

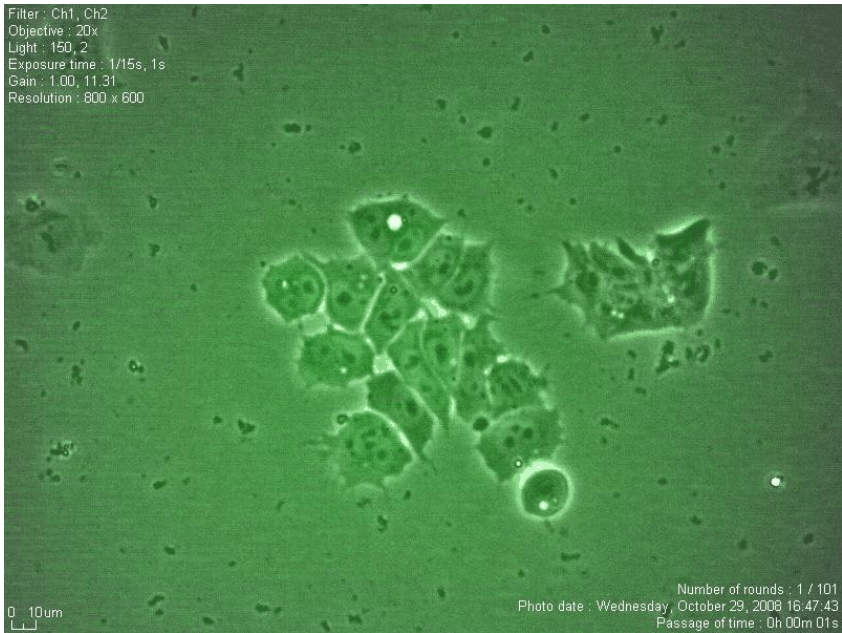


Universitat
Pompeu Fabra
Barcelona

Systems & Network Biology Networks

Jordi Garcia Ojalvo
Keith Kennedy

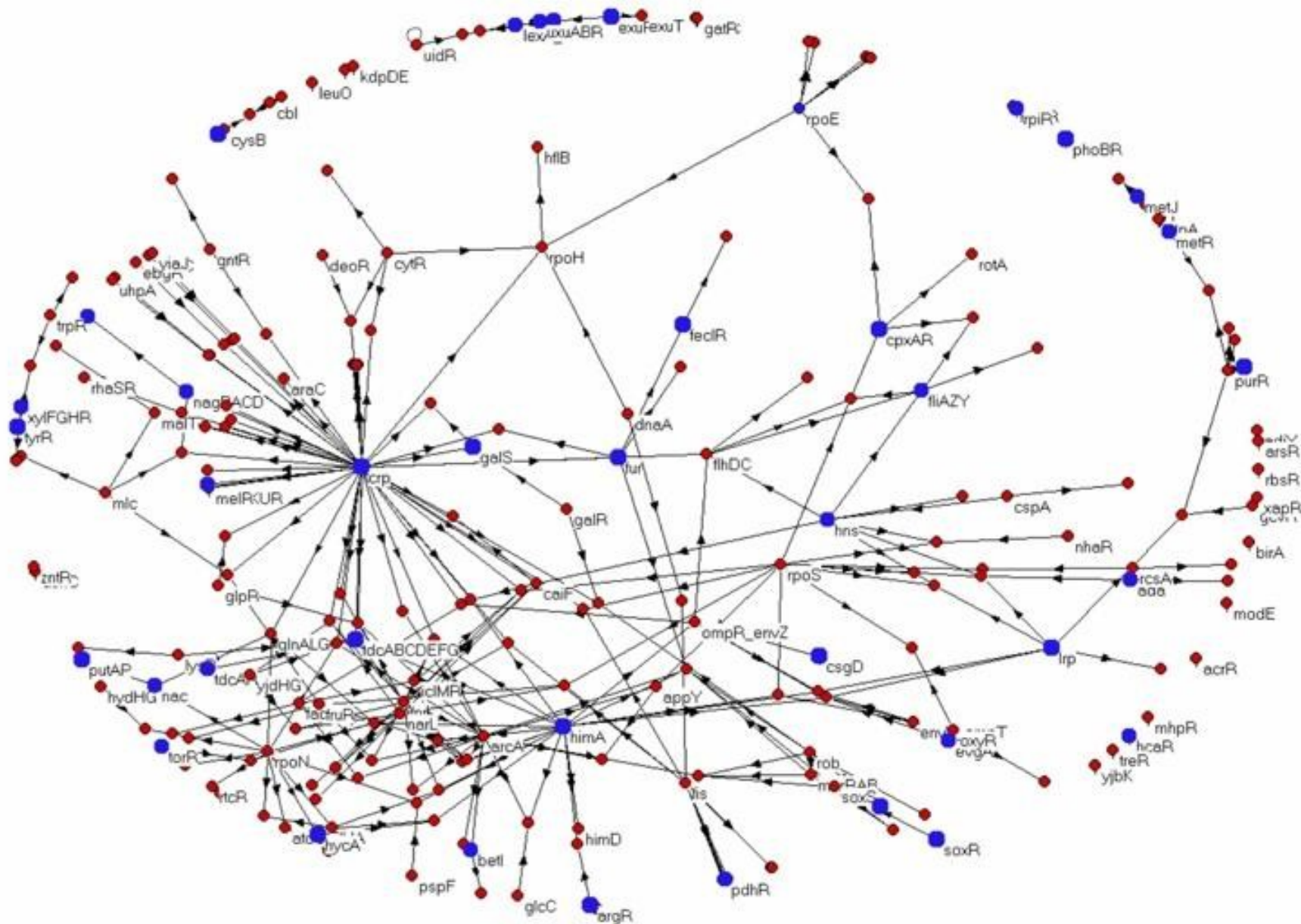
Department of Experimental and Health Sciences
Universitat Pompeu Fabra



