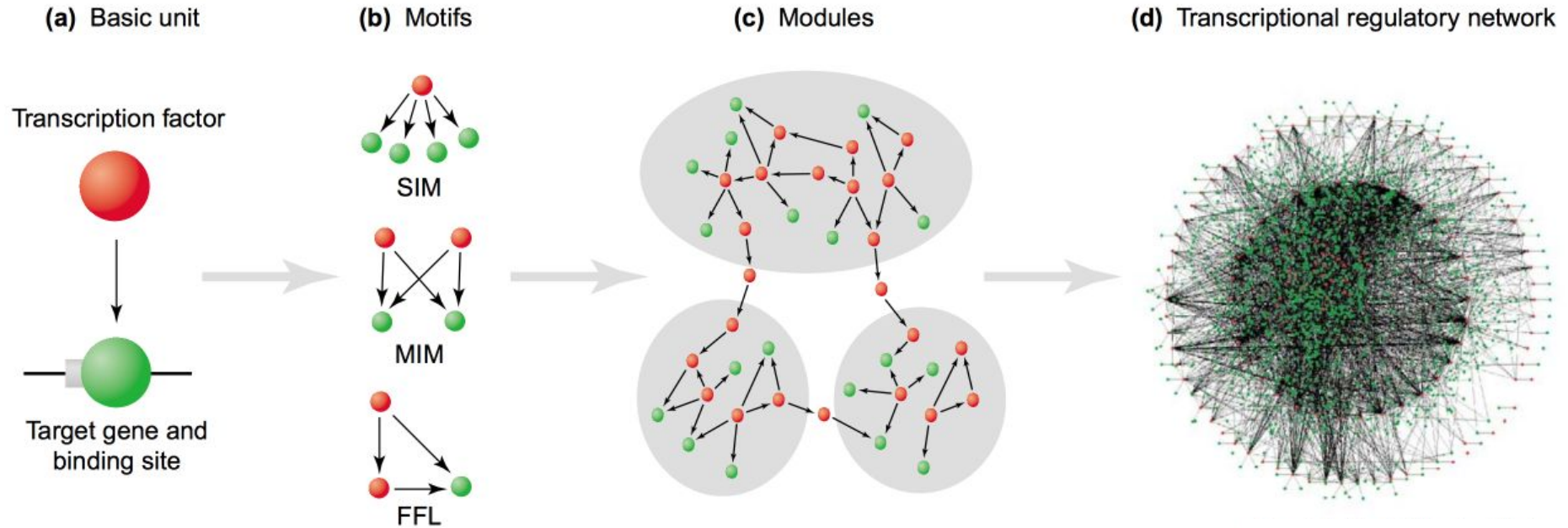
Network topology



Network topology

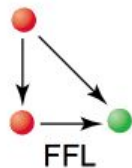
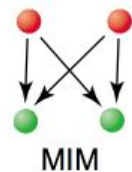
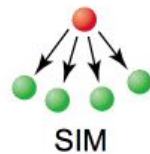


