

Network workshop

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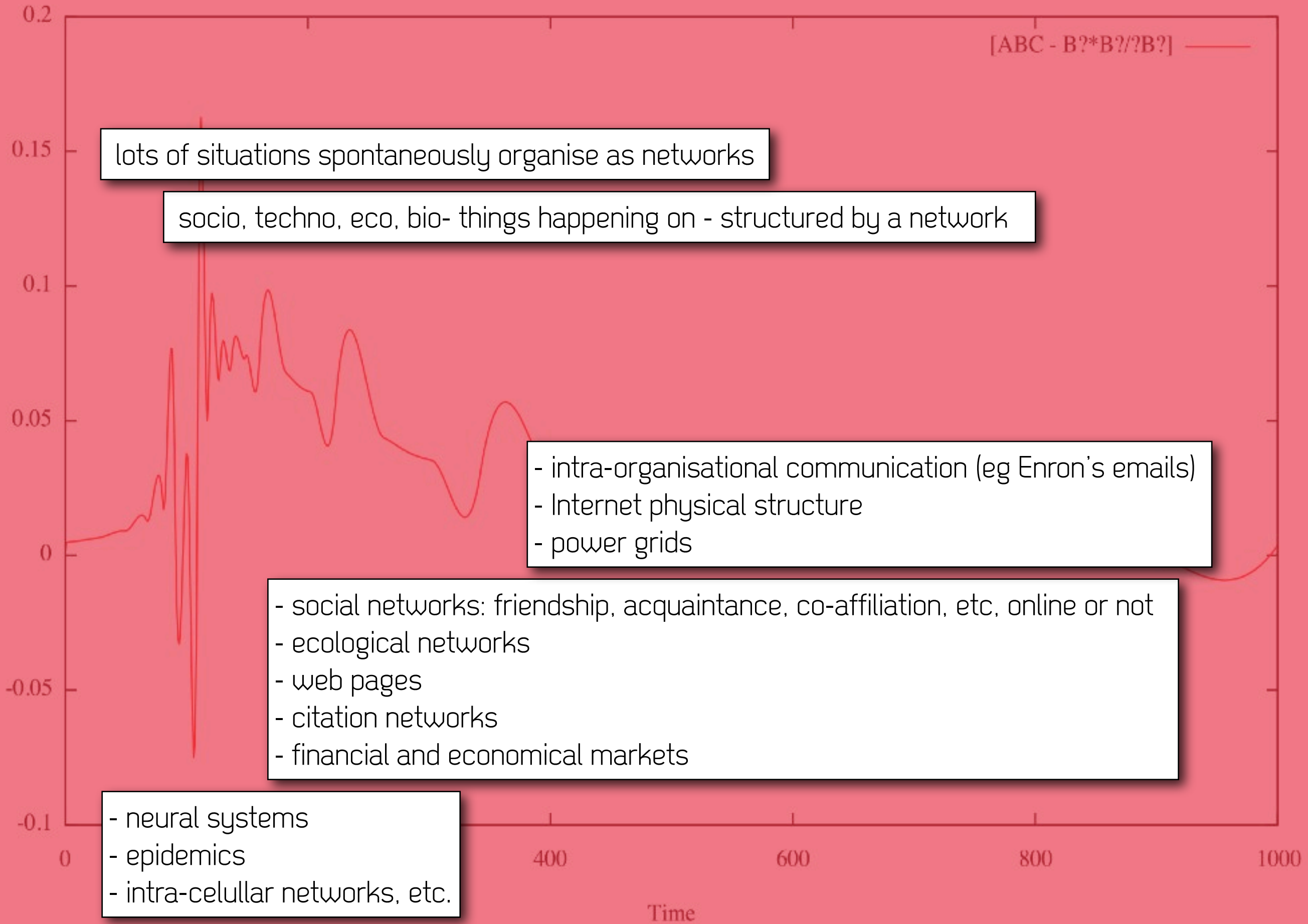
goals of today's network:

- gauging the local college and UoE interest for networks and network-related research
- getting interested people to know each other (ie to network :));

resources: edimod.org.uk, MAN M.Sc. class

see also Dec 16 modelling workshop (organiser: Jane Hillston)

ABC correlation



lots of situations spontaneously organise as networks

socio, techno, eco, bio- things happening on - structured by a network

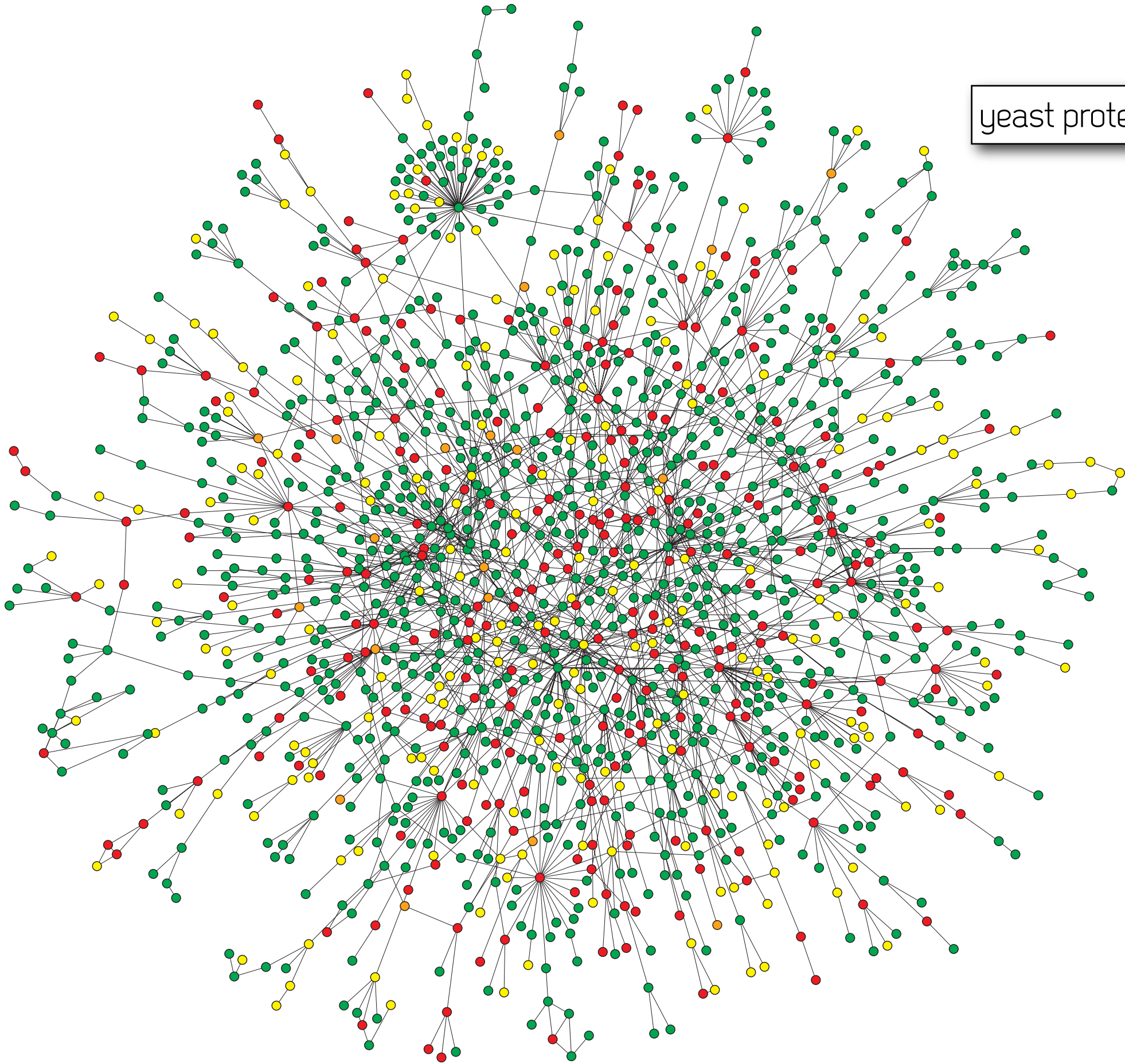
- intra-organisational communication (eg Enron's emails)
- Internet physical structure
- power grids

