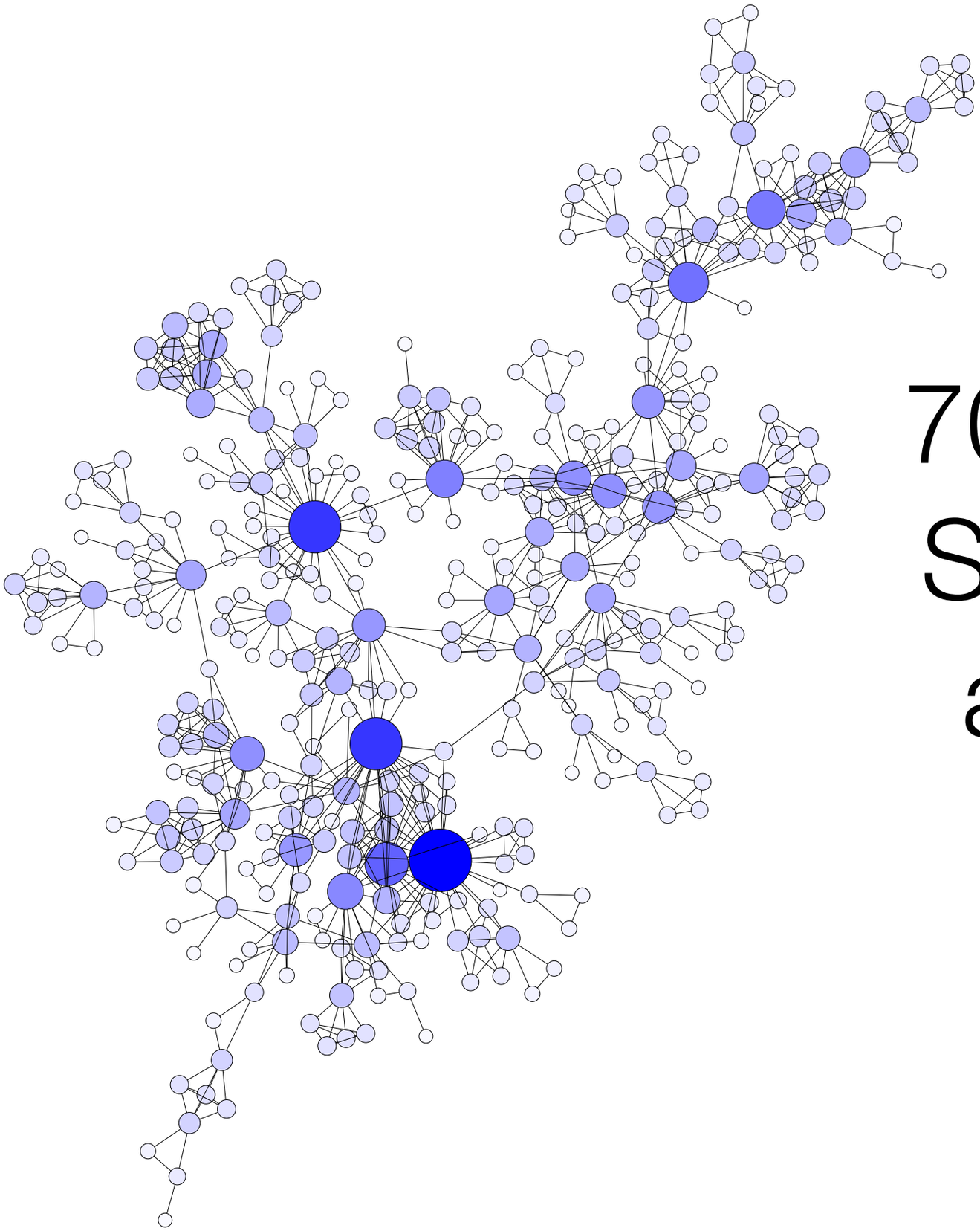


70-449 & 73-449: Social, Economic and Information Networks

Social Networks: An Introduction

Social Science is the study of interaction

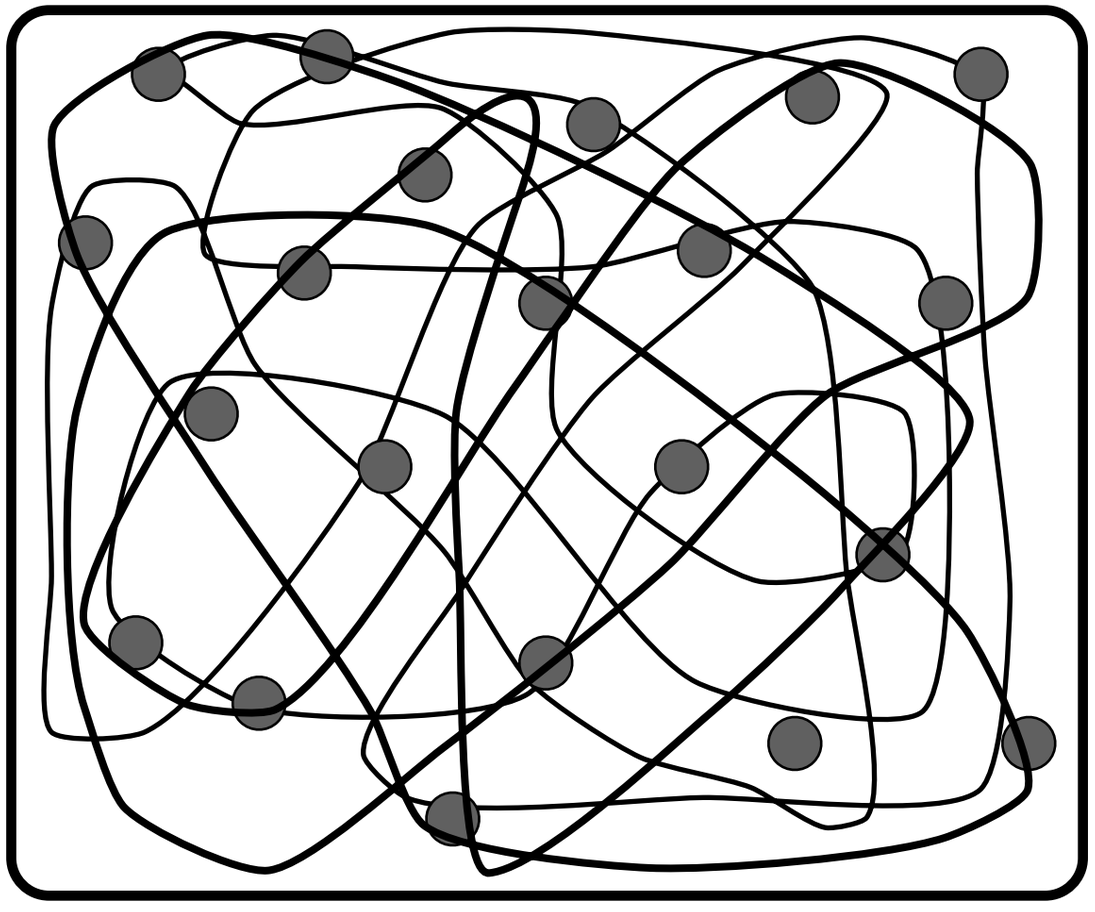
- Bargaining
- Trade
- Learning
- Job Search
- Market Strategy
- Voting
- Opinion formation
- Information Gathering
- Team dynamics
- Collaboration

Economic Models of Social Interaction

Traditional economic models assume "Perfect Mixing"

↓

Everyone interacts with everyone else at random



Sometimes it makes sense to assume perfect mixing.
But sometimes it misses the point!

An example…

My husband's geeky growth chart, created for our daughter's first birthday: geeky-dad.tumblr.com

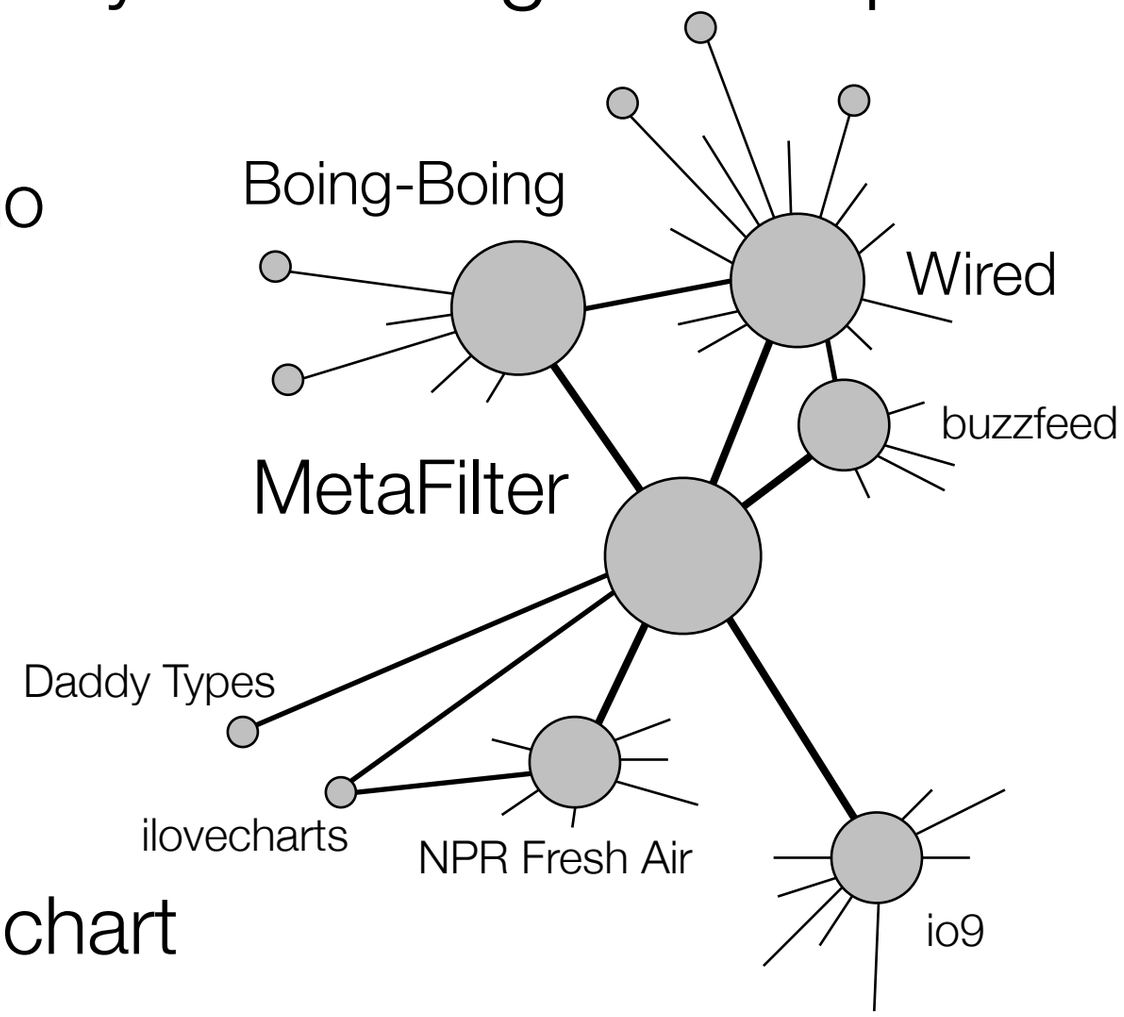
- March 15th, 2011: uploaded--1,500 downloads
- March 28th, 2011: 2,500 downloads
- March 29th, 2011: posted to metafilter
- March 30th, 2011: 30,000 downloads