Network motifs

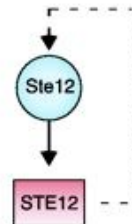


Network motifs

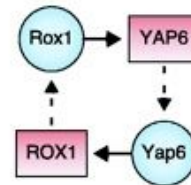
(b) Motifs



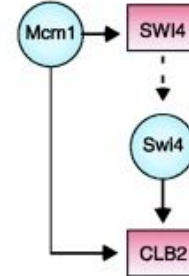
Autoregulation



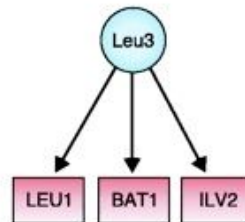
Multi-Component Loop



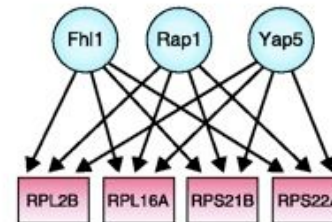
Feedforward Loop



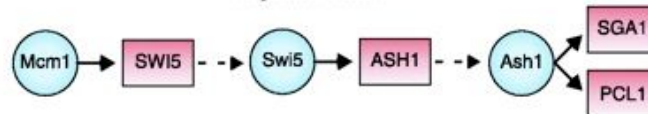
Single Input Motif



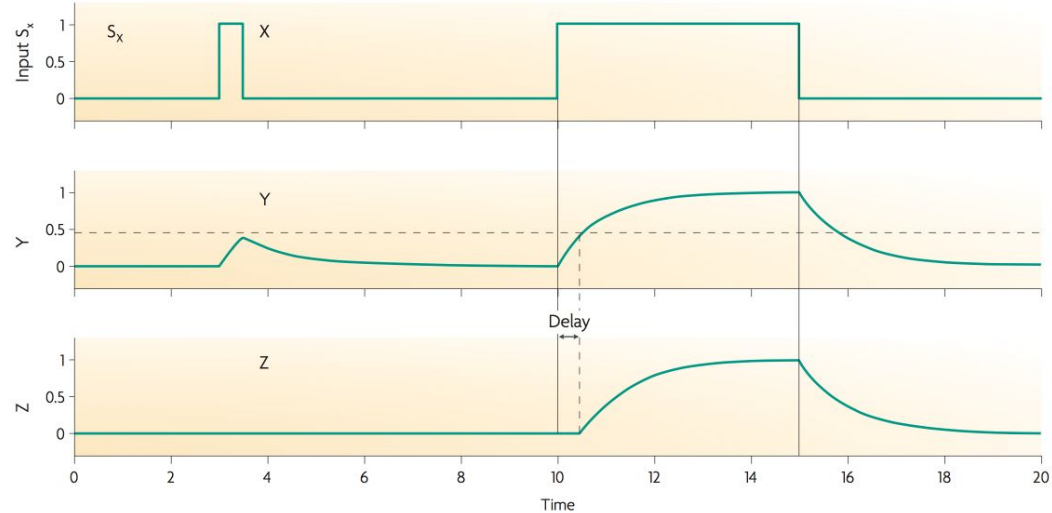
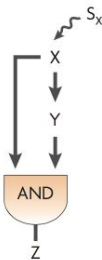
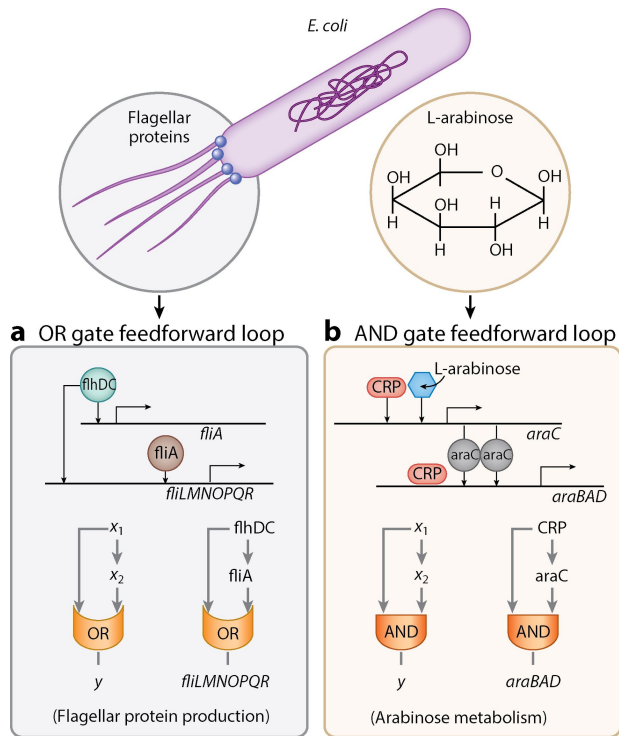
Multi-Input Motif