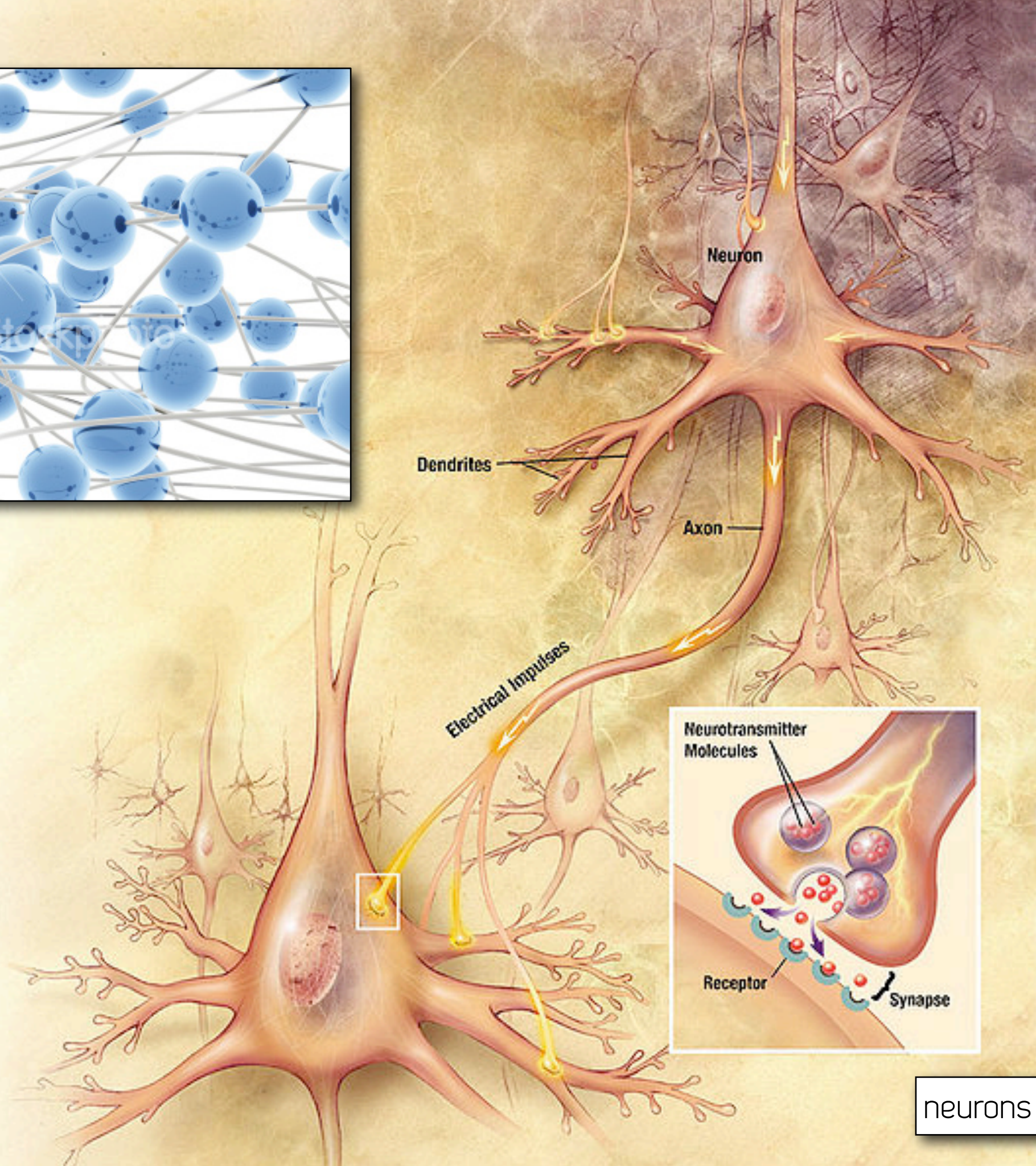
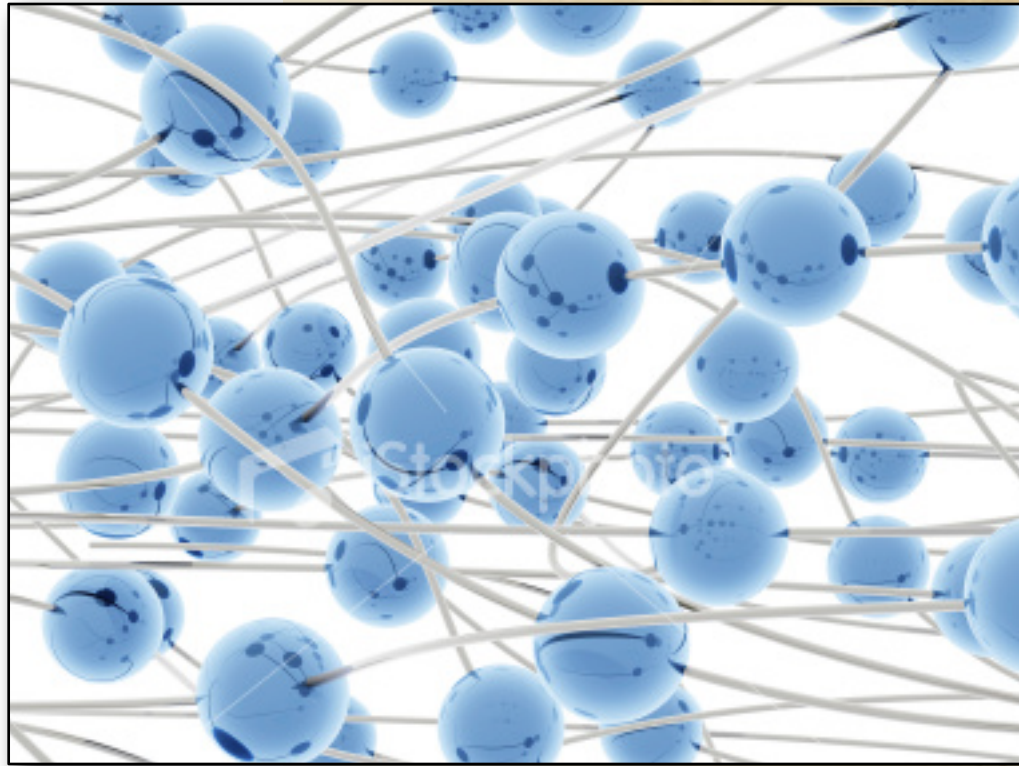
- social networks: friendship, acquaintance, co-affiliation, etc, online or not
- ecological networks
- web pages
- citation networks
- financial and economical markets

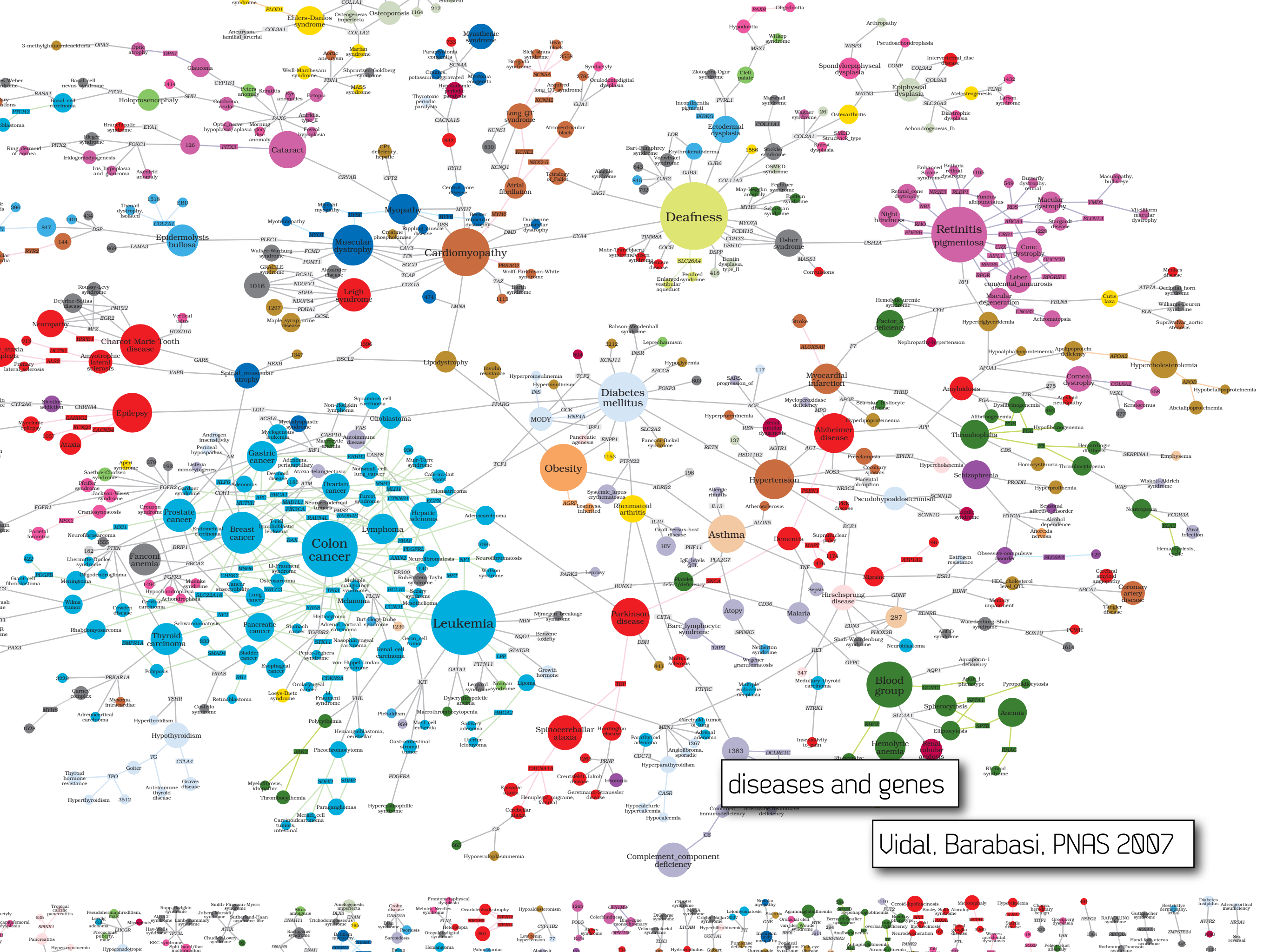
- neural systems
- epidemics
- intra-celullar networks, etc.

inventory ...