As of 2012, it had been downloaded over 60,000 times

A Network Perspective

Perfect mixing is not the right way of looking at the spread of the growth chart

- Who gets information from who becomes important
- Some people are more important than others



This has implications for:

- how you might market the chart
- who controls the spread of information
- what kinds of products become popular

Um…duh. But this isn't the way social scientists are used to thinking about these things!

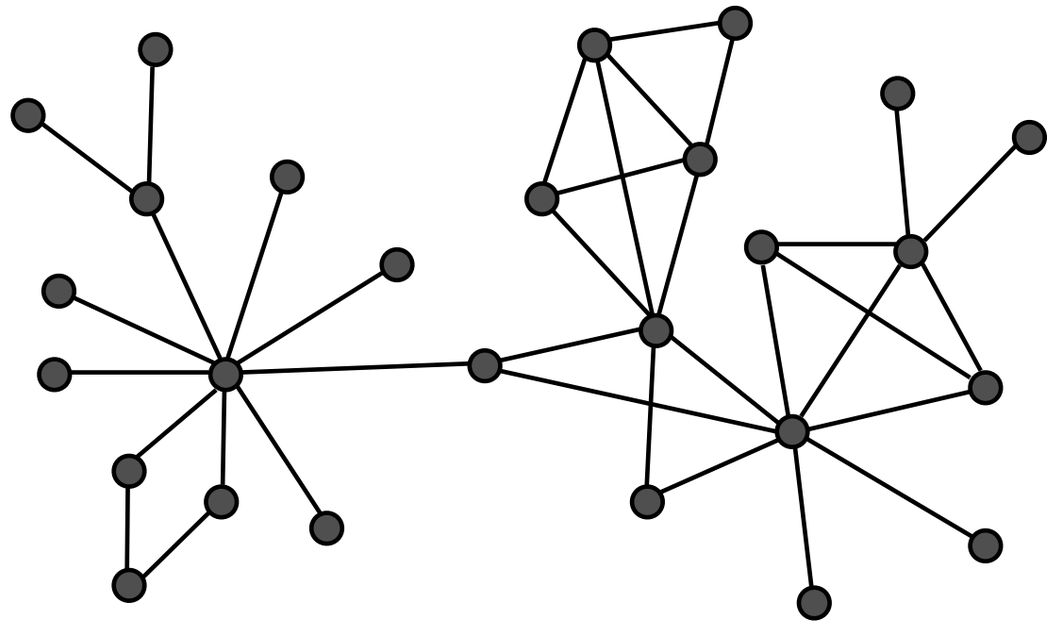
Social Networks as an alternative way to study human interaction

Social Networks give us a way to organize people and track their interactions

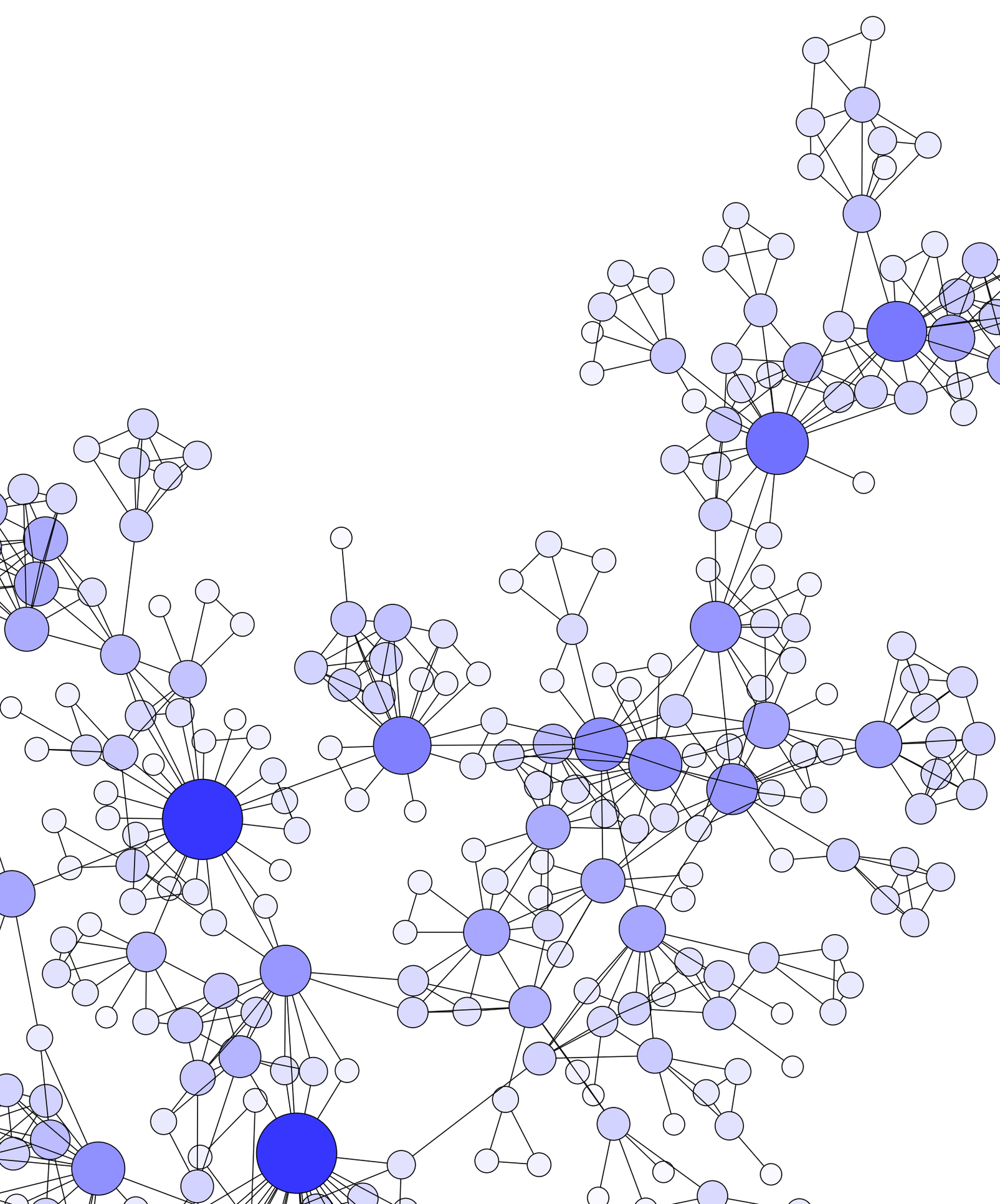
Nodes: people, firms, organizations

Edges: interactions

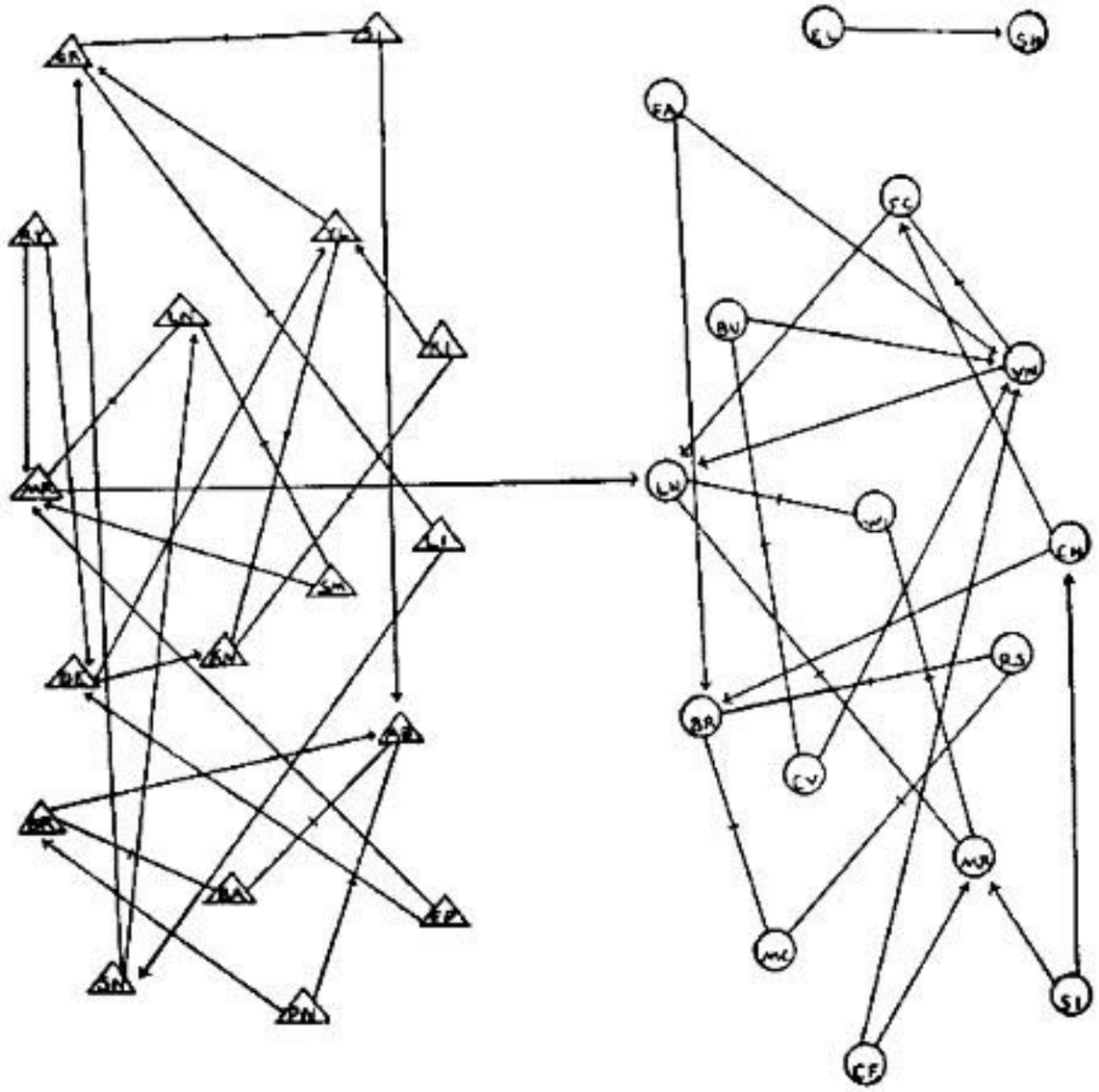
- Friendships
- Acquaintances
- Professional contacts
- Dating
- Co-location