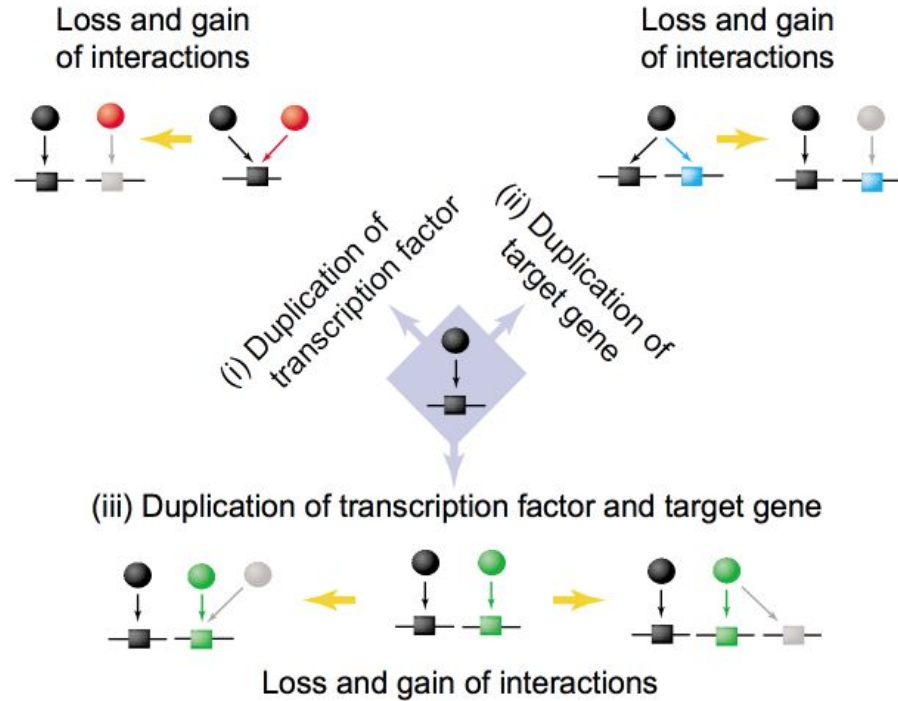
Regulator Chain



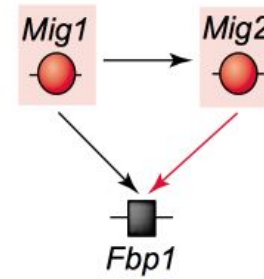
Network motifs



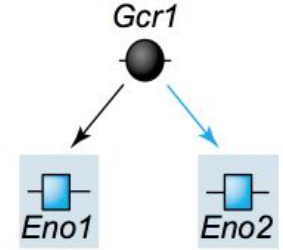
Network interactions evolve through time