yeast proteins

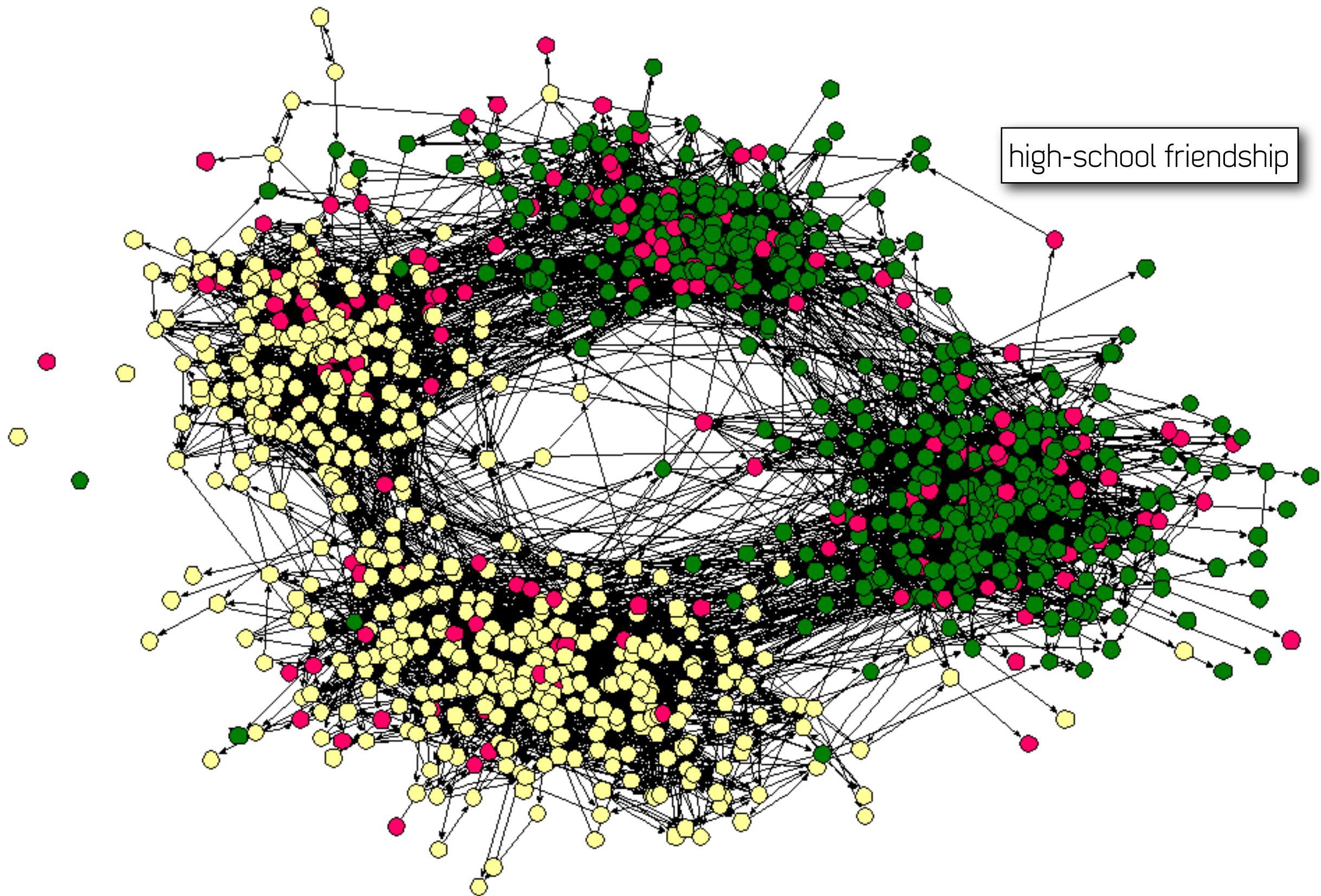






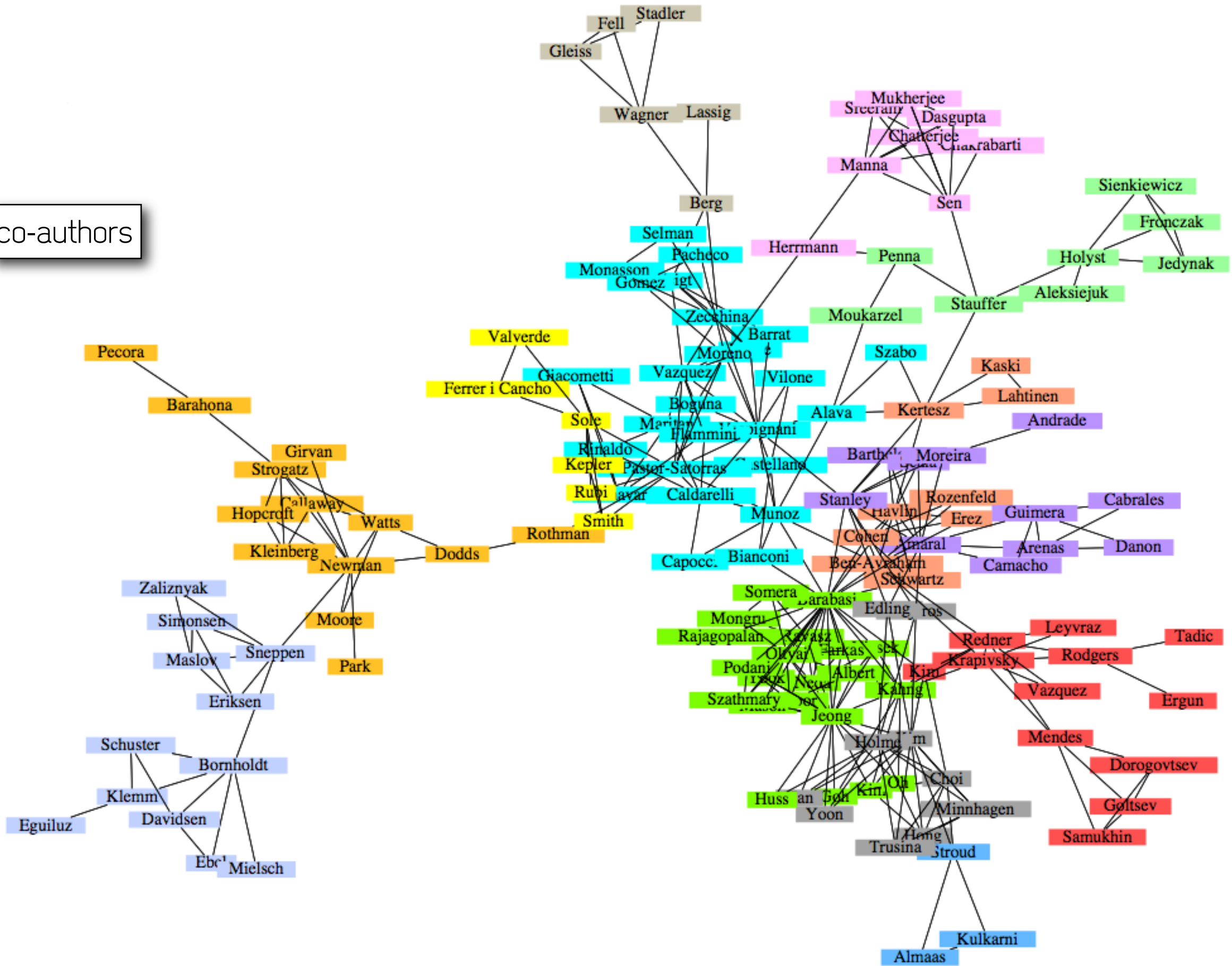
diseases and genes

Udal, Barabasi, PNAS 2007



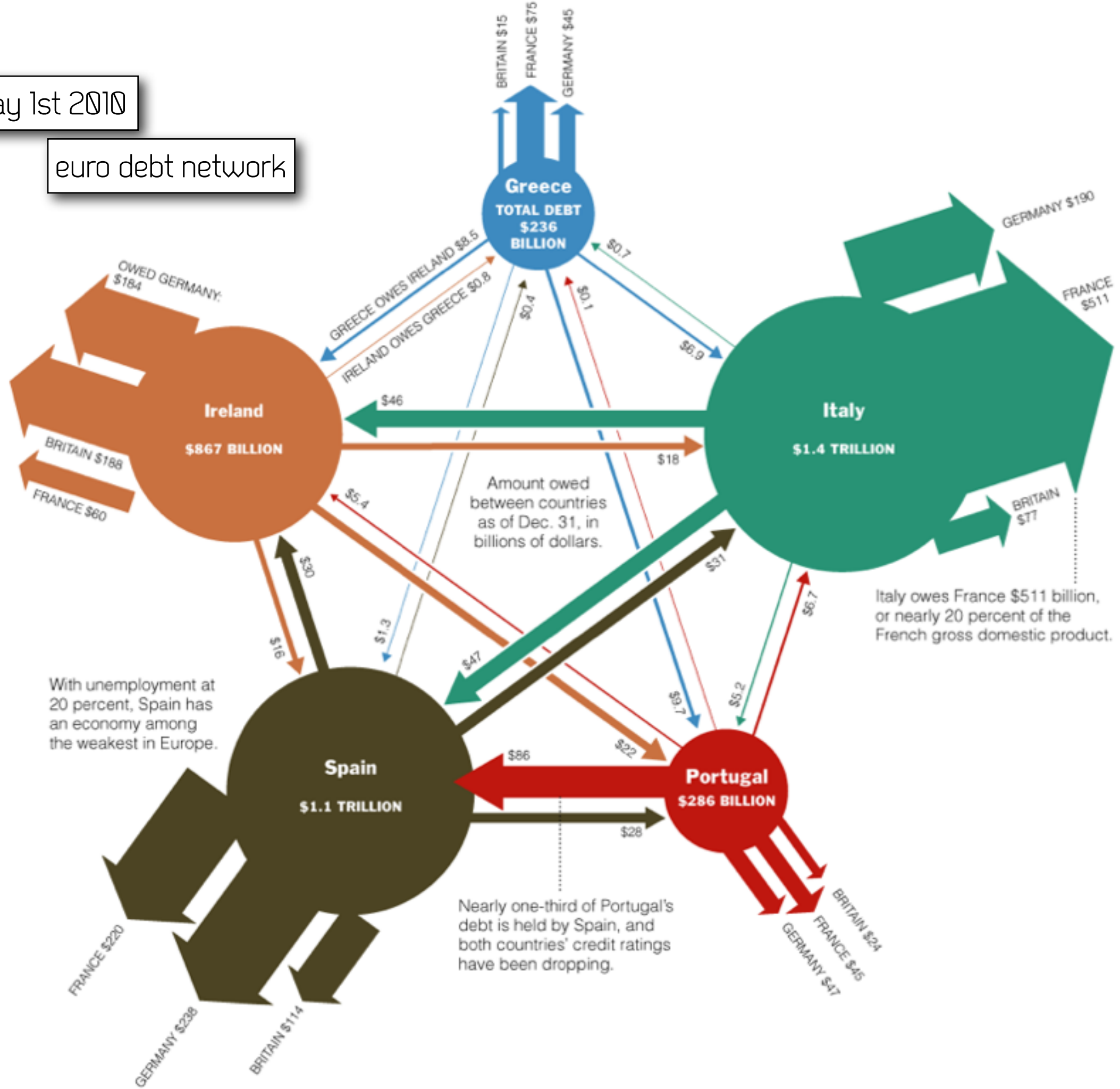
high-school friendship

co-authors

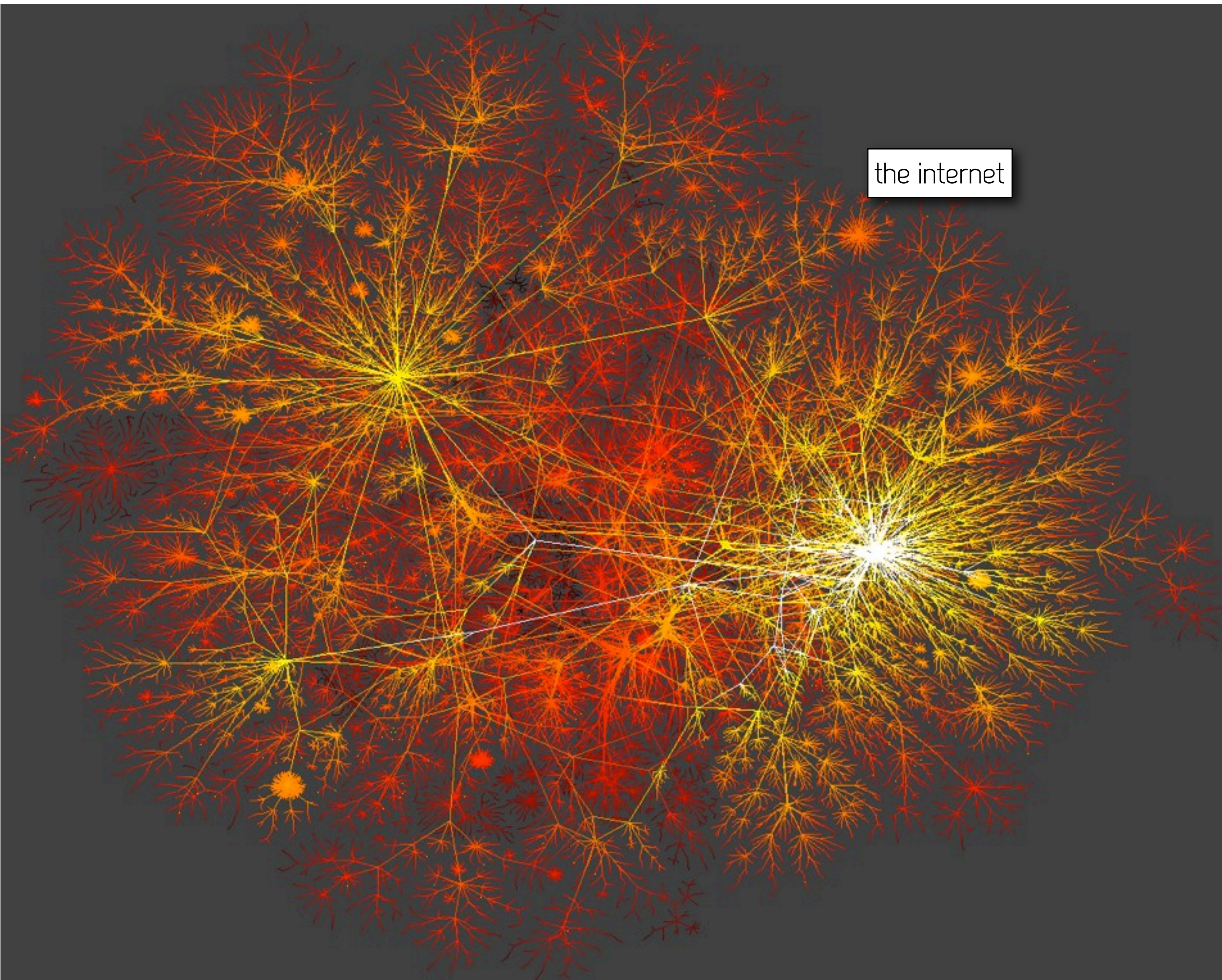


NYT May 1st 2010