How you define a node and an edge depends on what you want to understand...

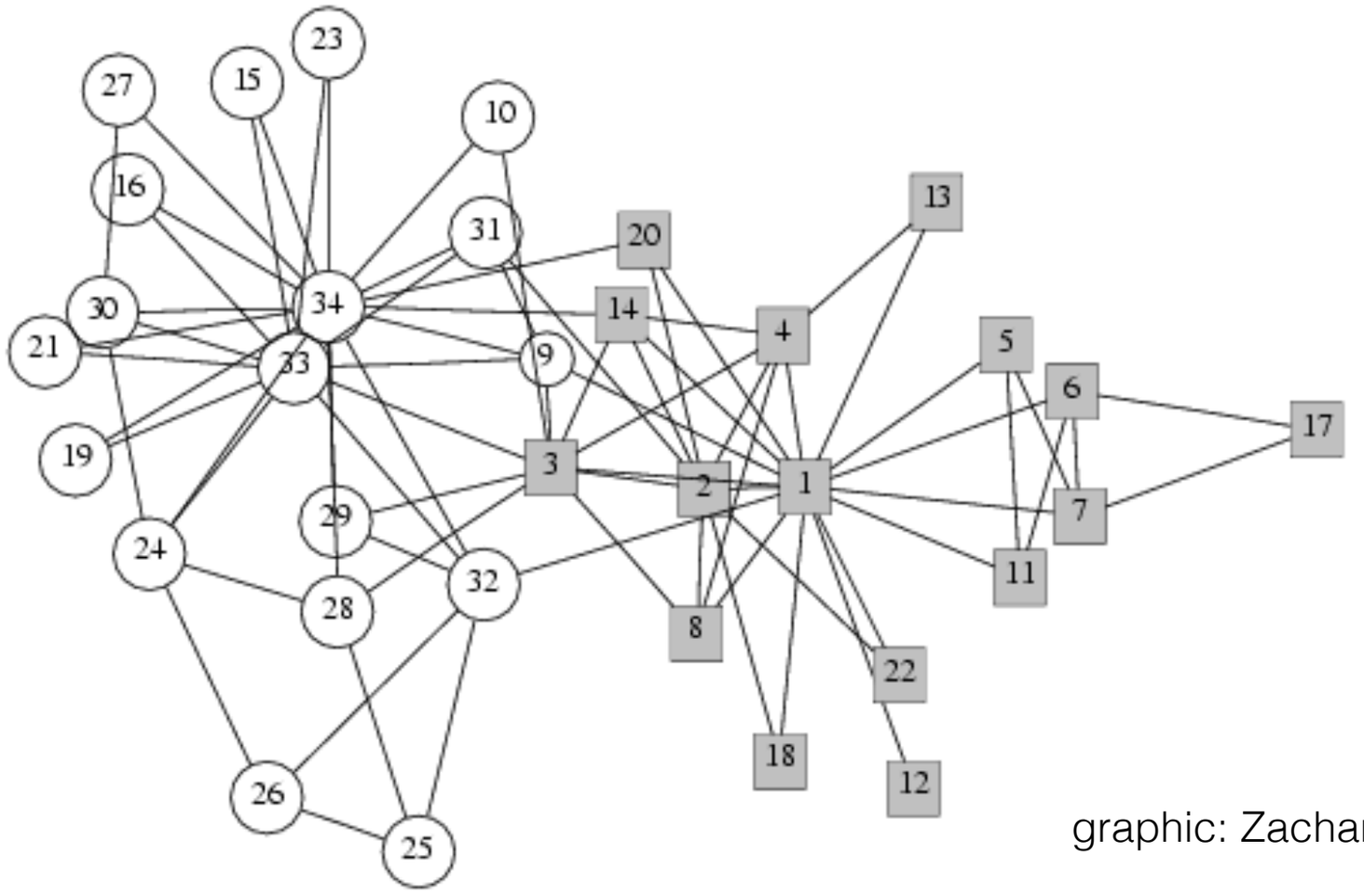


Famous Networks of History



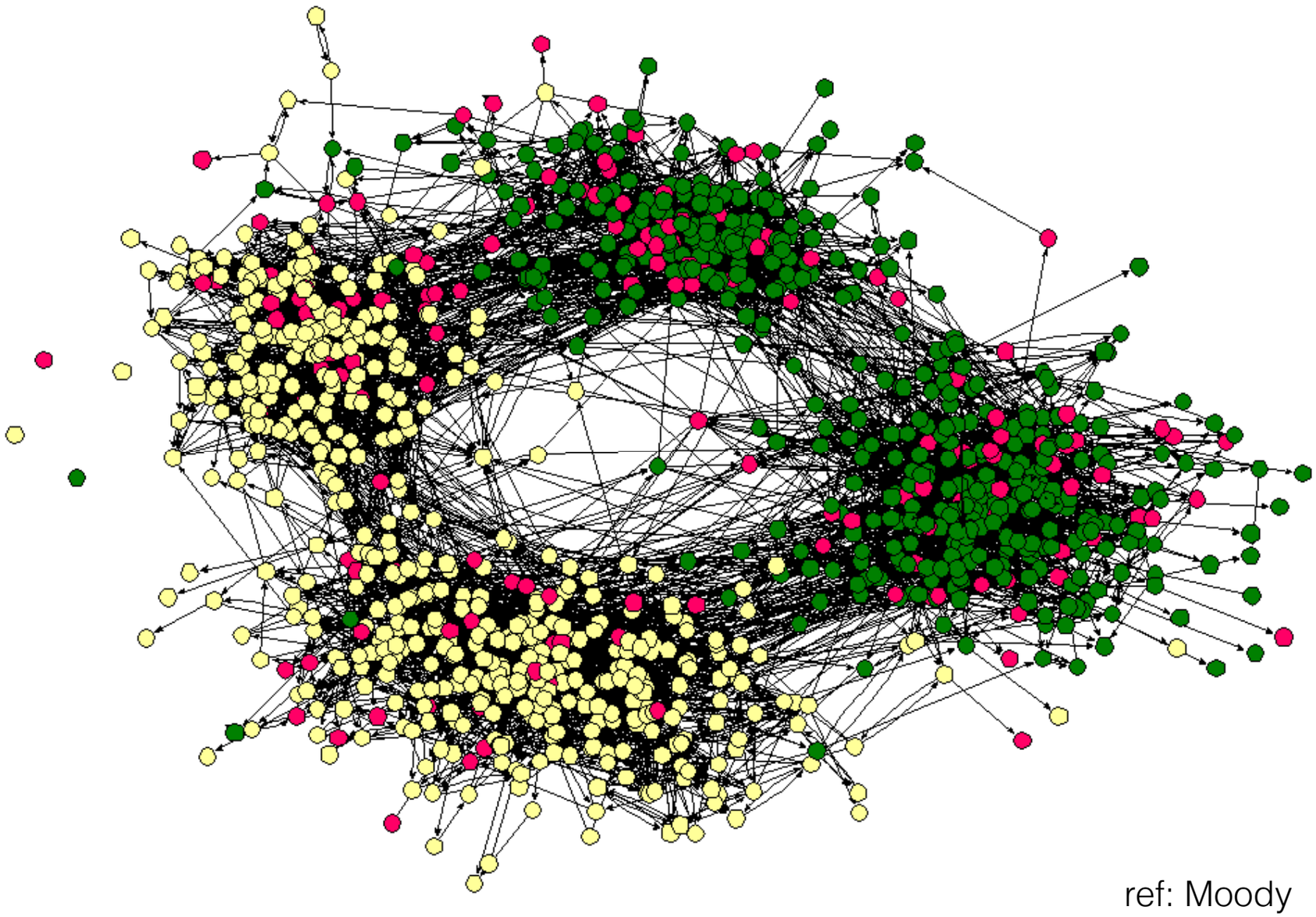
ref: Moreno

“Sociograms”: Moreno School Friendship Network (1934)