Dynamics of Nanog in embryonic stem cells

Kalmar et al, PLoS Biol 7, e1000149 (2009)

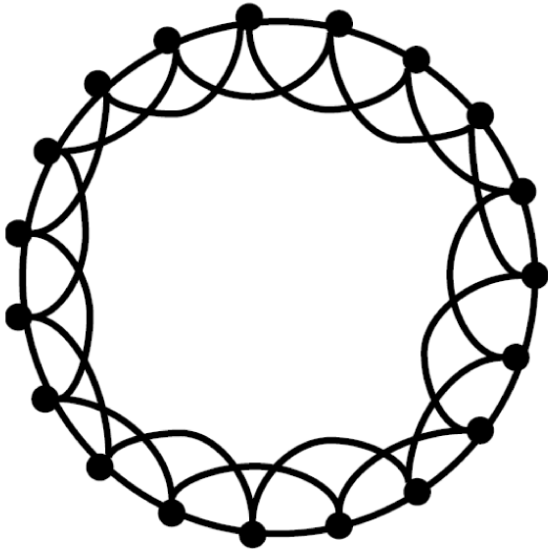
Dynamics of Nanog in embryonic stem cells



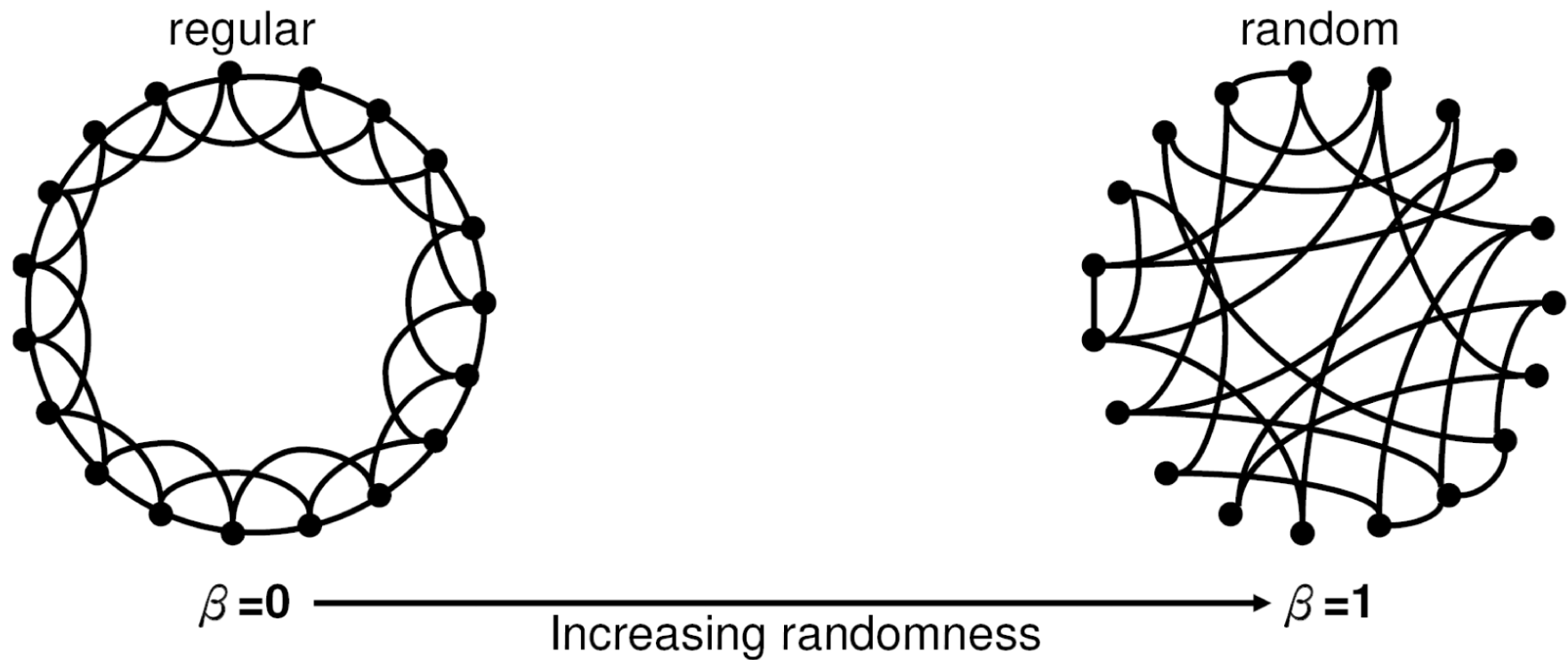
Siming Li et al, Science 23 January 2004: **303** (5657), 540-543