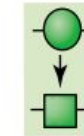
(i) Duplication of transcription factor



(ii) Duplication of target gene



Aro80



Aro9

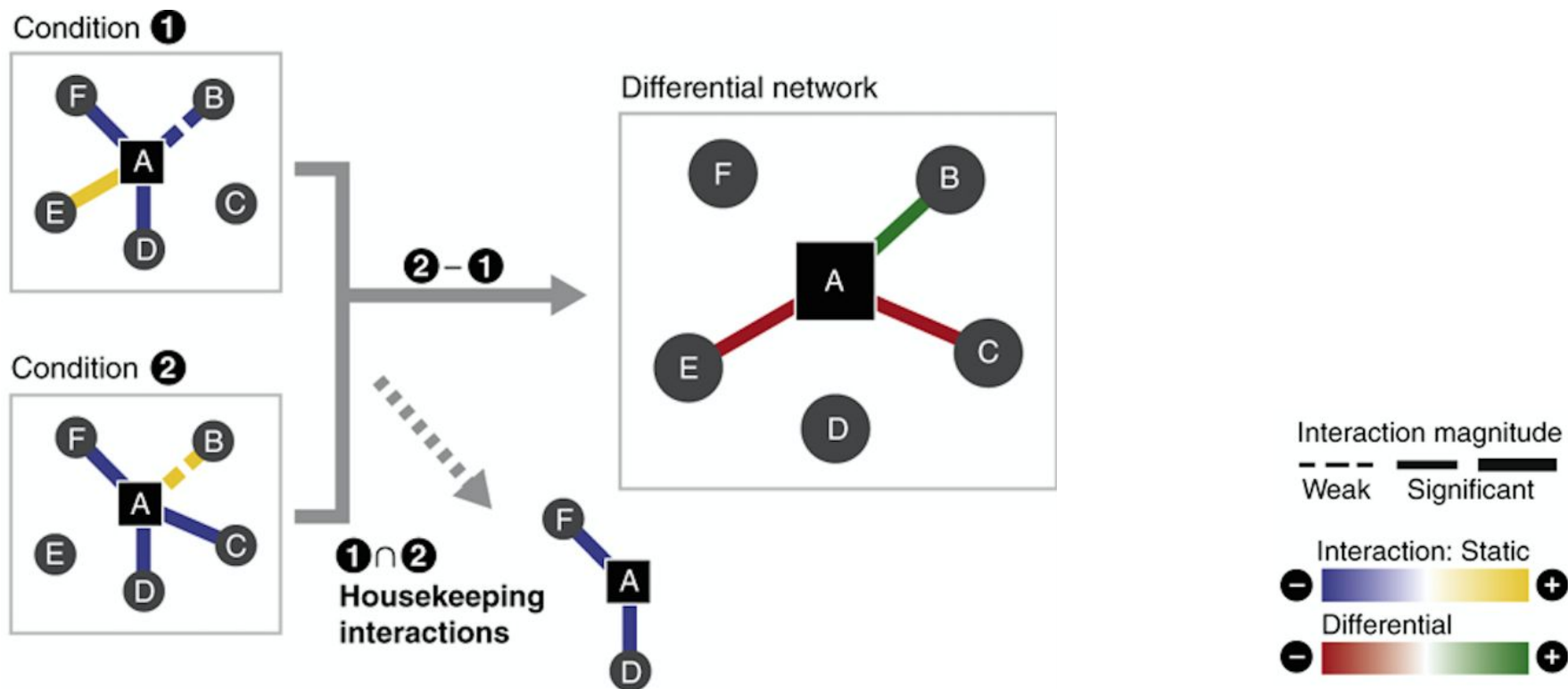
Dal81



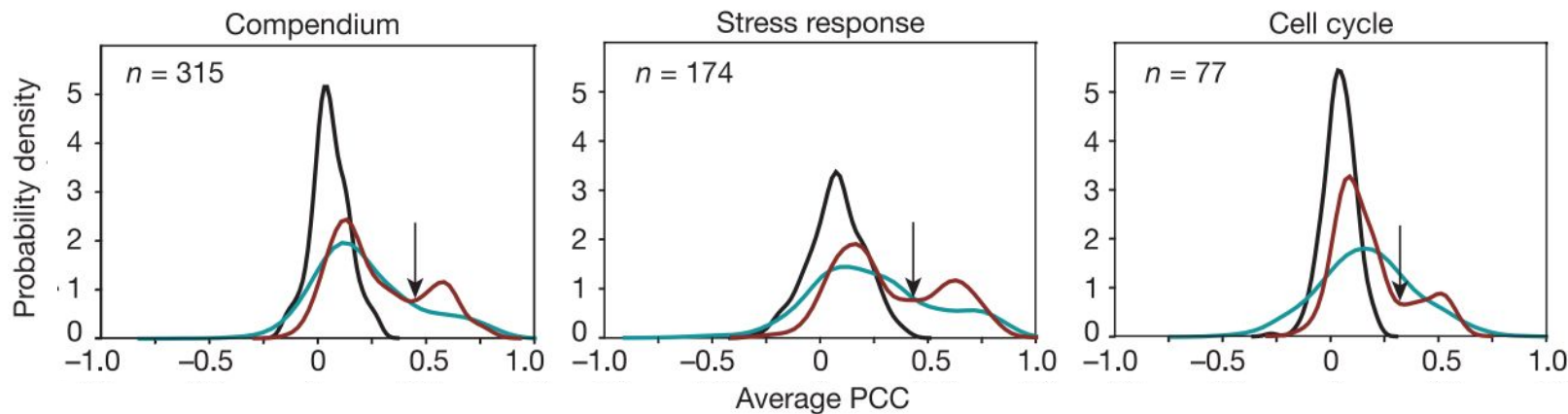
Uga1

(iii) Duplication of transcription factor and target gene

Network interactions are condition-specific



Network interactions are condition-specific

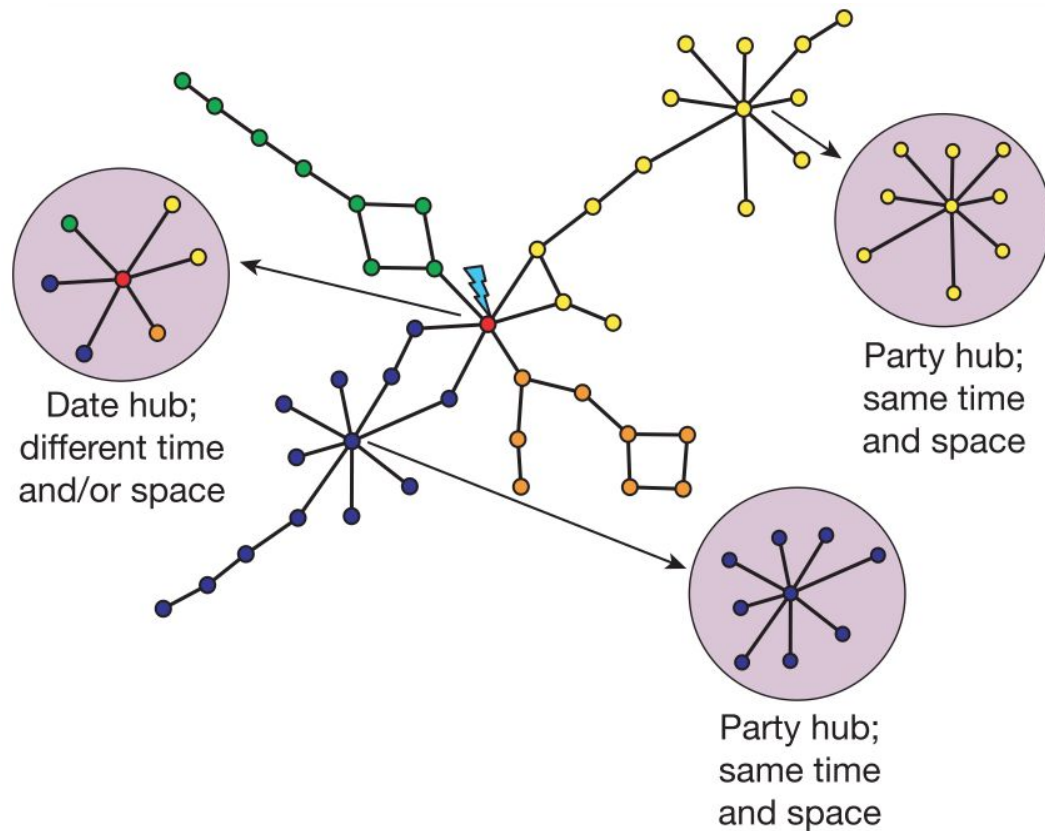