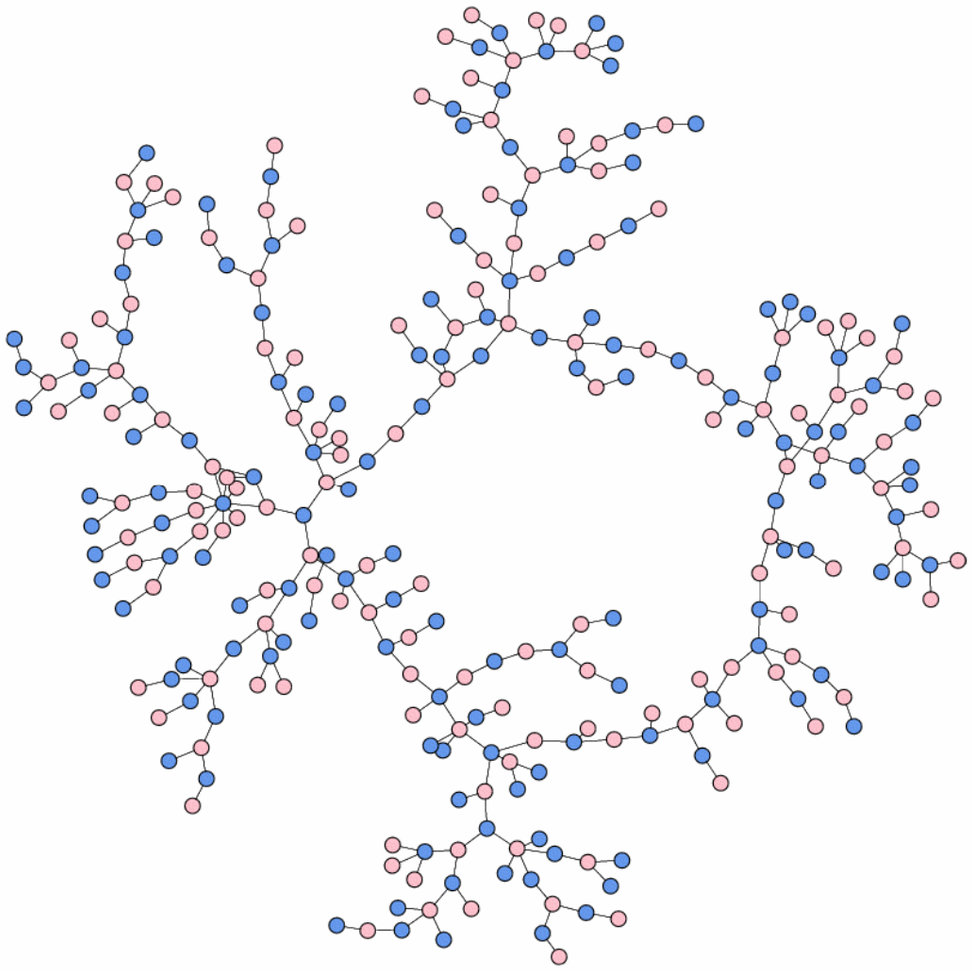
graphic: Zachary

Zachary Karate Club Network



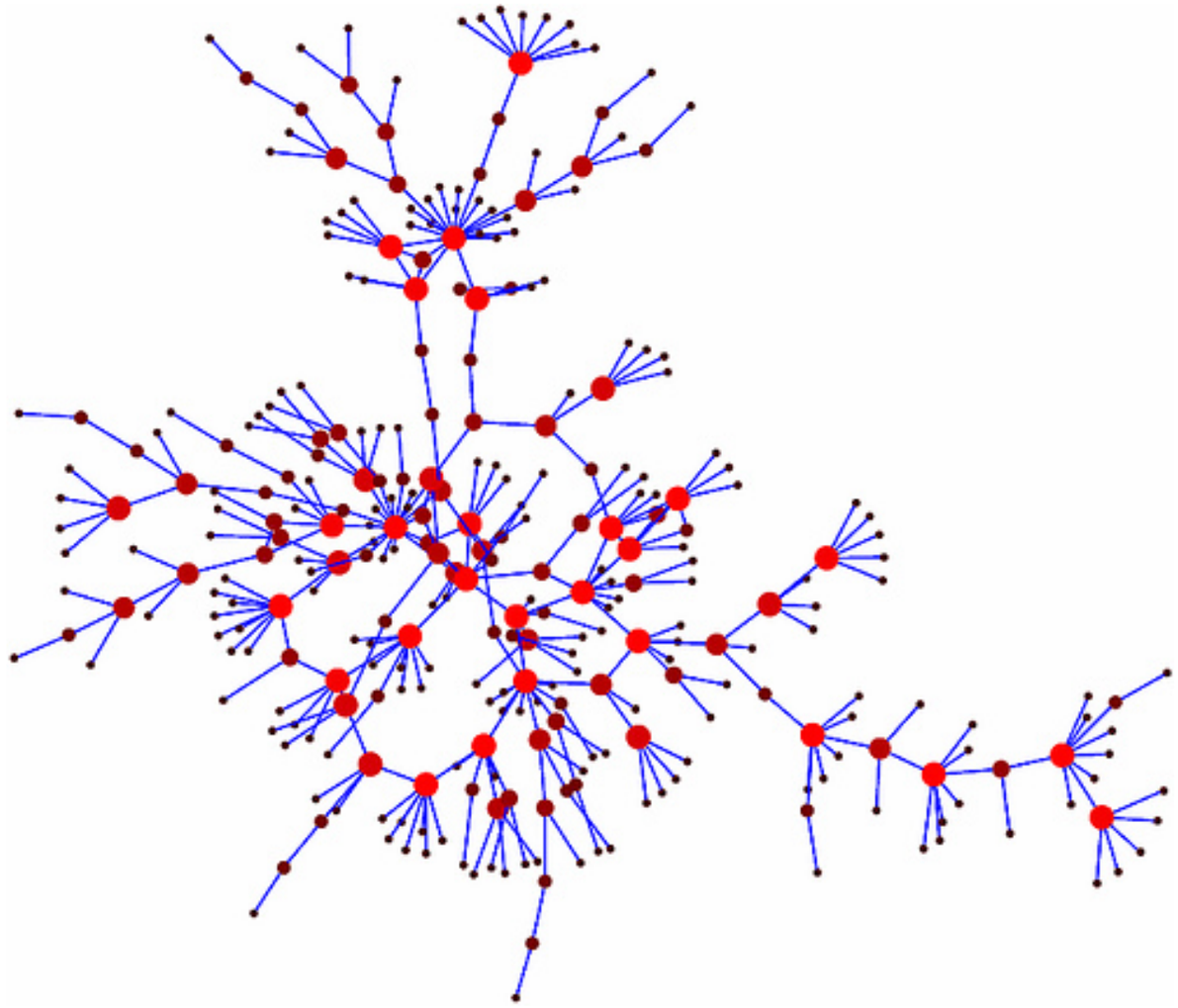
ref: Moody

High School Friendships (Moody 2001)