From regular to random networks

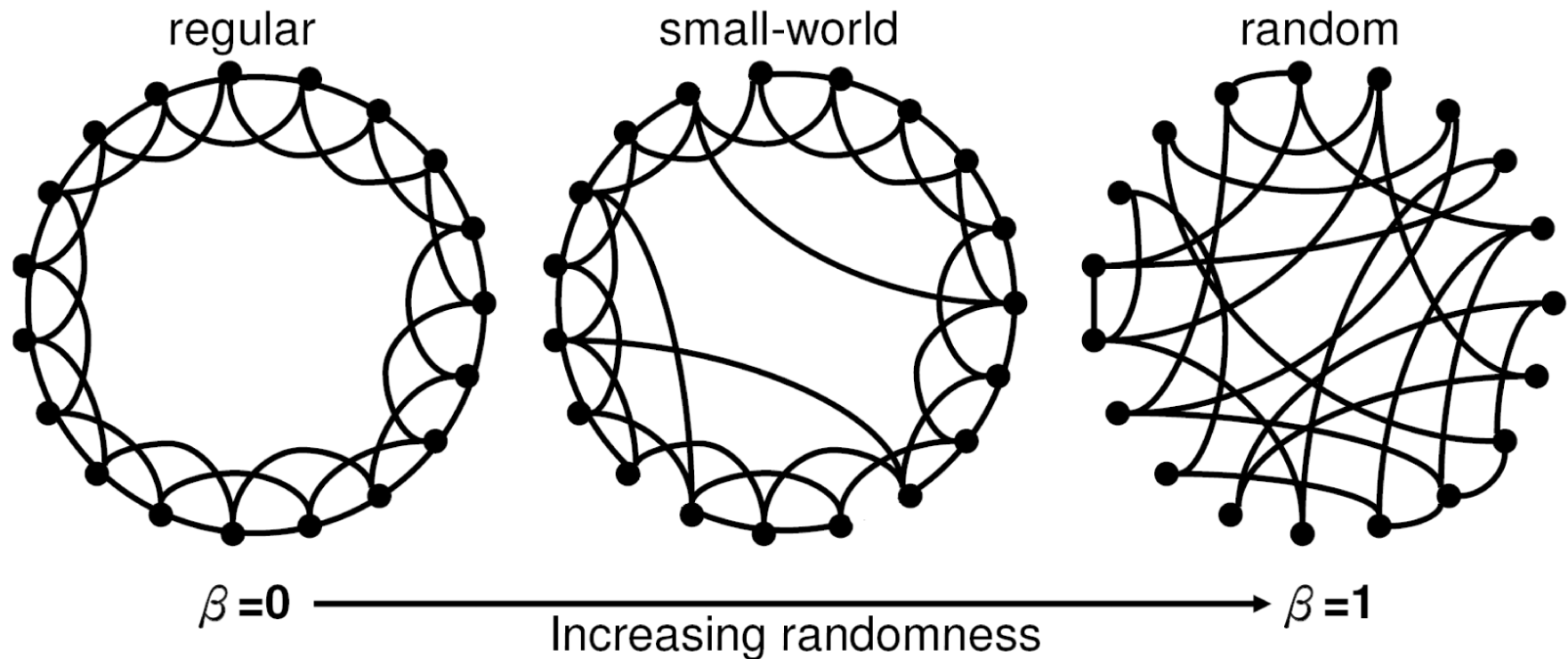
regular



From regular to random networks

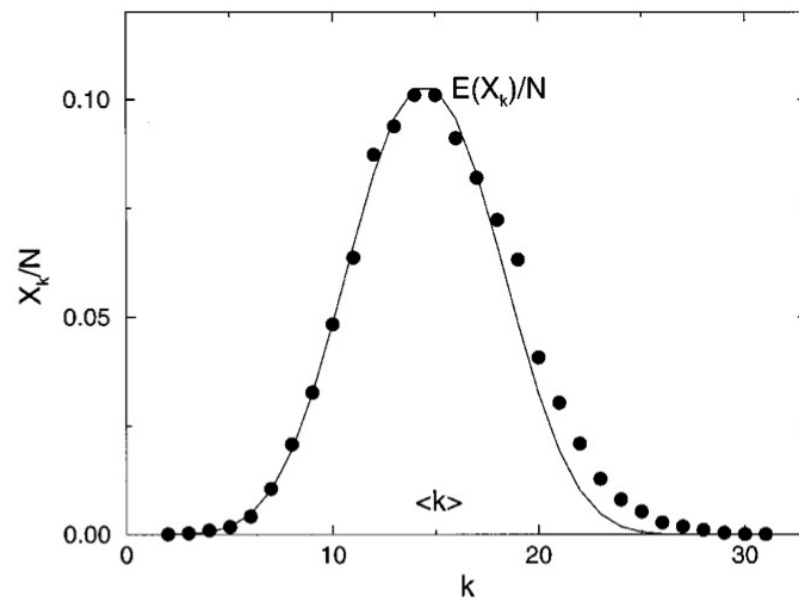
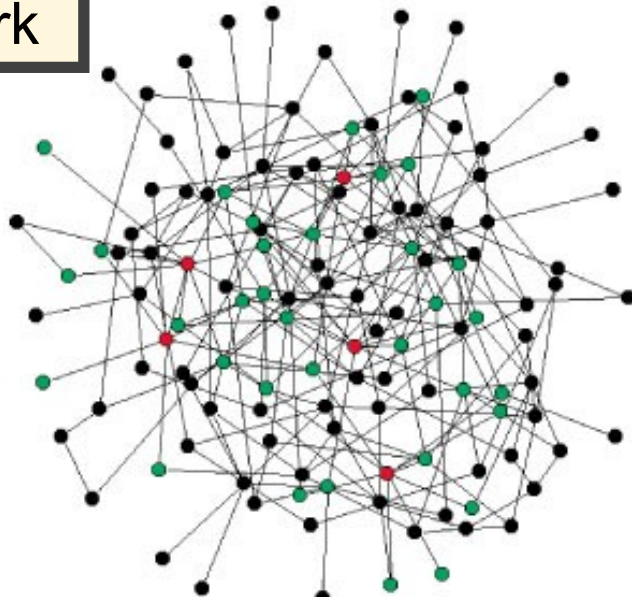