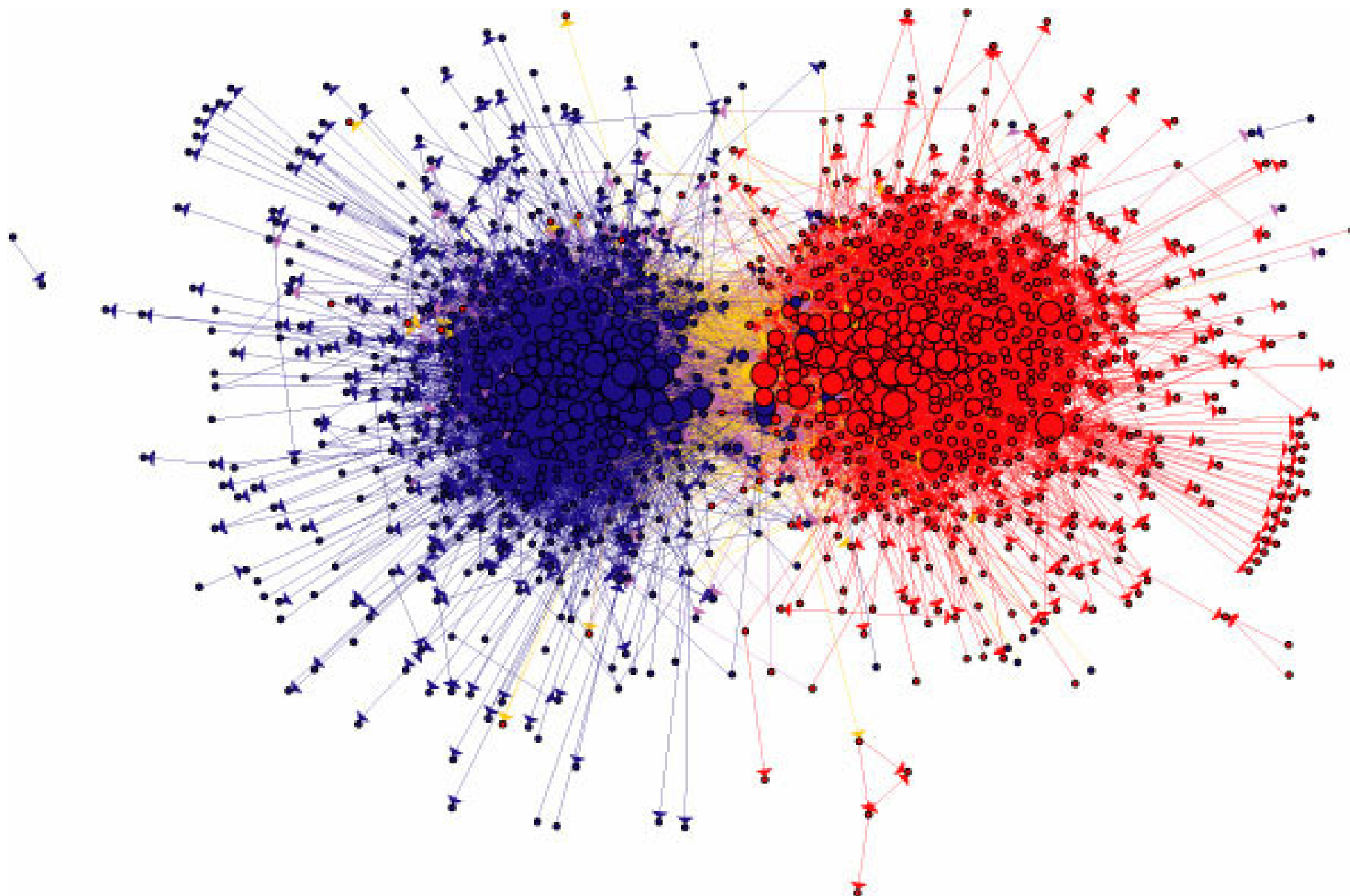
euro debt network



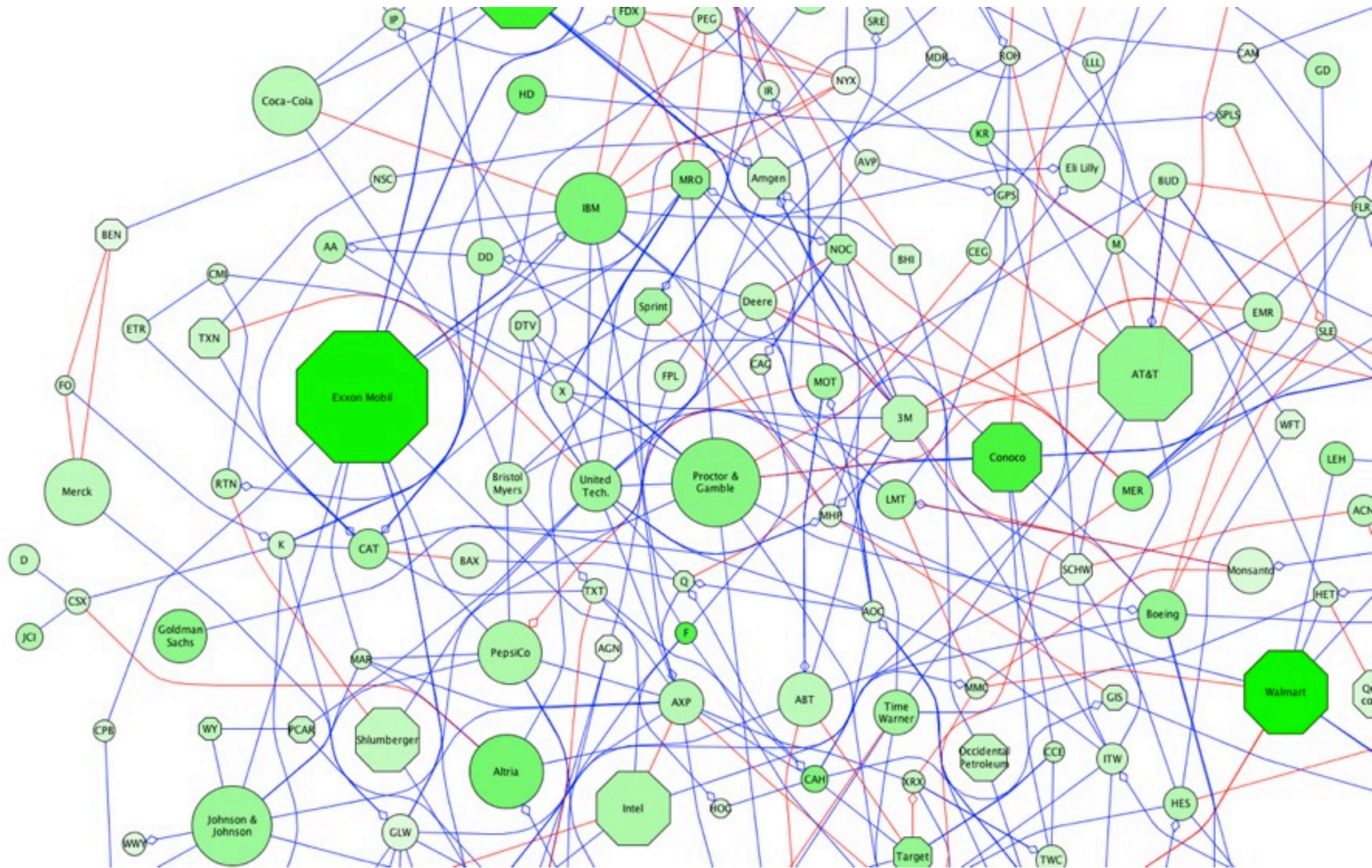
the internet



red vs blue political blogs - 2004 US campaign



capital, revenue and board members in the top 400 US companies



questions ...

what's a node? an agent, a country, a molecule?