Red: Hub proteins

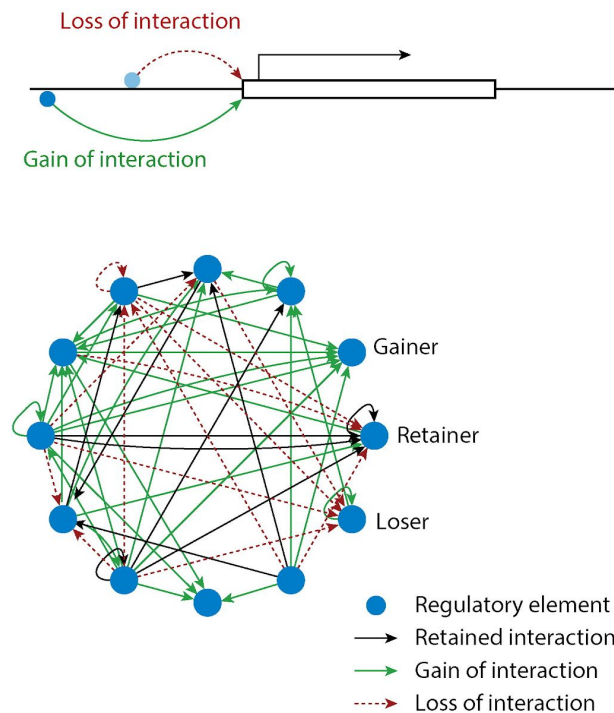
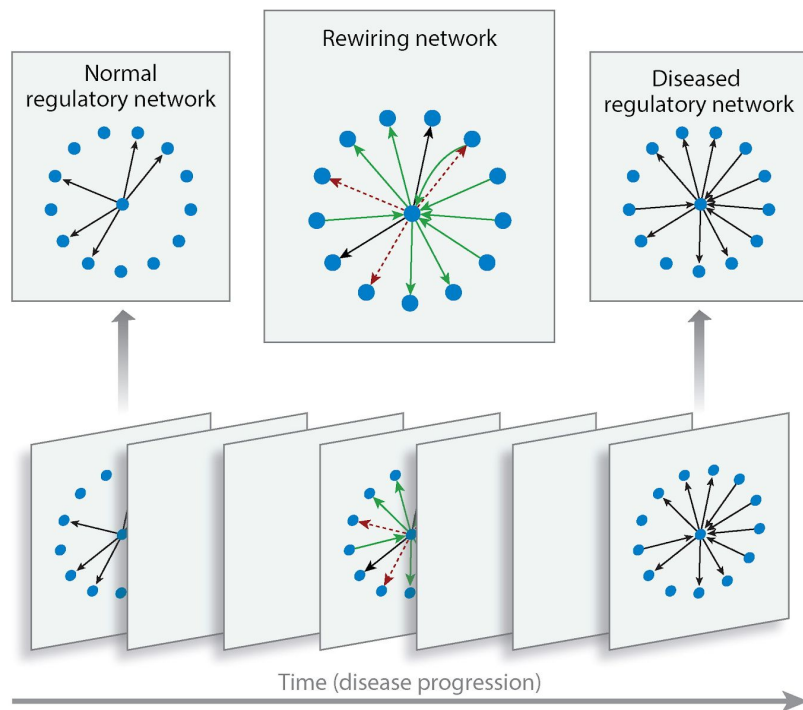
Cyan: Non-hub proteins

Black: Hubs in randomized networks

Network interactions are condition-specific

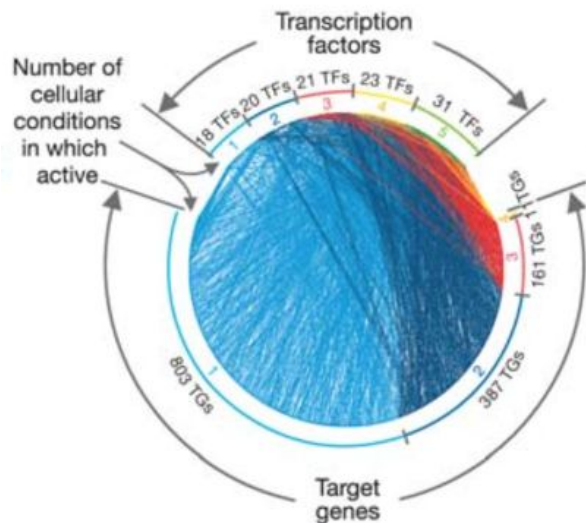


Network interactions are condition-specific



Network interactions are condition-specific

Static



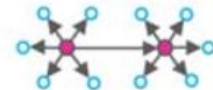
Endogenous

- Complex transcription factor combinations
- Few targets per transcription factor
- Long path lengths
- Highly inter-connected transcription factors
- Many feed-forward loops

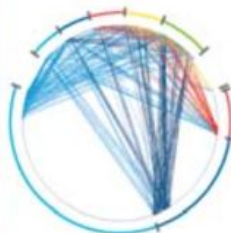


Exogenous

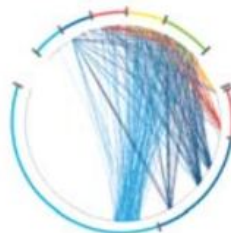
- Simple transcription factor combinations
- Many targets per transcription factor
- Short path lengths
- Few inter-connected transcription factors
- Many single input motifs