Small-world networks



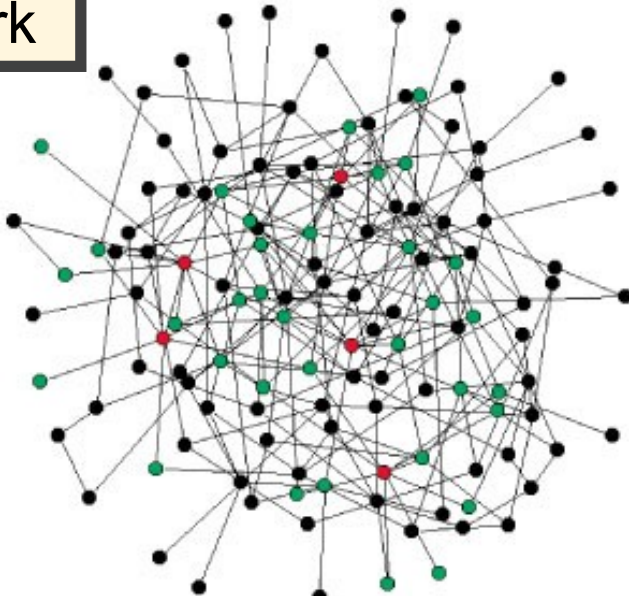
Degree distribution

random
network

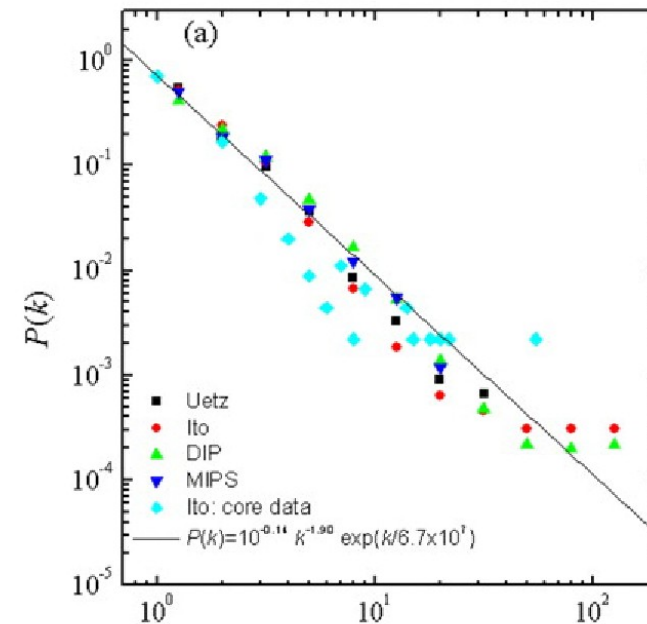
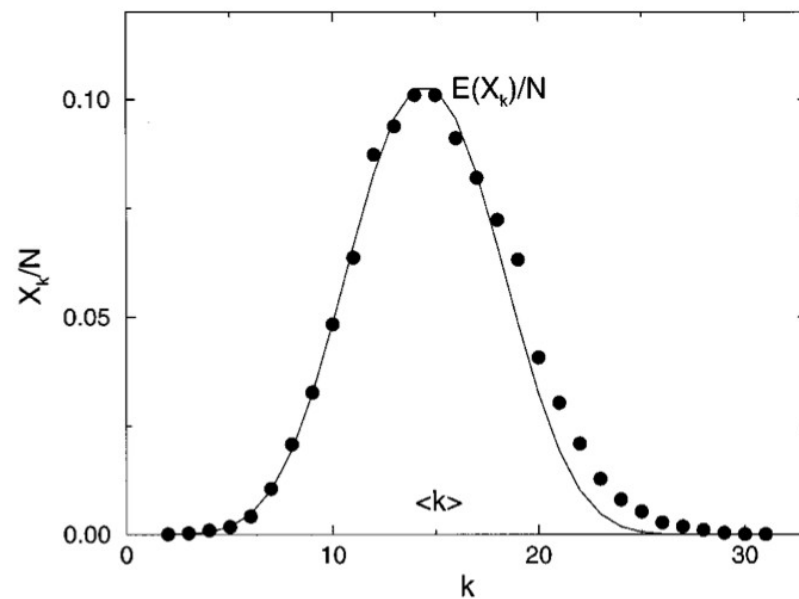
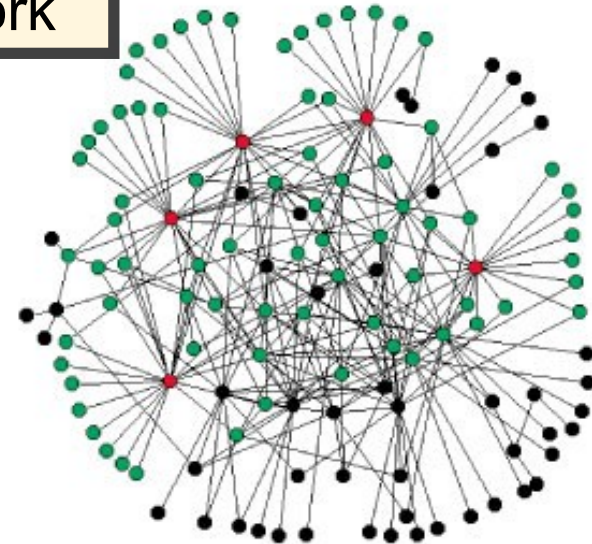