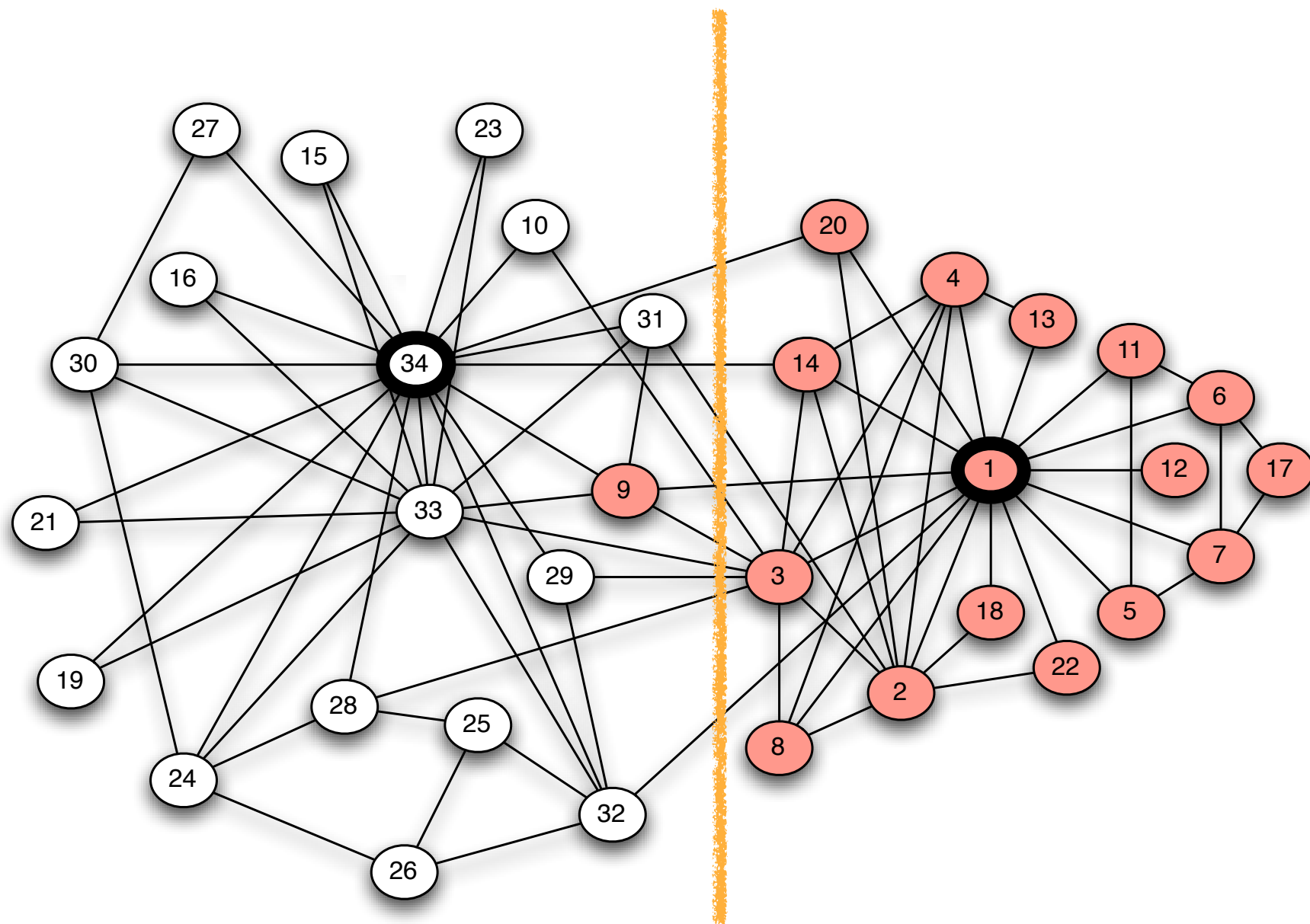
what is an edge - transient/permanent - coarse-grained?

what to measure, local and global properties
how connected, how resilient is a network
do we have useful modular decompositions

what kind of dynamics is there on the network - how stable?
how well, fast, far do signal propagate and which signal?

how does a network happen, growth scenario
how does it evolve, rewiring scenario?

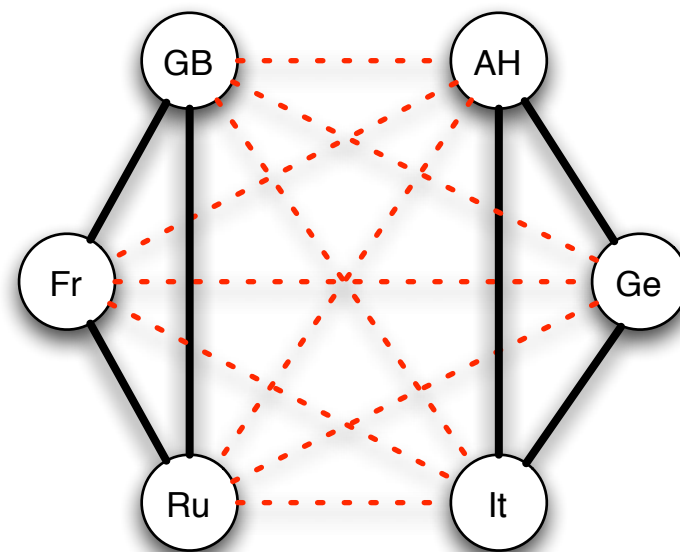
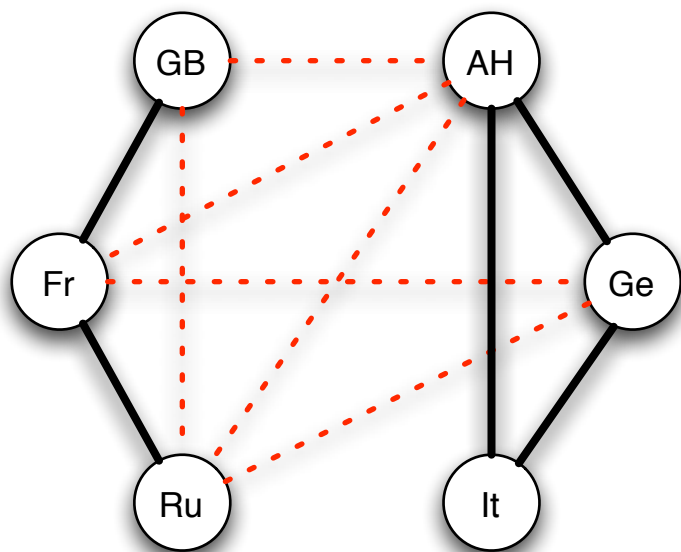
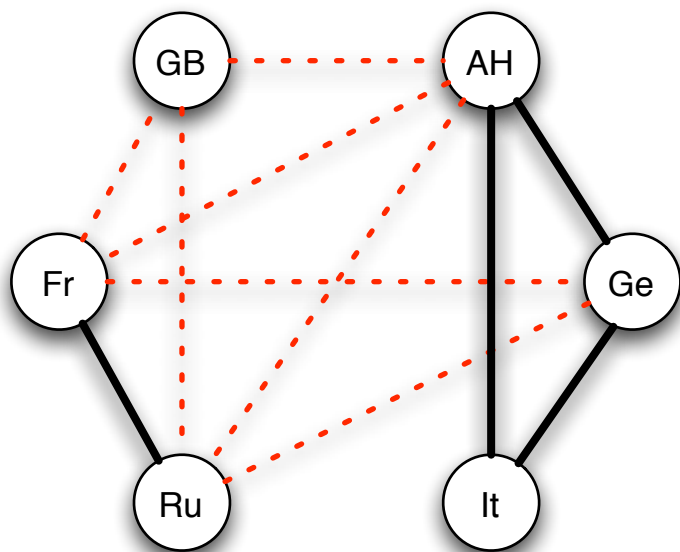
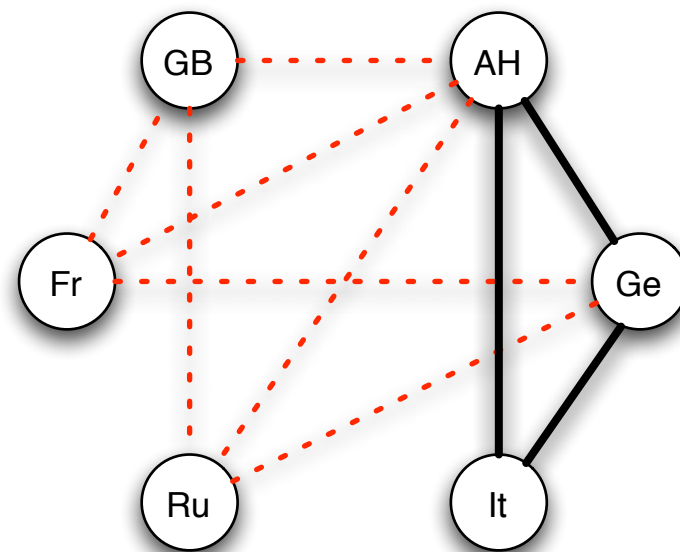
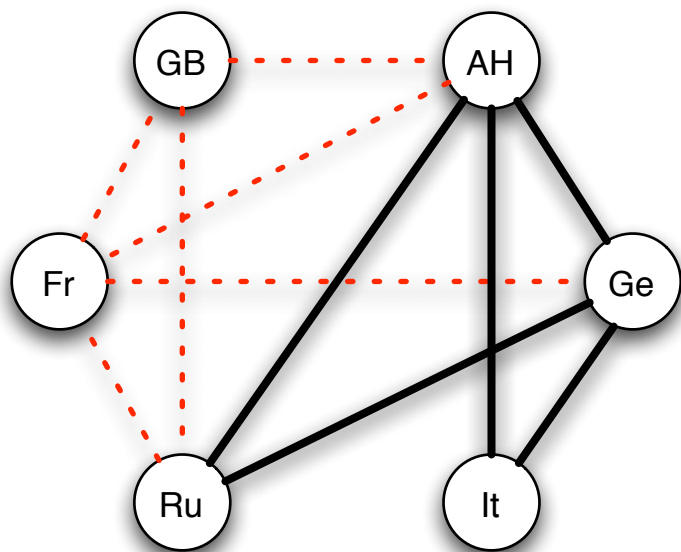
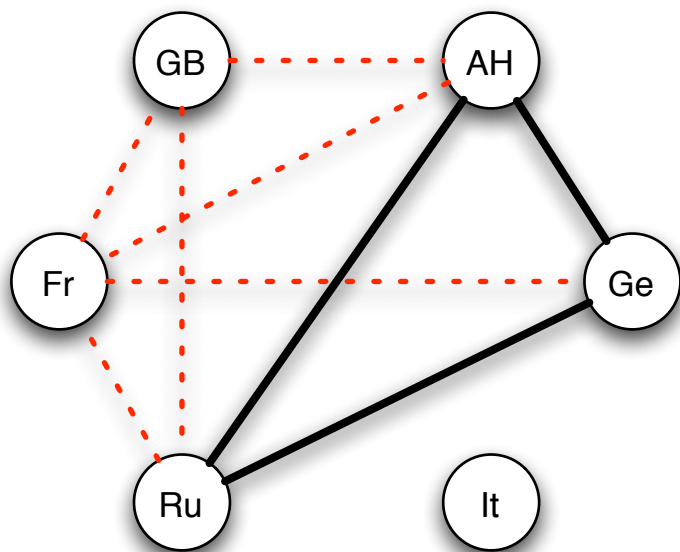
statistical correlation to non observables
from features of the network?