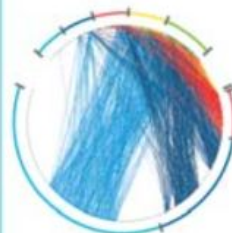
Cell cycle



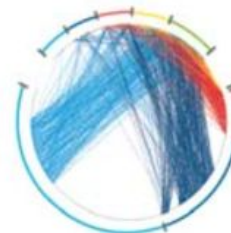
Sporulation



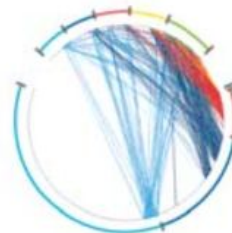
Diauxic shift



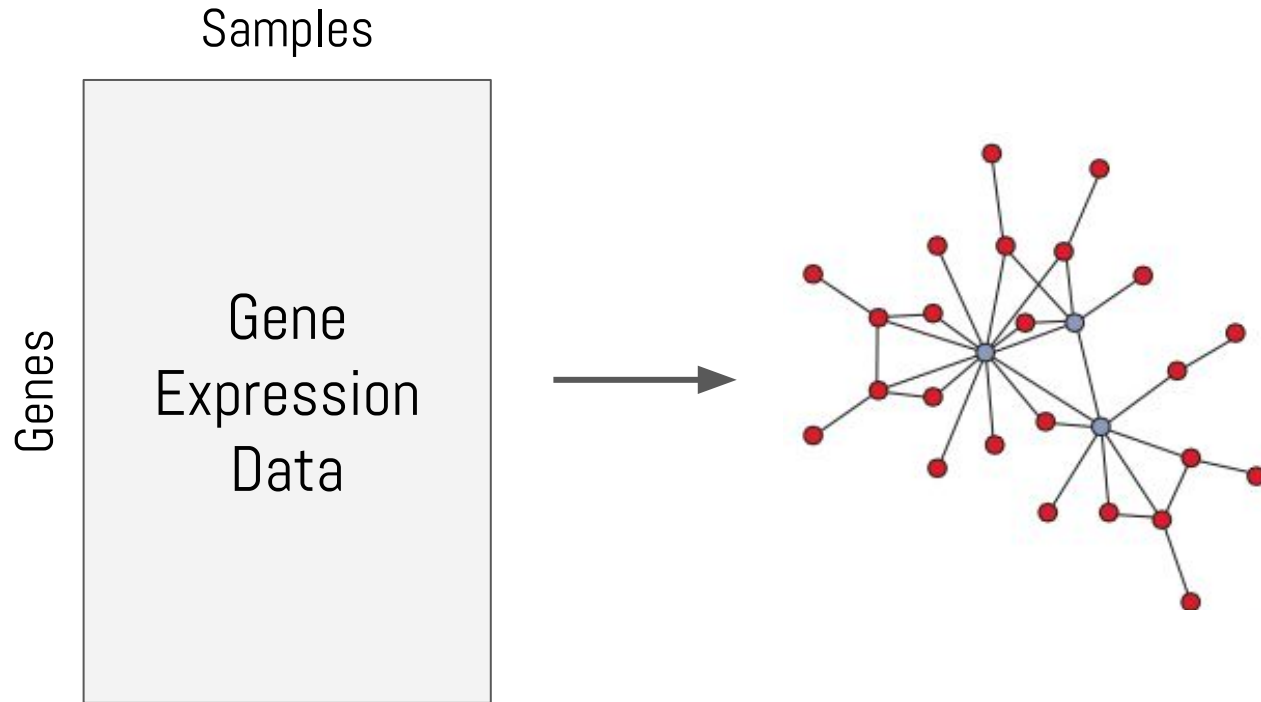
DNA damage



Stress response

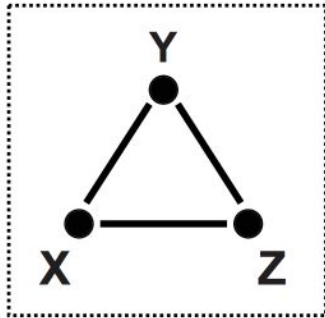


Reconstructing networks from observational data



Reconstructing networks from observational data

Coexpression



Regulatory network