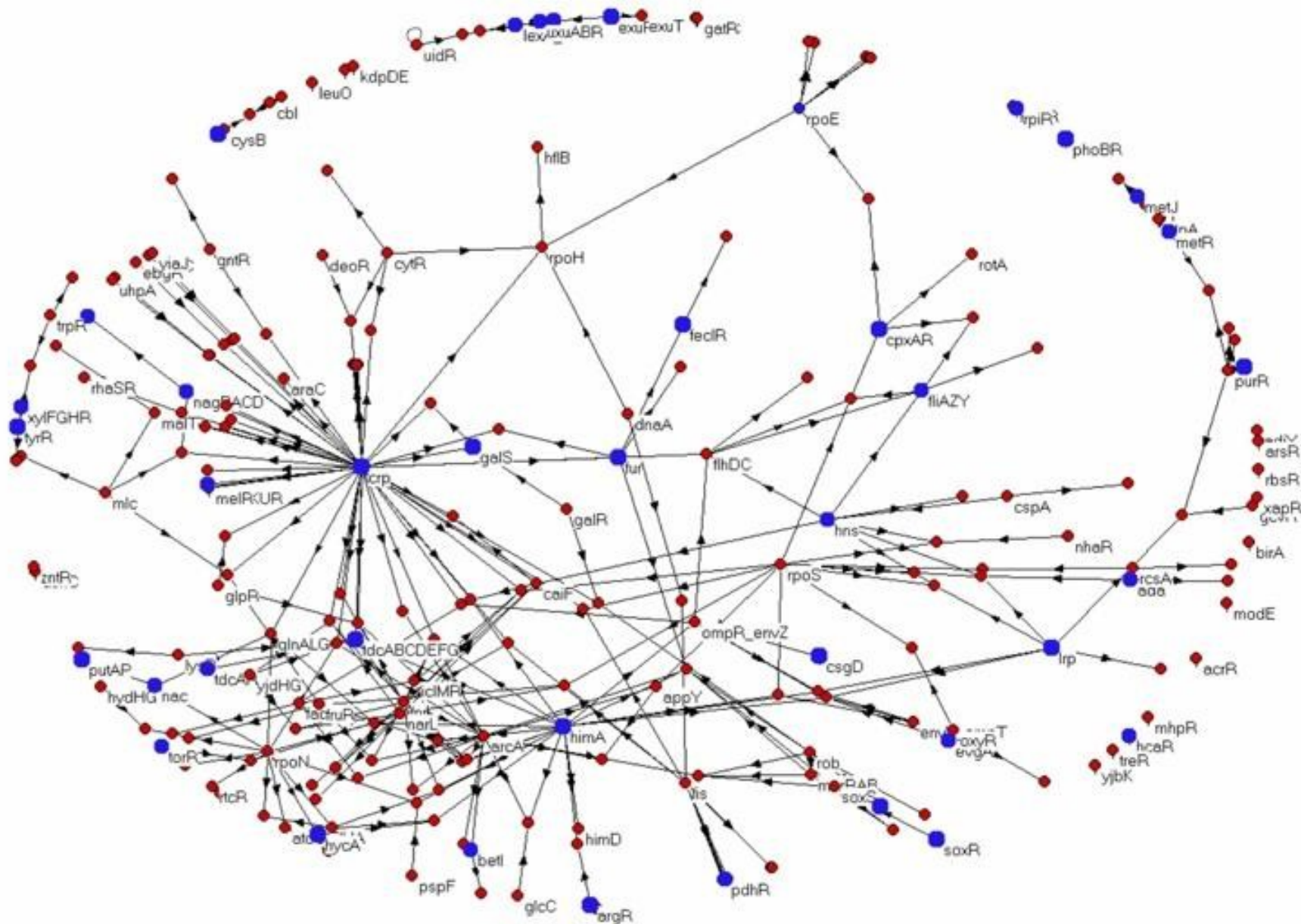
Scale-free networks

random
network

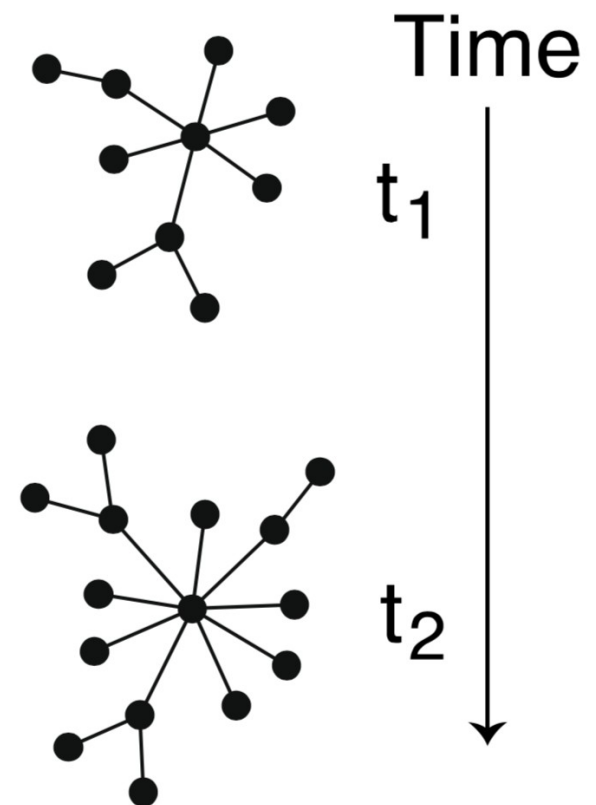
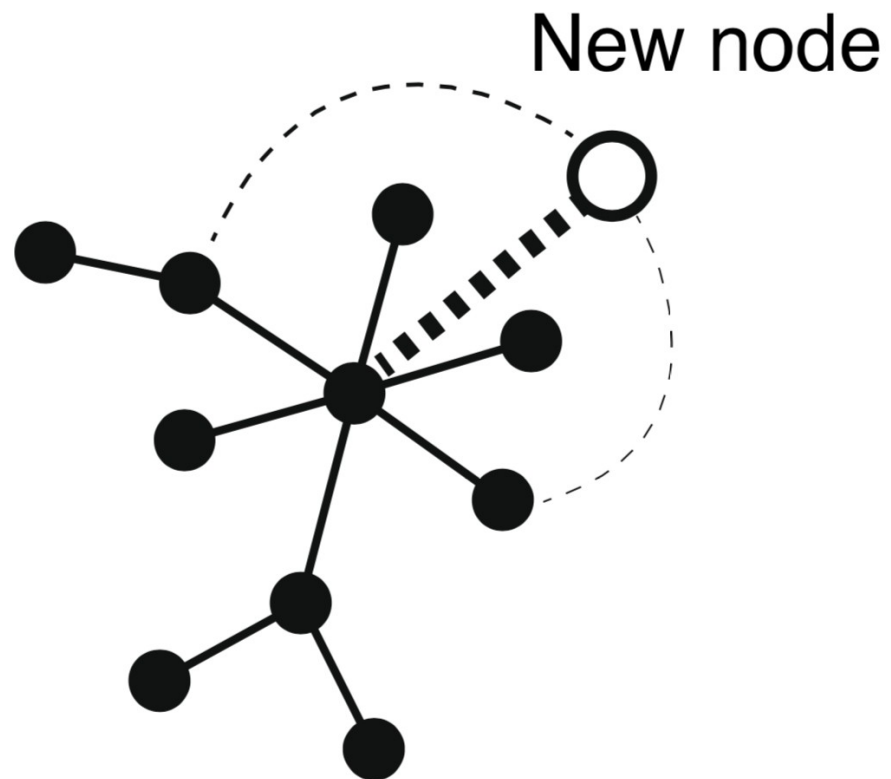