the karate club divide one can see stress and fragility ... not very long after the secession happened almost along the expected faultline

diplomatic alliances

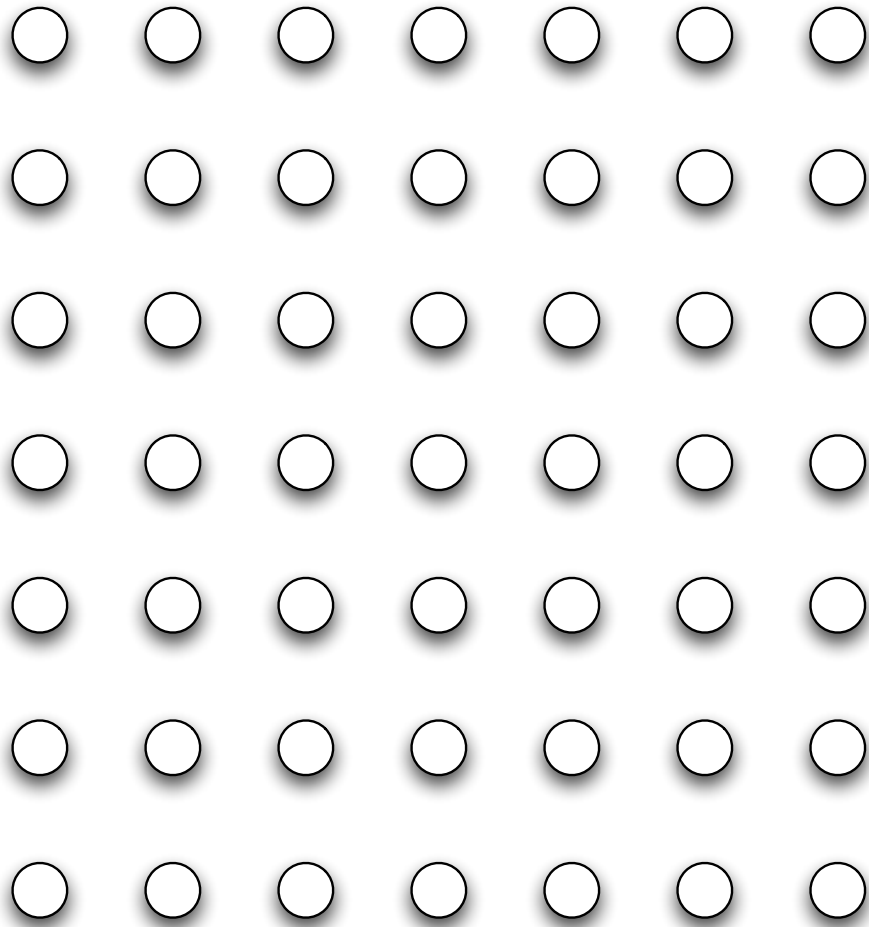
progressive shift to a balanced +- networks



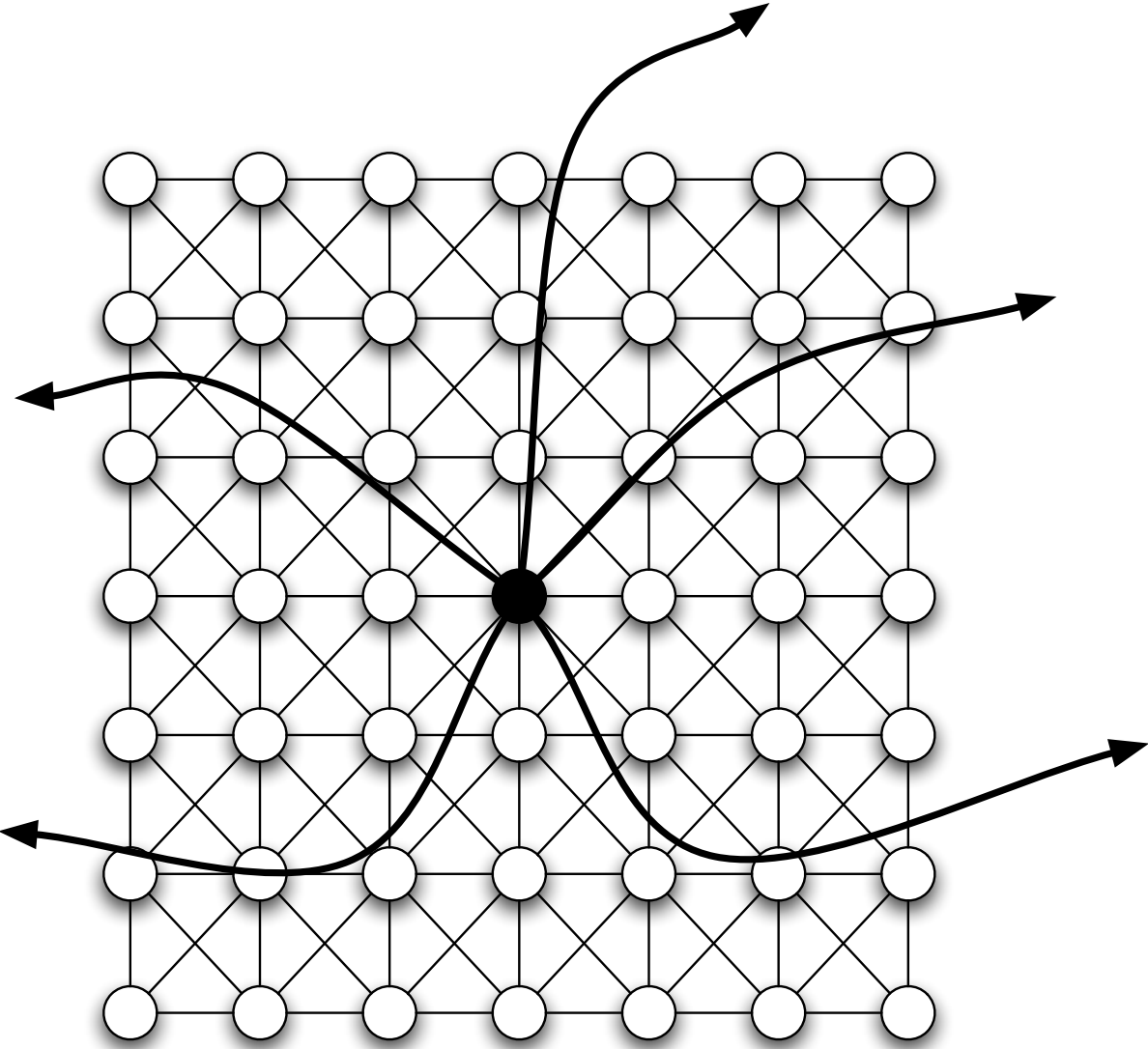
structures ...