High School Dating

ref: Data by Bearman et al (2004)
Graphic by M.E.J. Newman

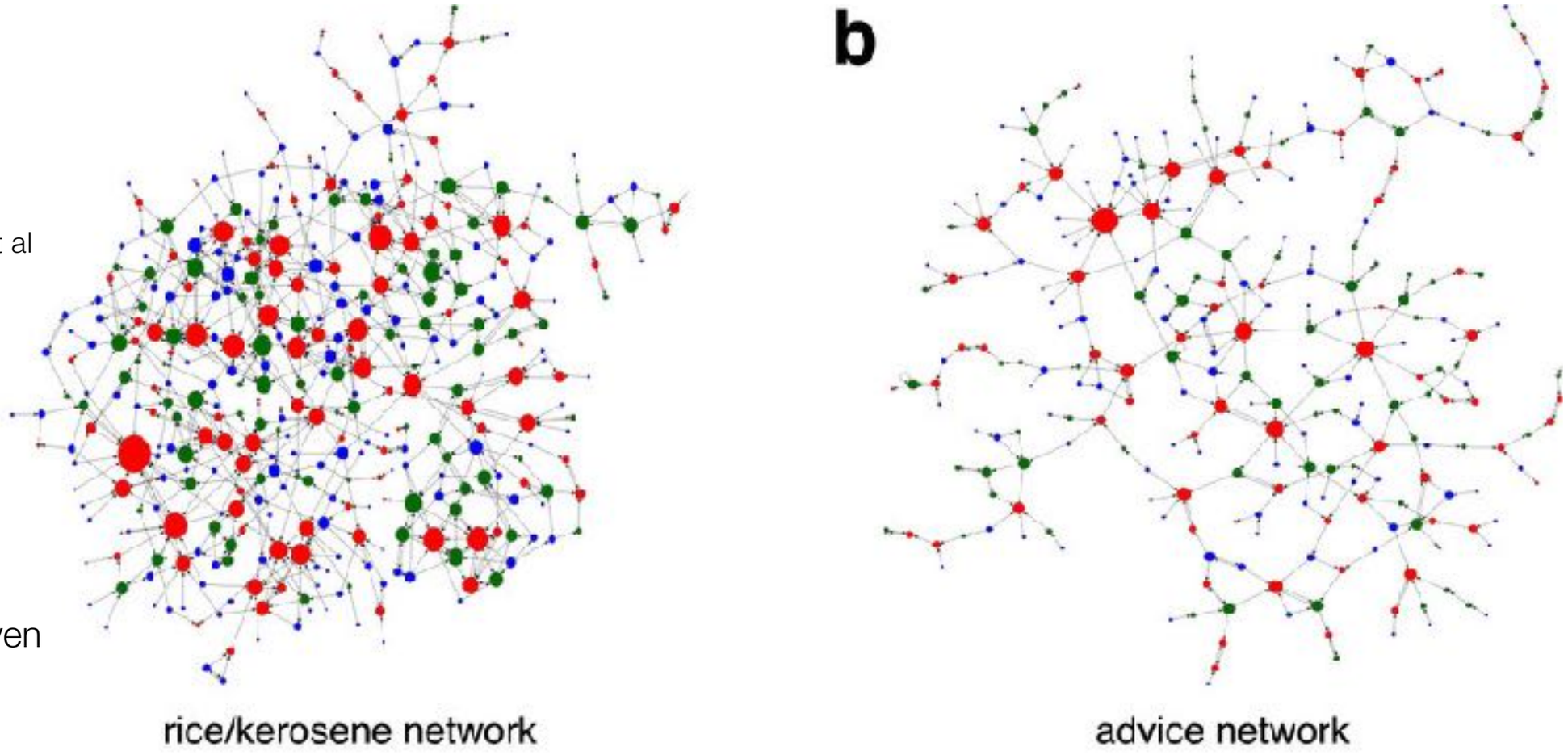


Sexual Contacts

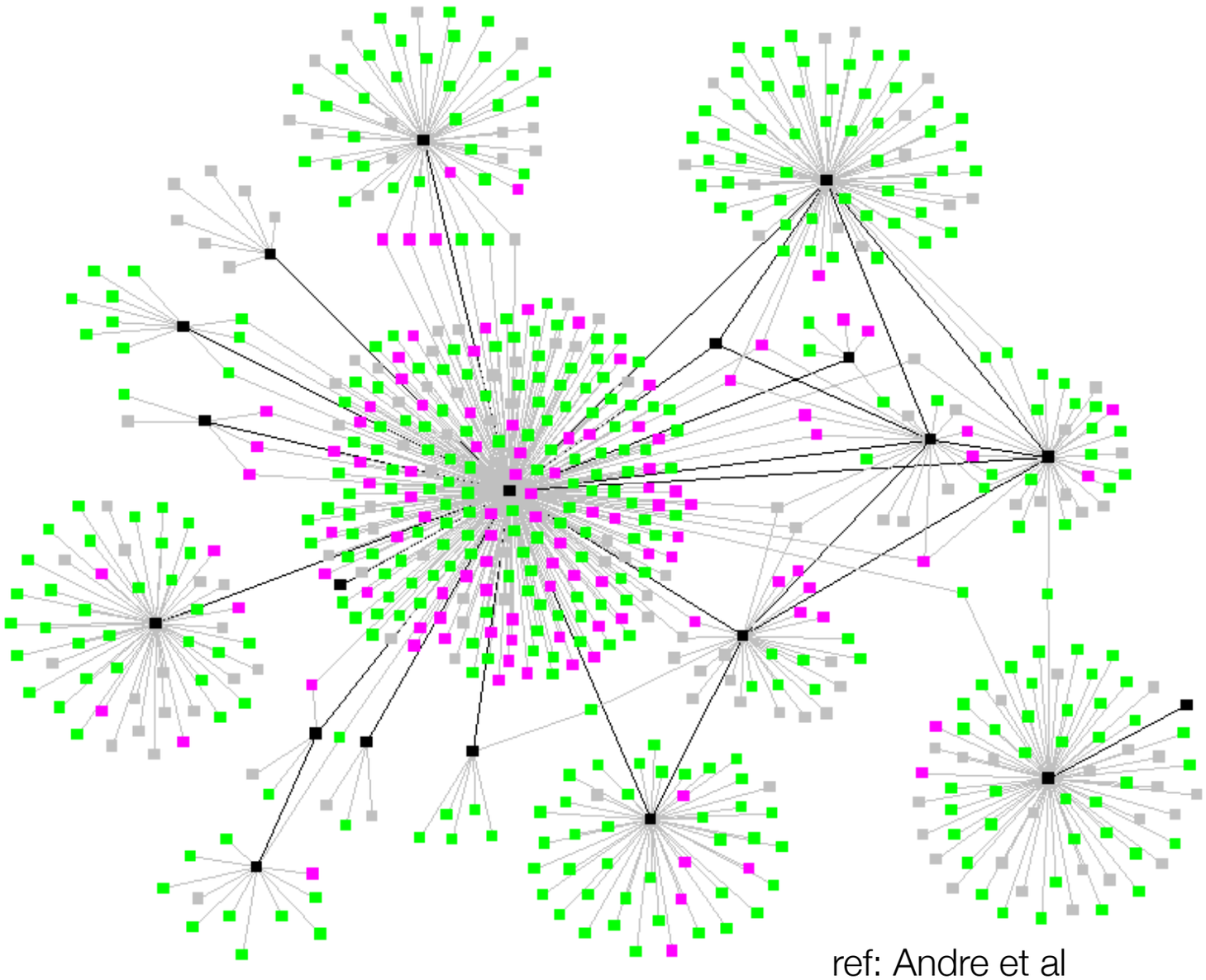
ref: Potterat et al (2002)