scale-free
network

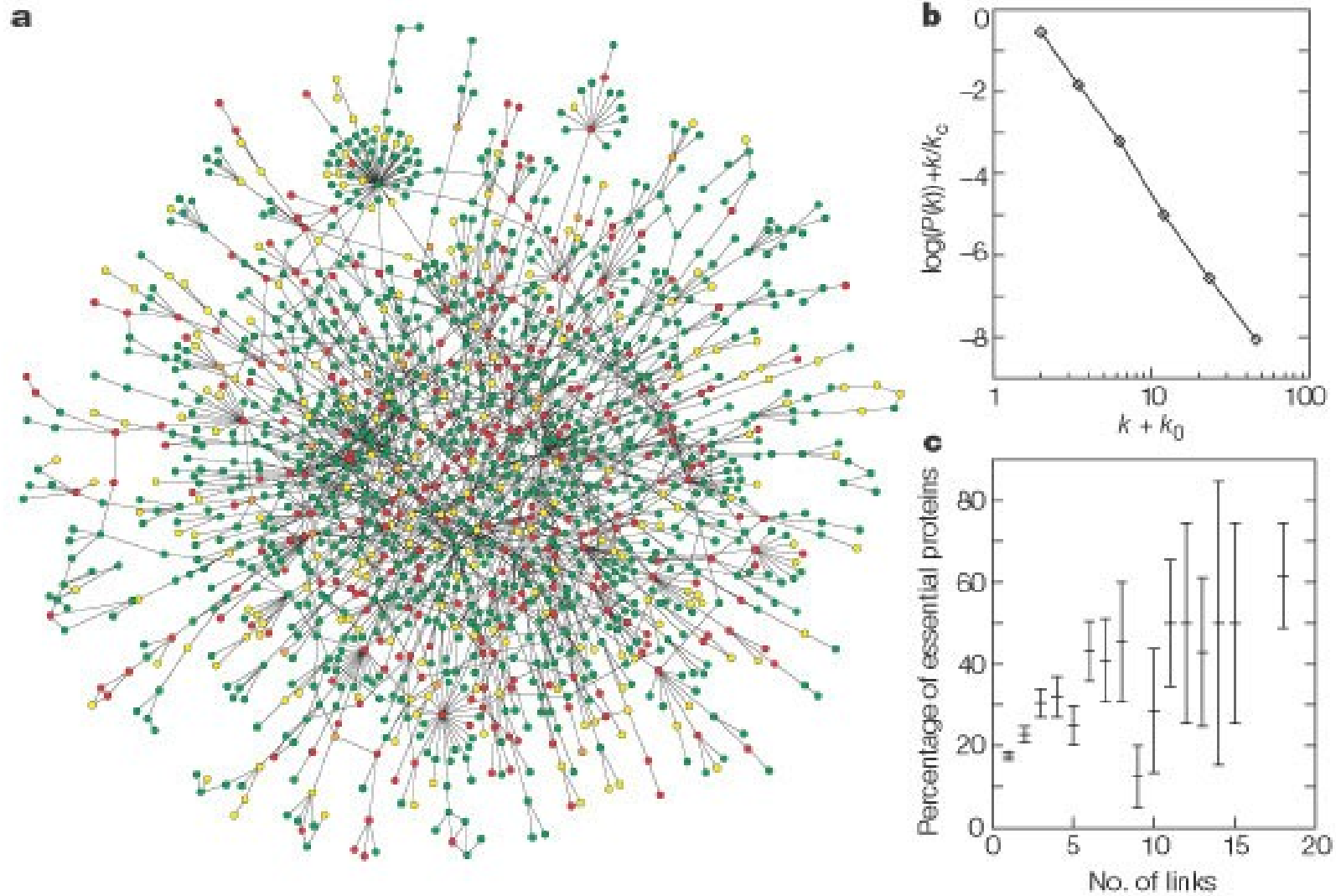




Preferential attachment



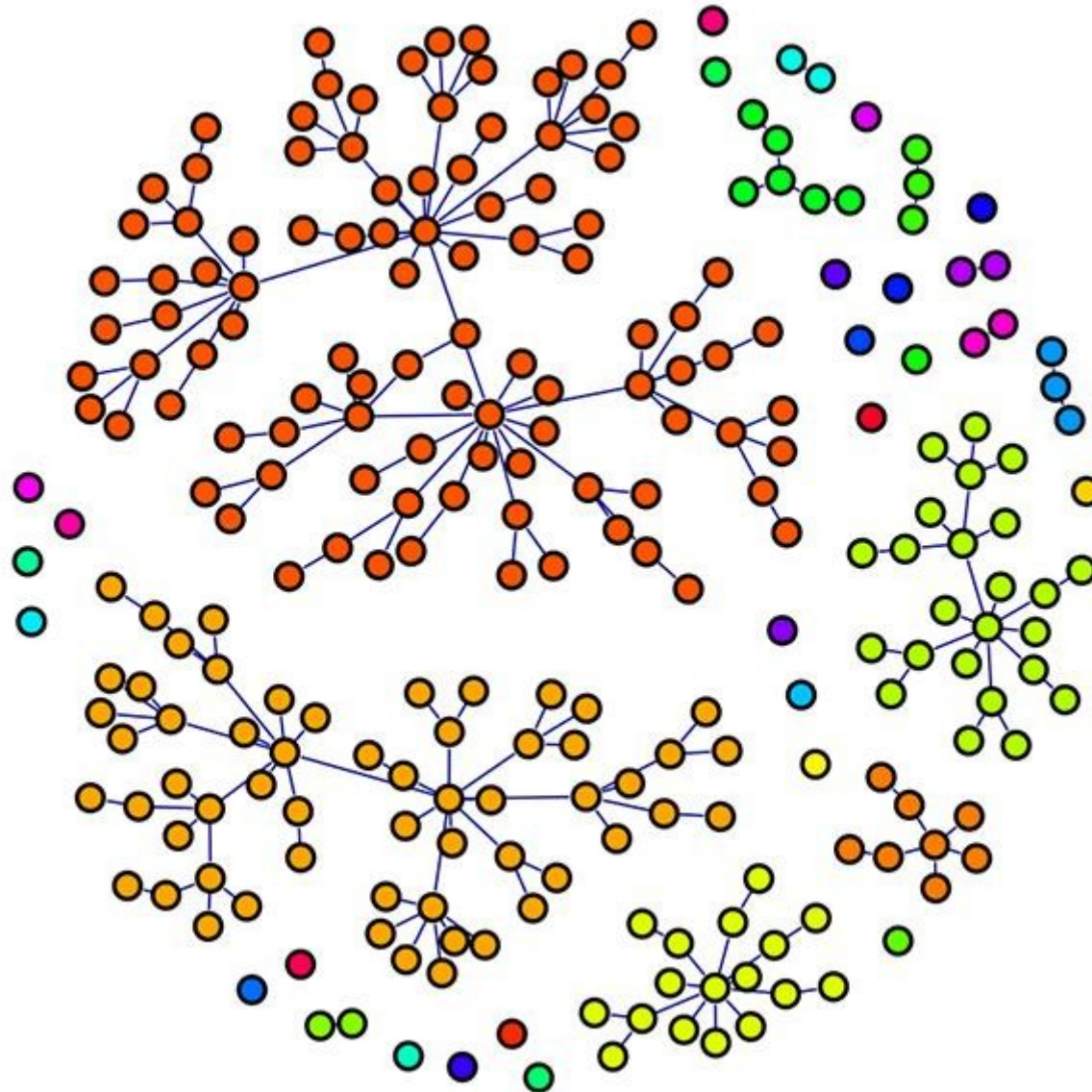