local ties and (small amount of) random ones

clustering and short distances

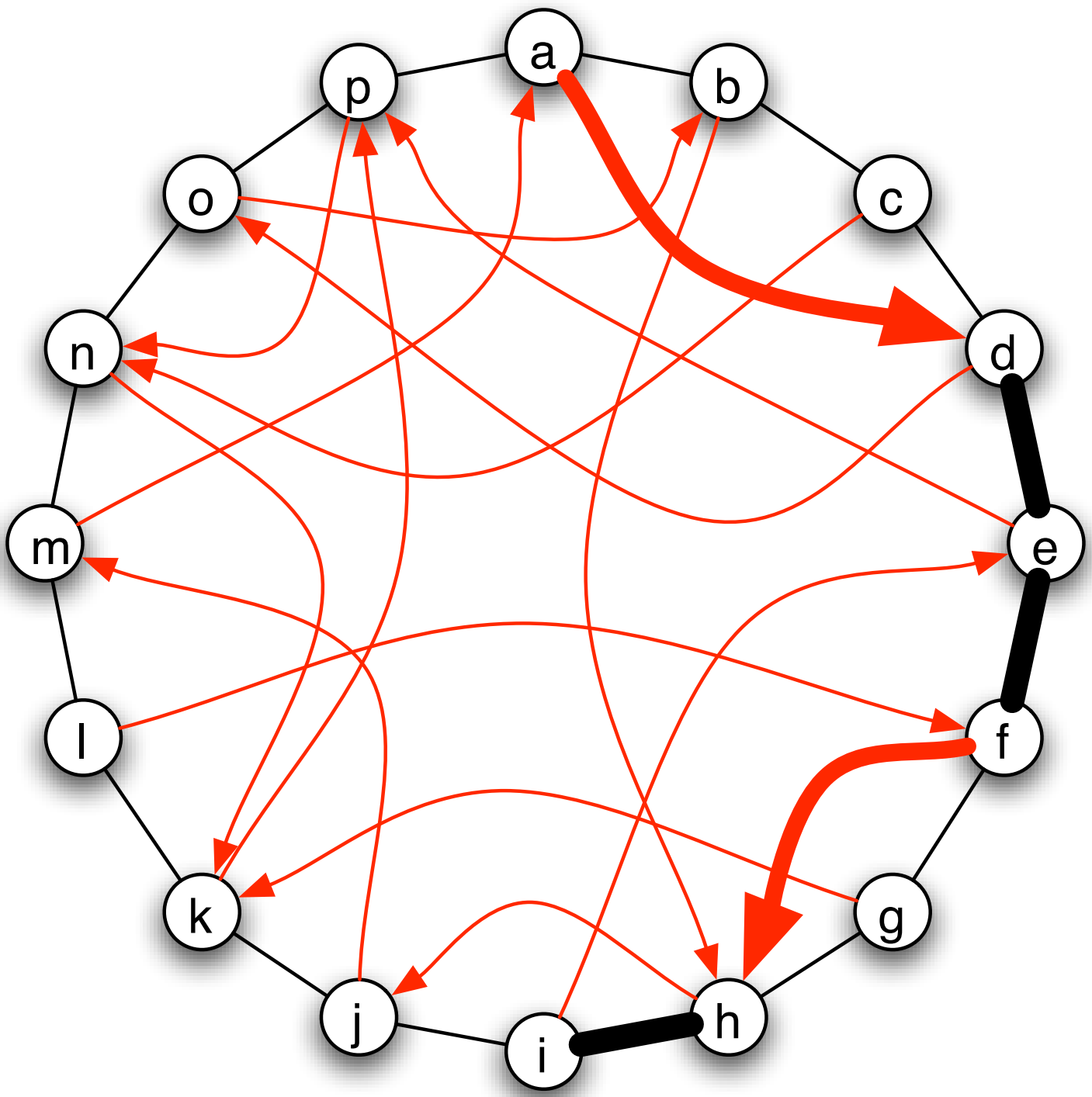


(a) Nodes arranged in a grid



(b) A network built from local structure and random edges

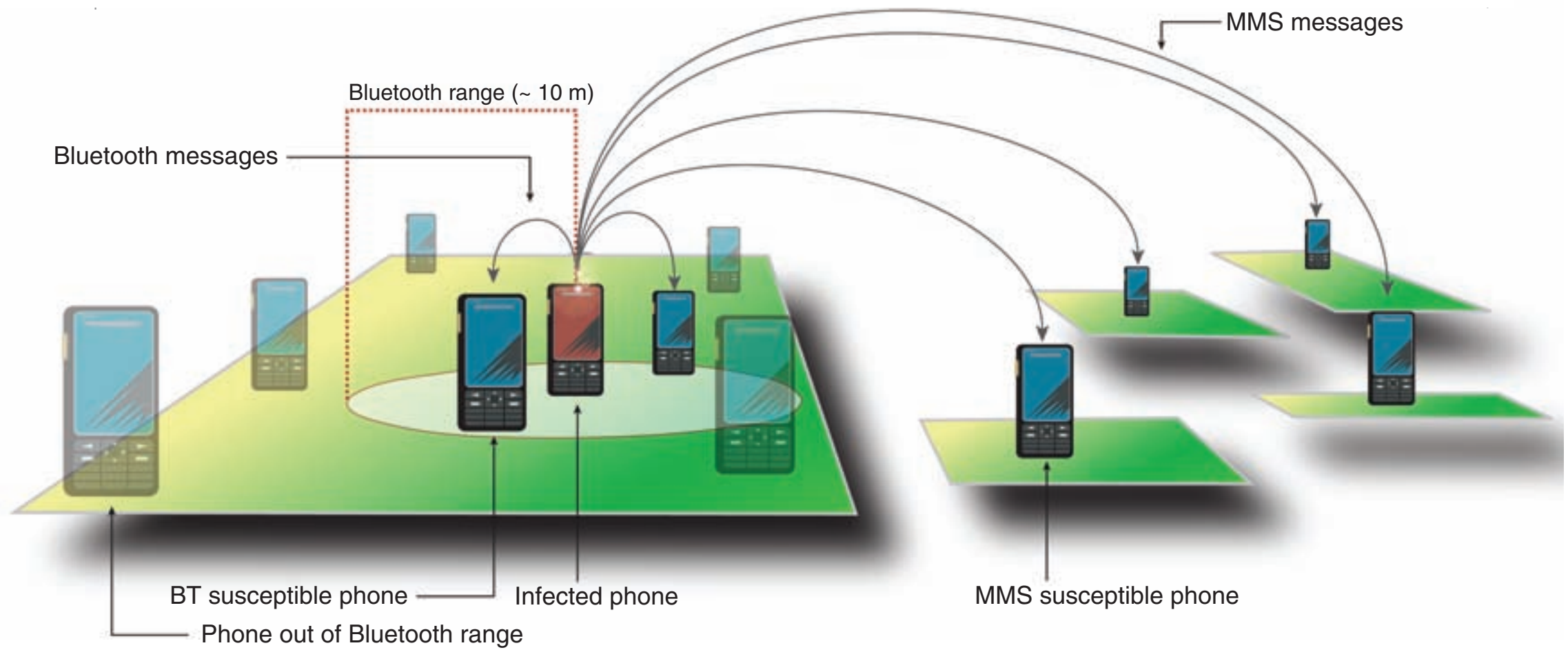
myopic decentralized search: from a to i



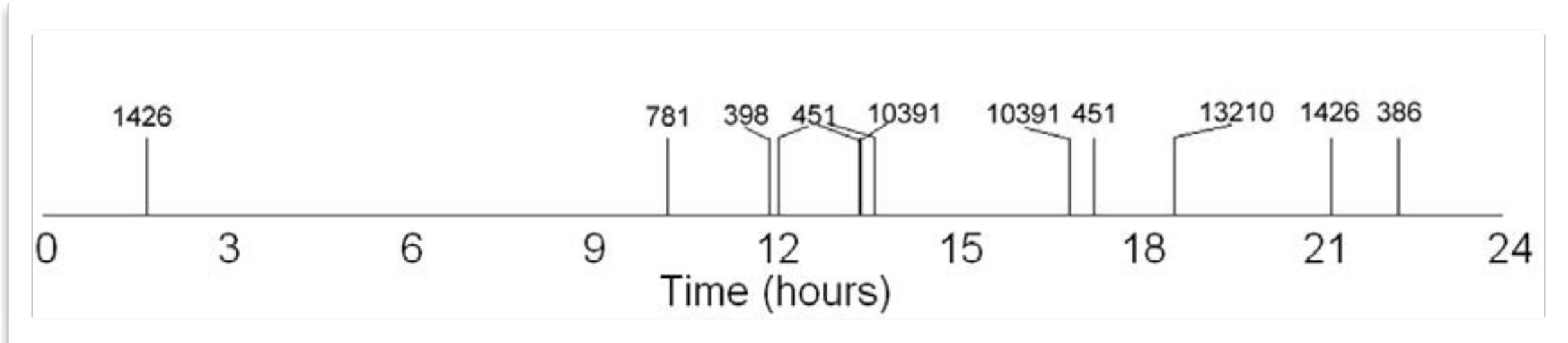
models ...