graphic: Wardil
and Hauert
data: Jackson et al

Red = in
Blue = out
Green = even



Trust and Information

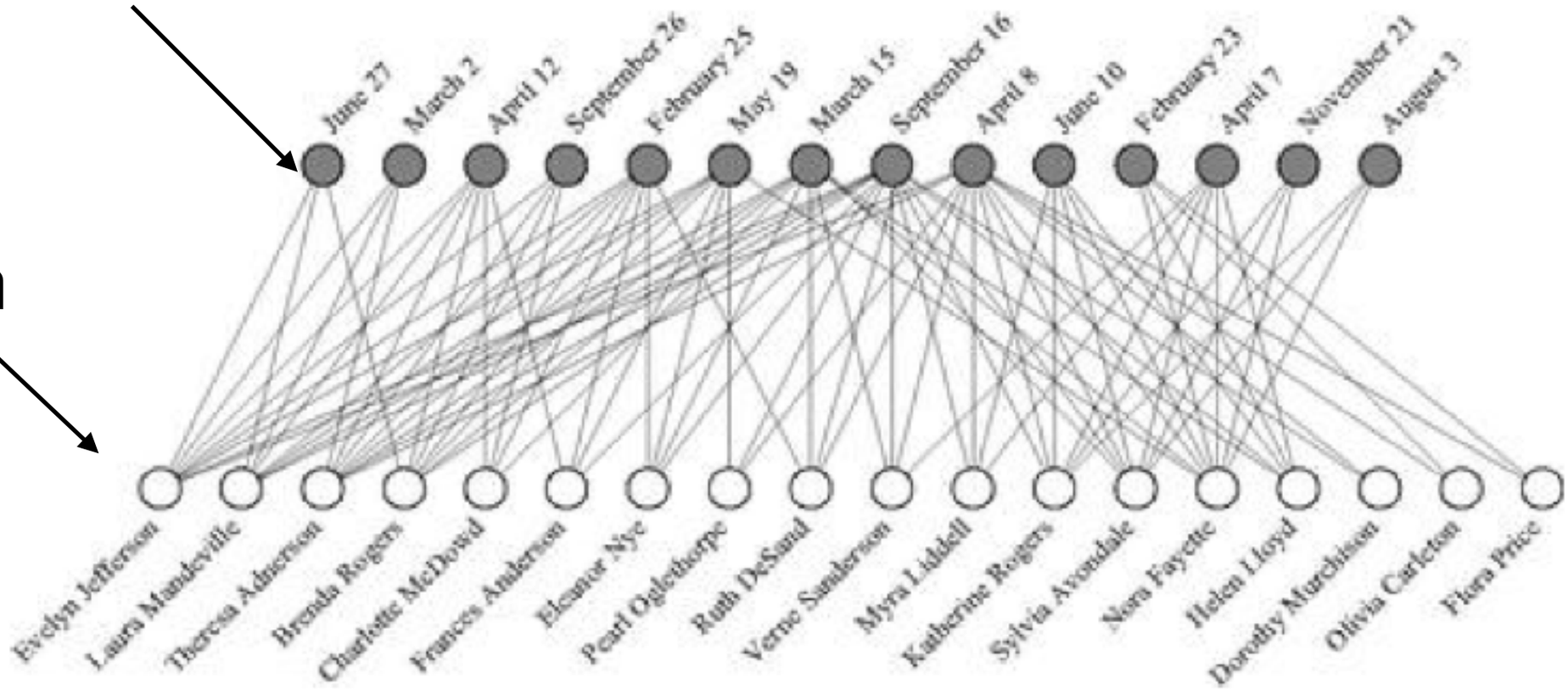


ref: Andre et al

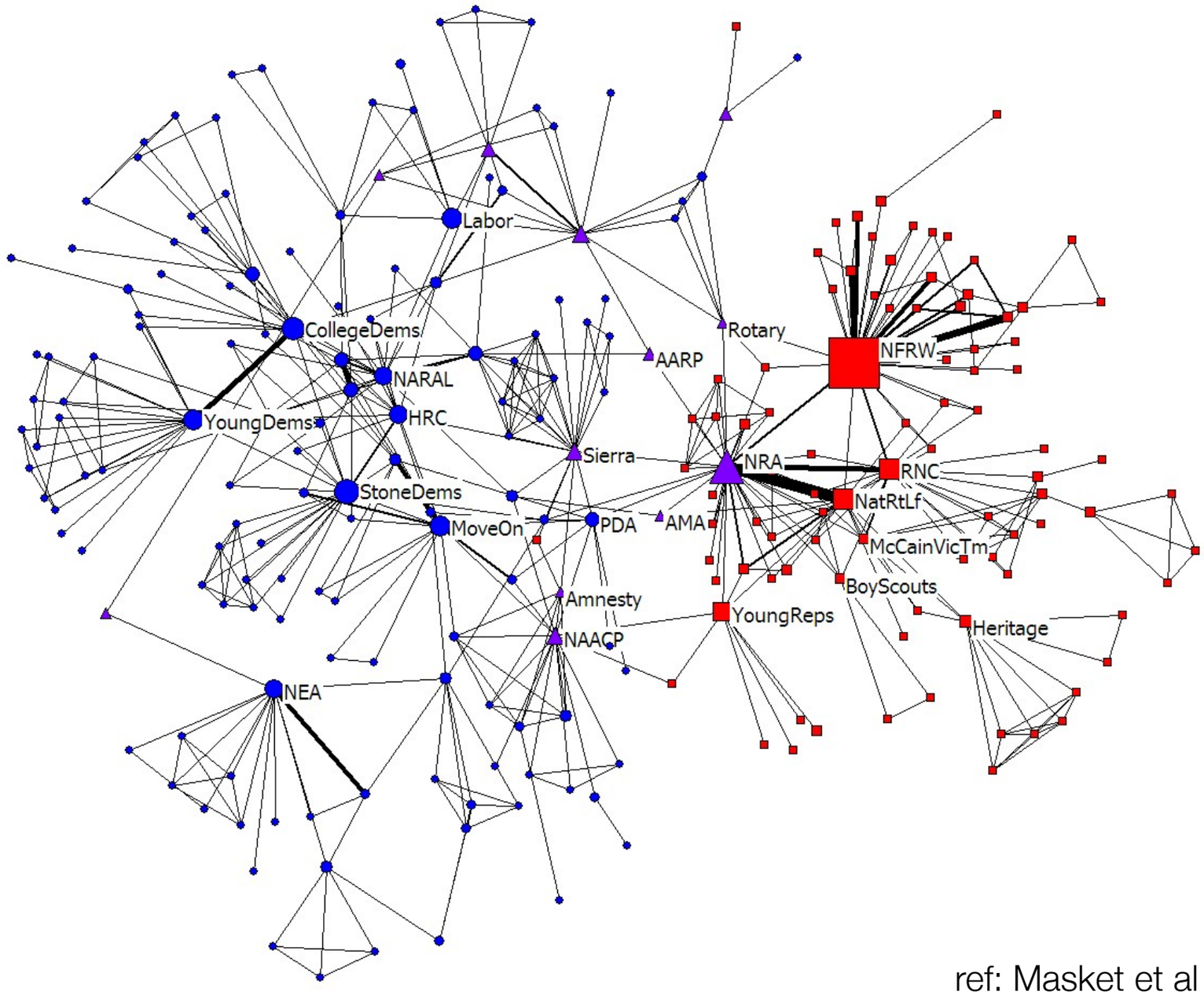
Epidemiological Network: Tuberculosis

Social Events

Women

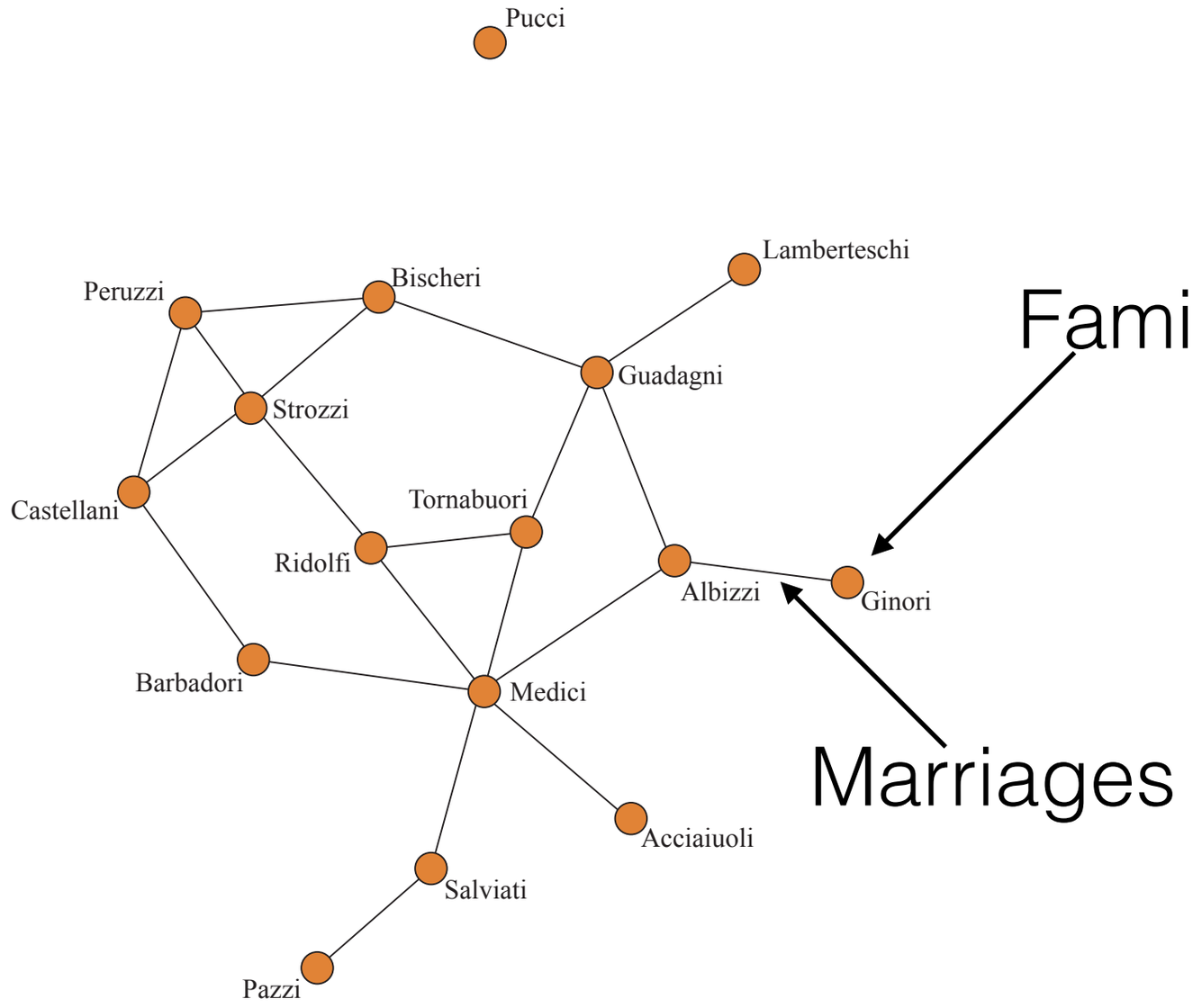


Affiliation Networks: The Southern Women Network