Lethality and network architecture



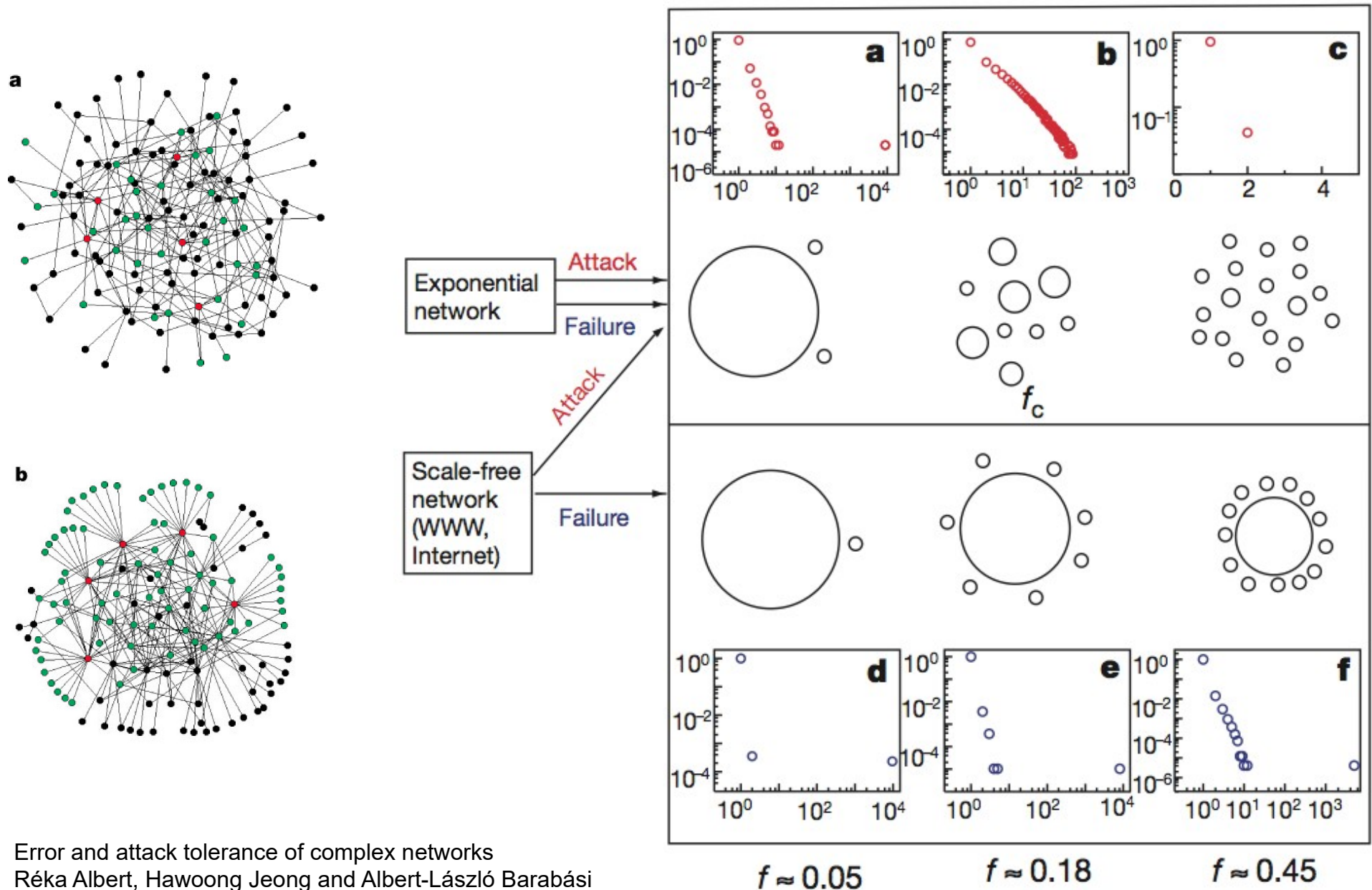
[Lethality and centrality in protein networks](#)