spatial networks - random encounters

propagations: spatial - non spatial - hybrid

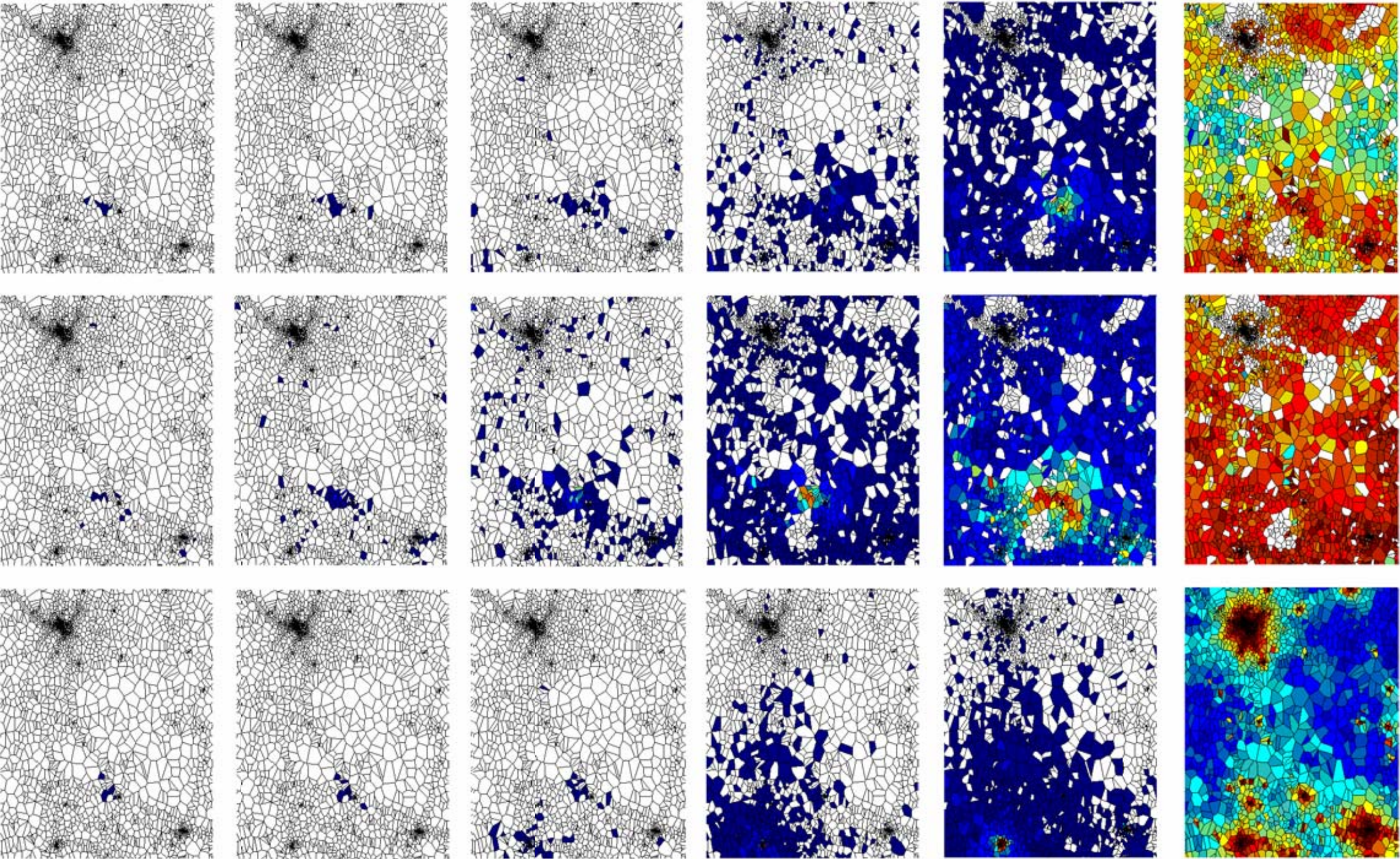


timelines - we leave traces of our activities!





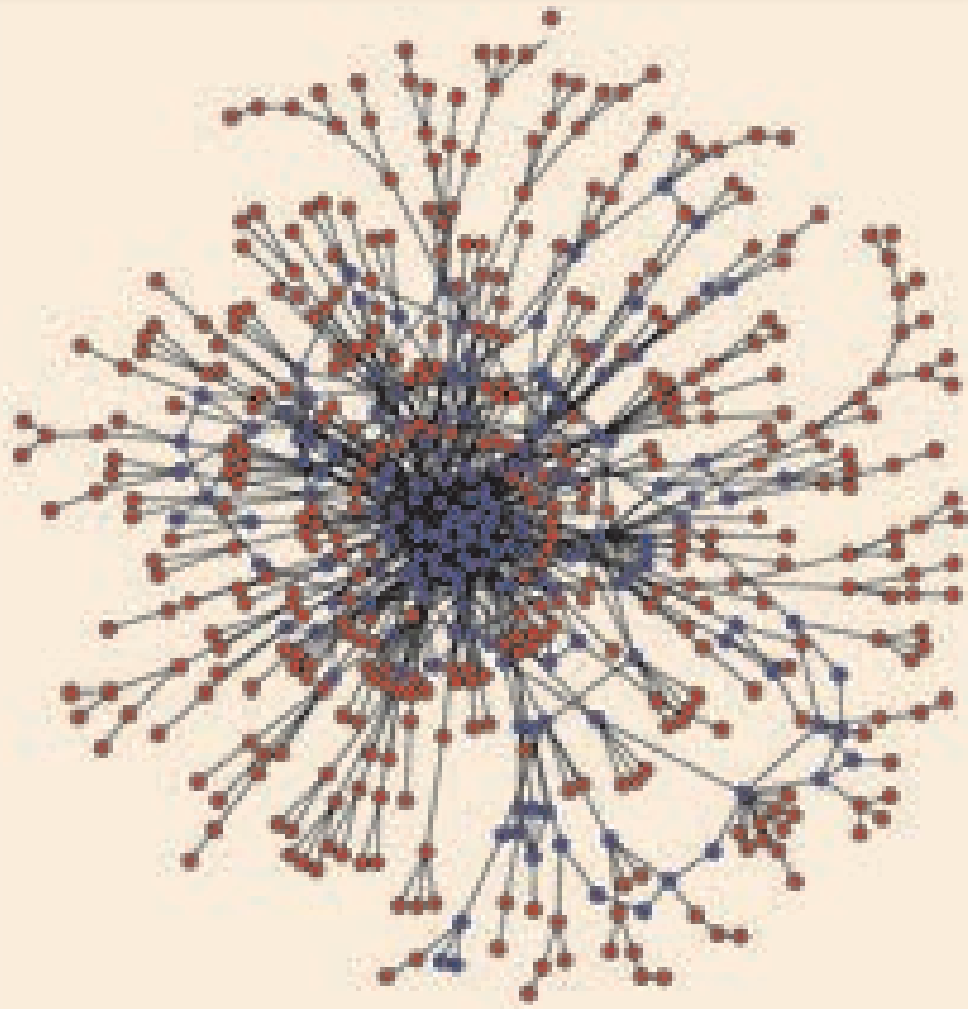
propagation models under various assumptions



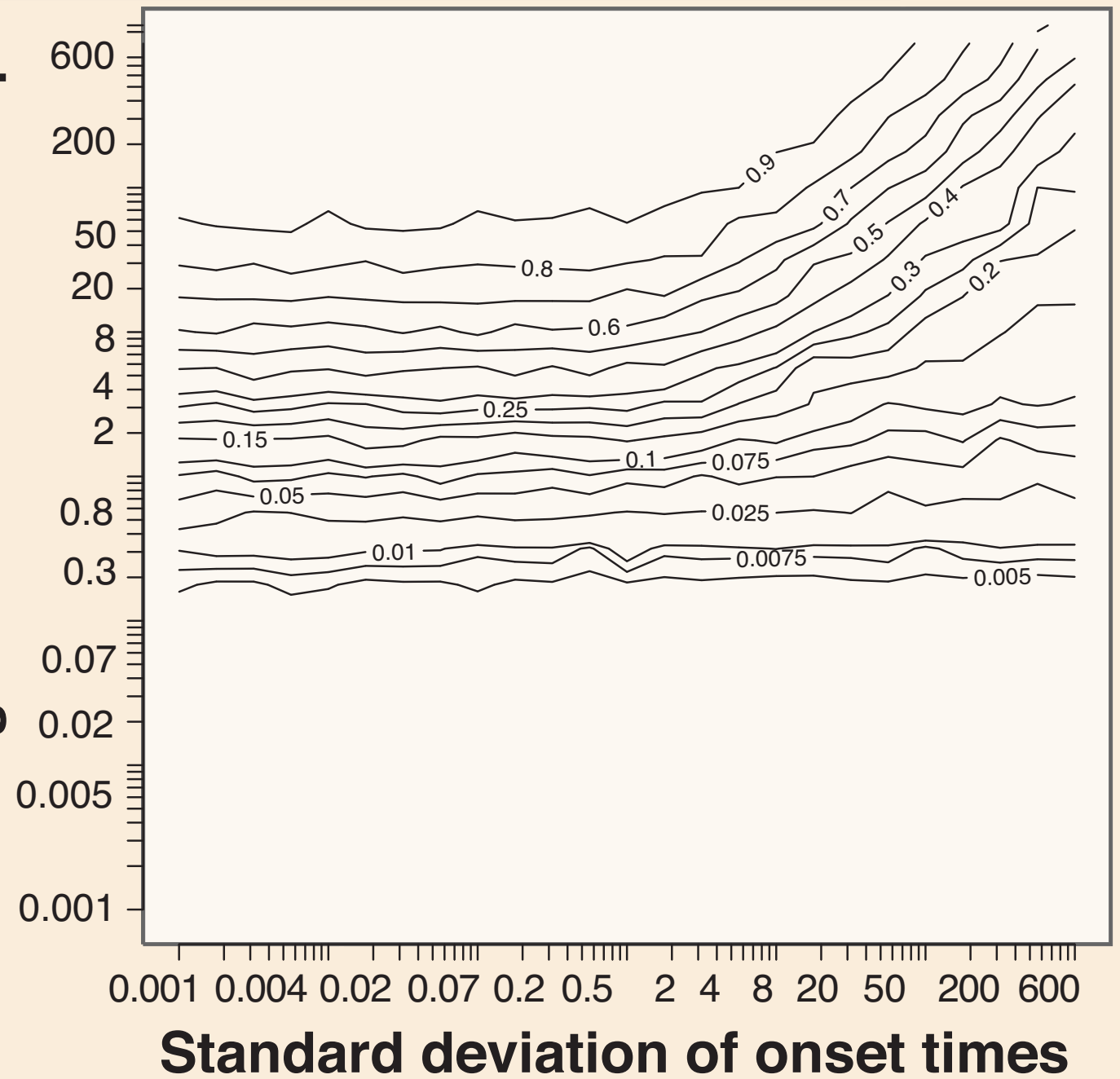
but ...

can we trust network-based models?

Science (2009) vol. 325 (5939) pp. 414-416



Mean length of sexual relationship



a time-aggregated network of sexual contacts not a good model

everyone may become infected or no one may be infected, depending on:

- edge duration
- deviation on time of onset

information ...

Social network analysis

patterns of socio-techno-eco-interactions
with the increasingly computational and digital nature of modern world, there is more of these patterns

Finding them has become a profitable business

suppose you receive quick callbacks, call other people late at night, get more calls at social times

fine time-structure of local information propagation

even if eventually everyone knows (??), info can be scarce at micro time scales

friction, a sort of illiquidity of info - so there should be an information market?

Too much information; nodes have limited resources to process information

reward for propagating accurately, relevantly (Gricean maxims of conversation apply?)
what needs to be propagated? differentially as a function of the "power" of nodes, their neighbour's tastes?
exponential decrease of influence (à la Maslov)?

randomness of encounters seems hard to control as well

can one engineer opinions and their propagation?

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