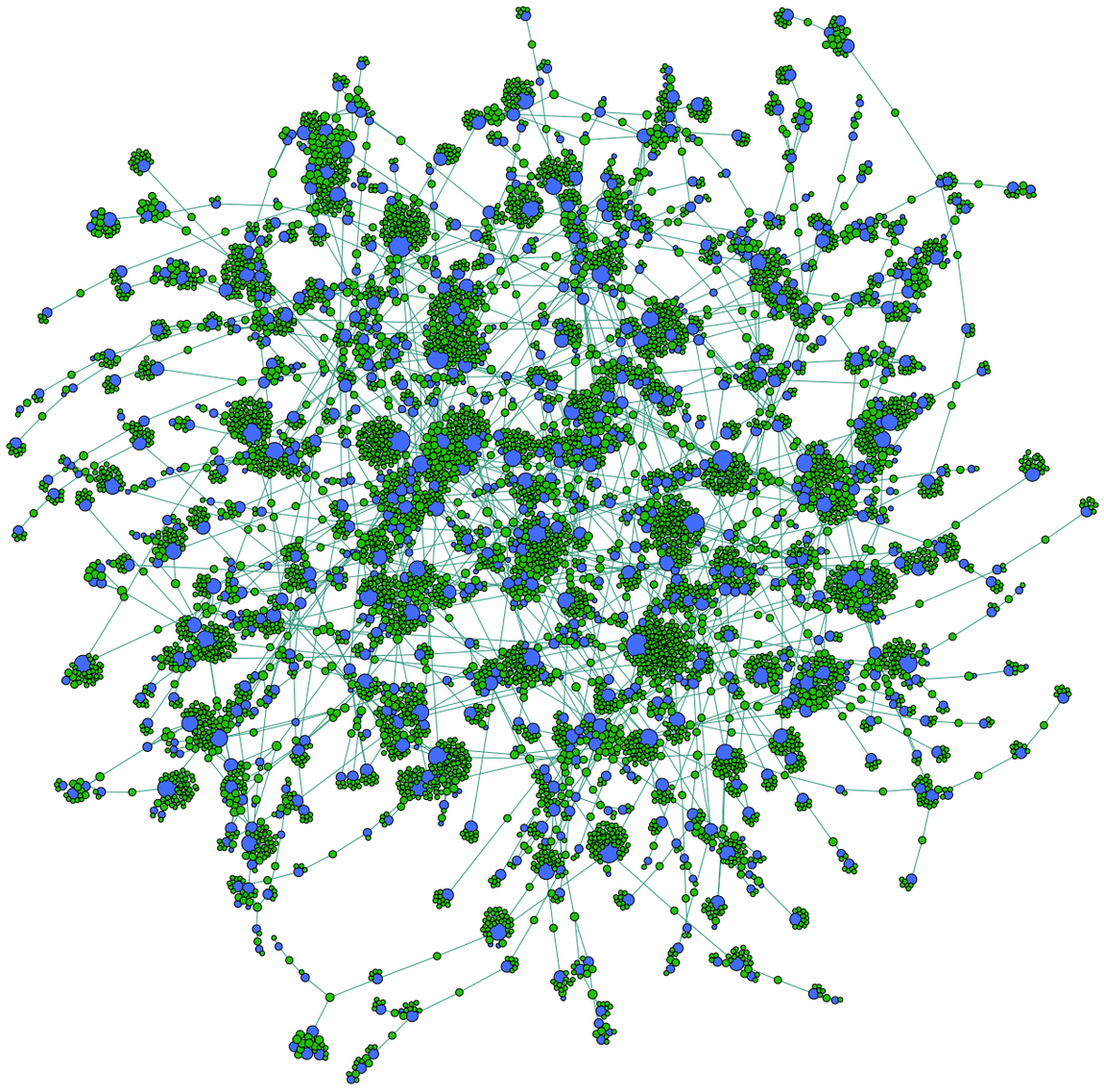


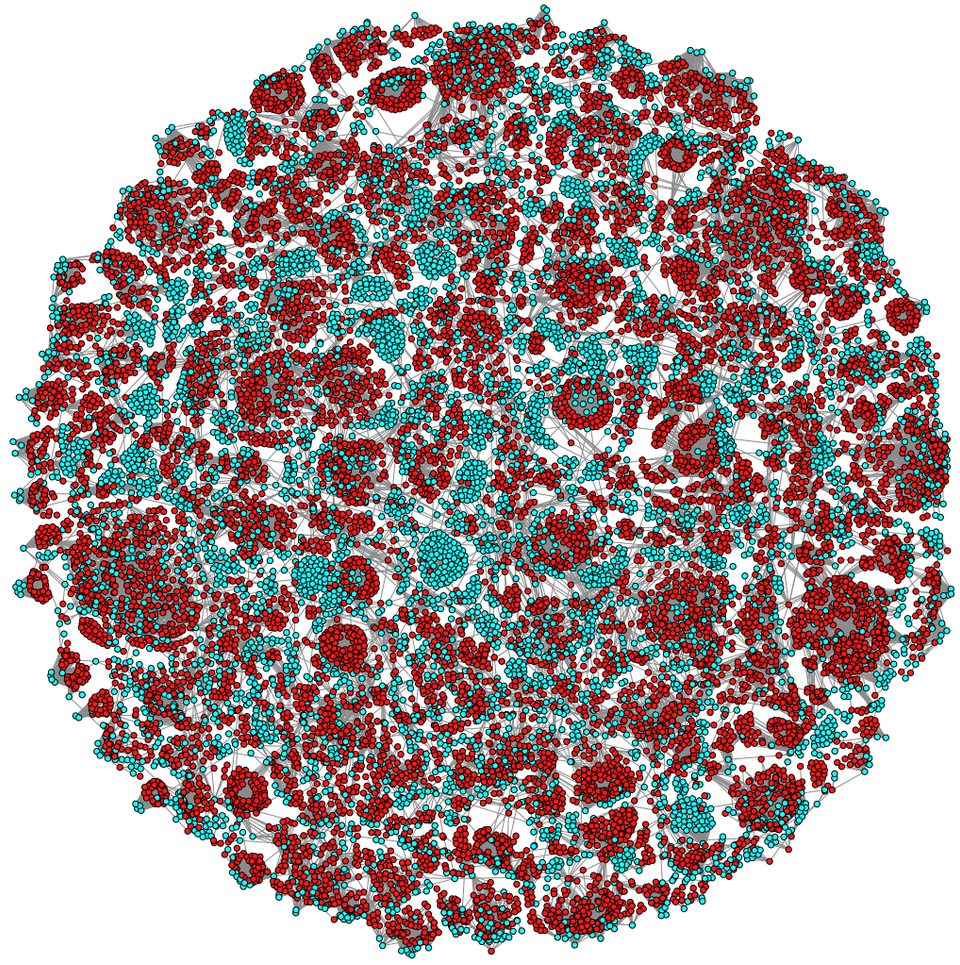
ref: Masket et al (2009)

Co-membership Networks: US delegate survey



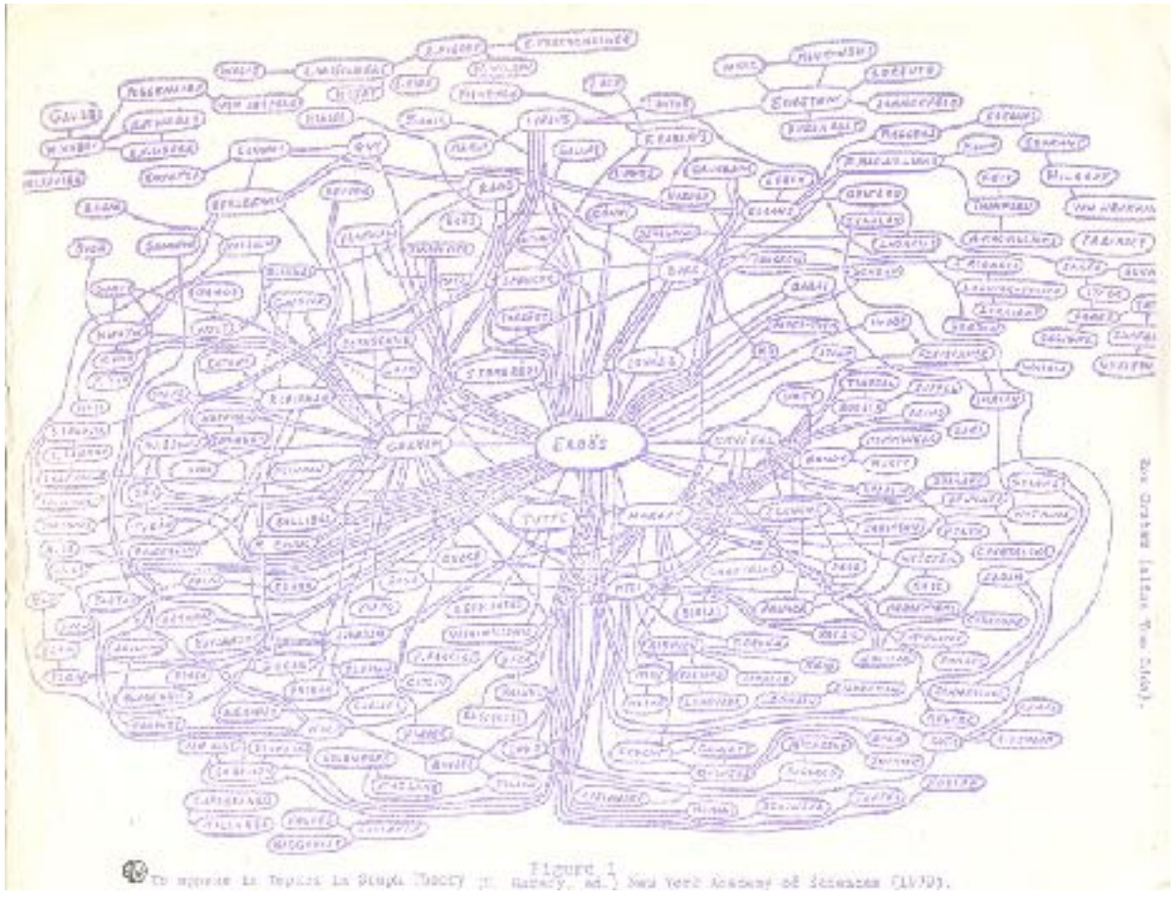
Political Networks: Florentine Marriage





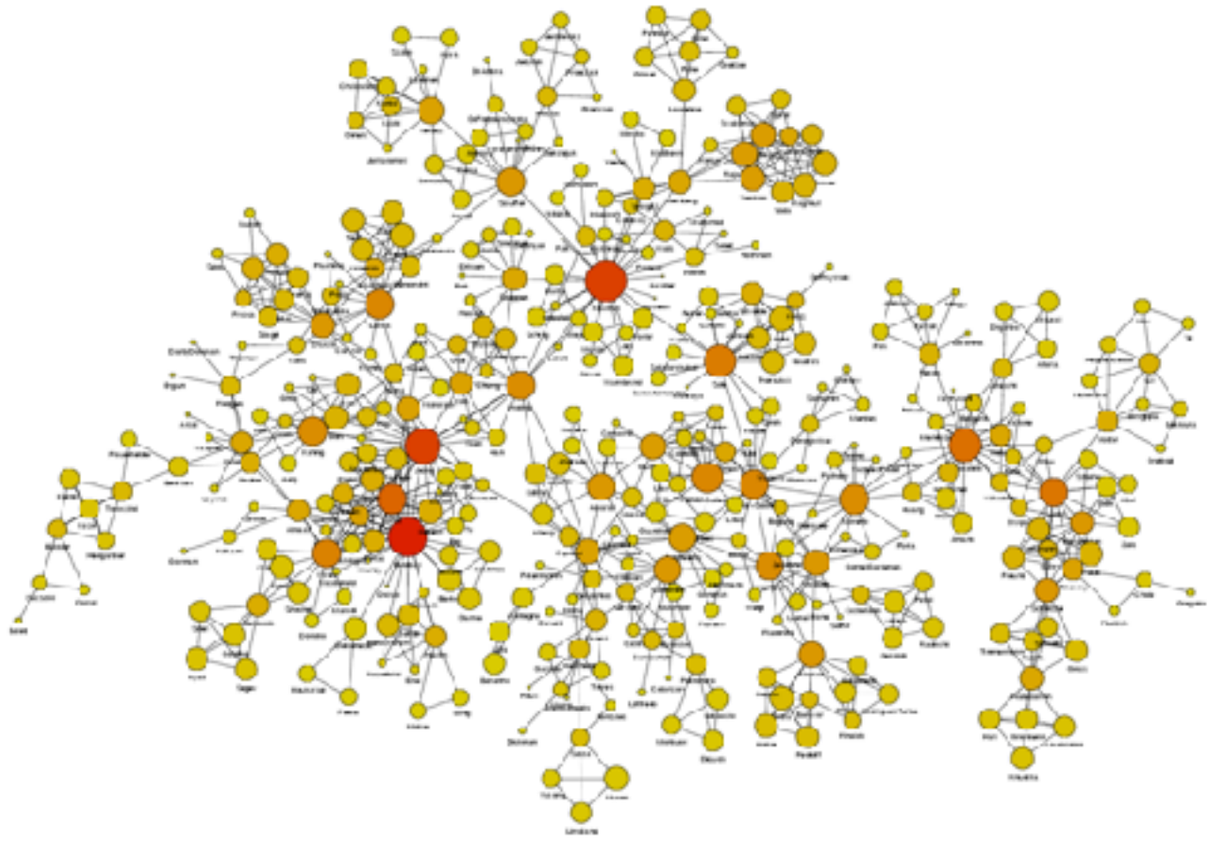
Political Networks: Lobbyists, Firms, and Contracts