H. Jeong, S. P. Mason, A.-L. Barabási and Z. N. Oltvai
Nature **411**, 41-42(3 May 2001)

Connected components



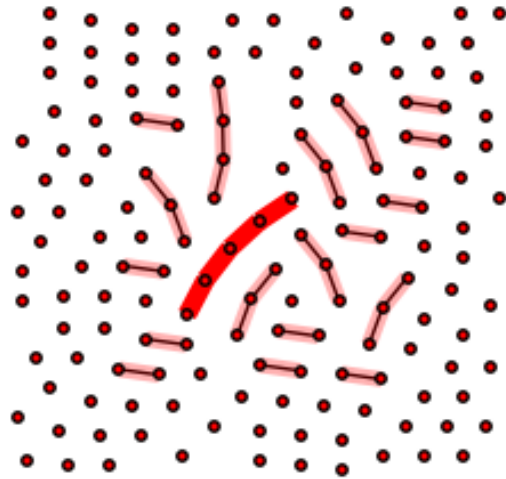
Tolerance of complex networks to errors and attacks



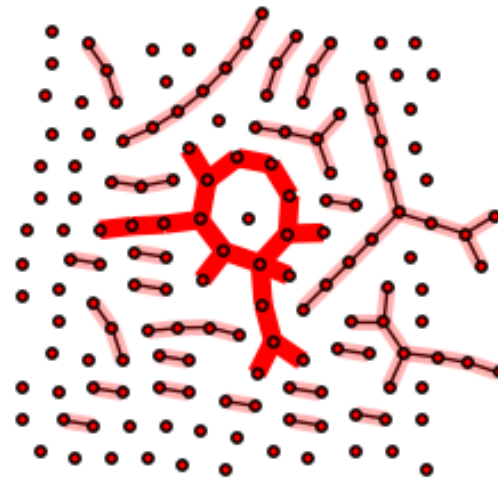
Error and attack tolerance of complex networks
 Réka Albert, Hawoong Jeong and Albert-László Barabási
Nature **406**, 378-382 (27 July 2000)

Giant component

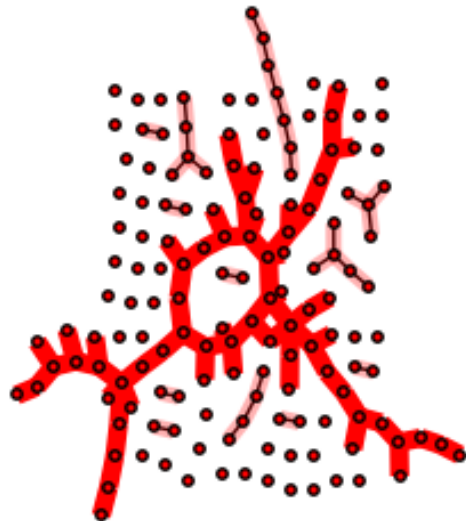
$p = 0.003$



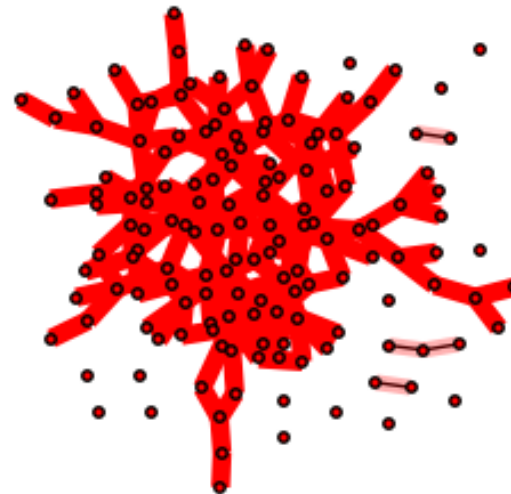
$p = 0.006$



$p = 0.008$



$p = 0.015$



Percolation transition