Coauthorship Networks



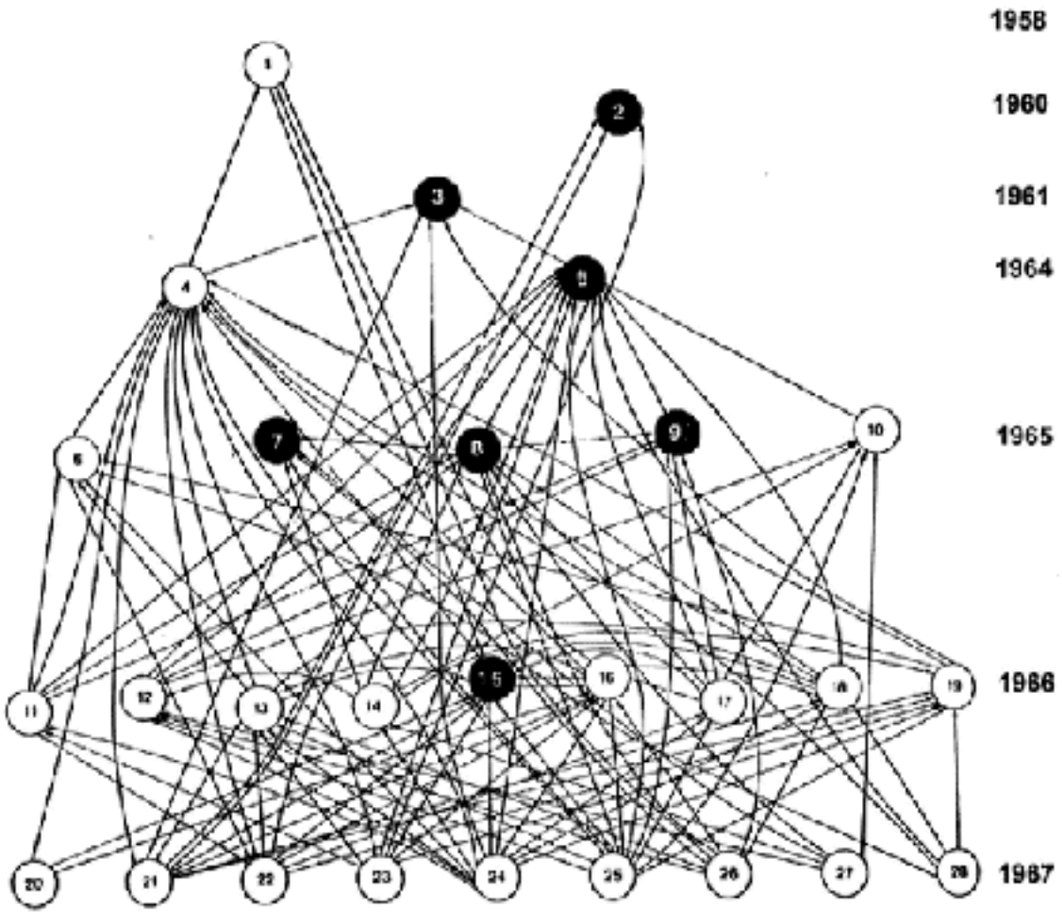
Mathematics

Ref: The Erdös Number Project, Jerry Grossman and Patrick Ion



Network Science

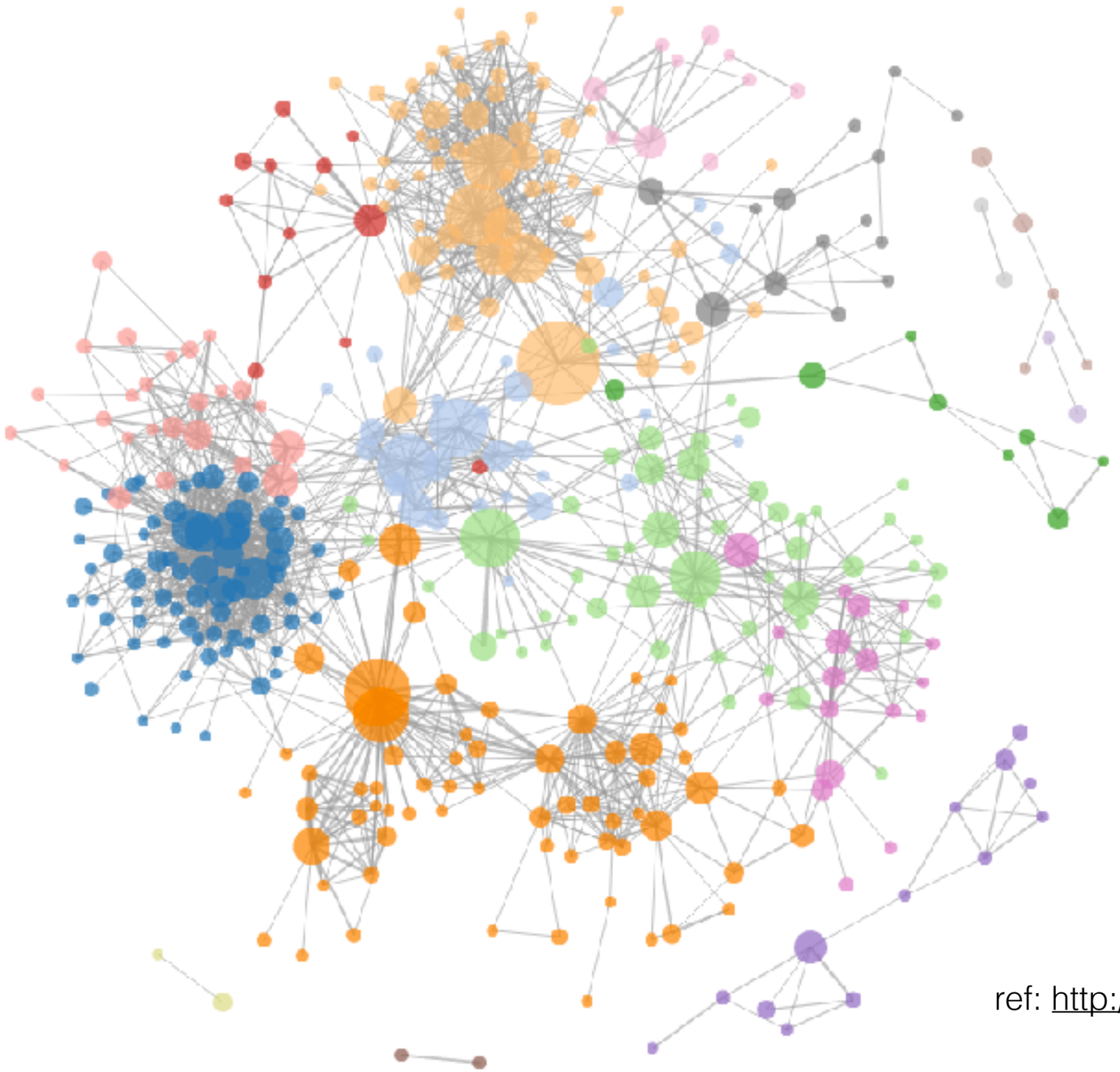
Ref: MEJ Newman (2006)



Citation in early DNA research: Garfield (1997)

SNA citation: Thomas Ullmann

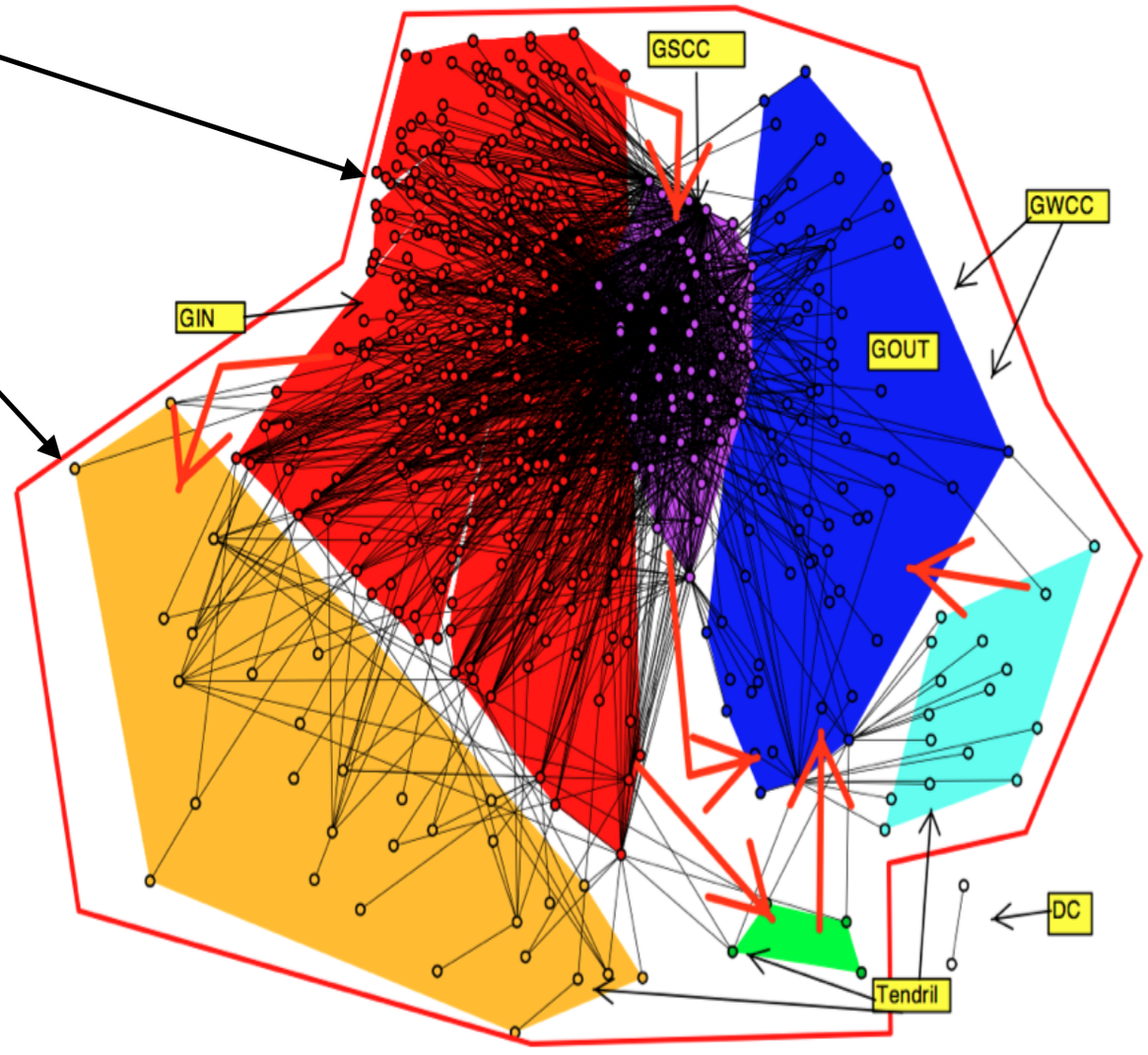
Citation Networks



ref: http://goo.gl/L9ars

Sociology Citation Network

Financial Institutions

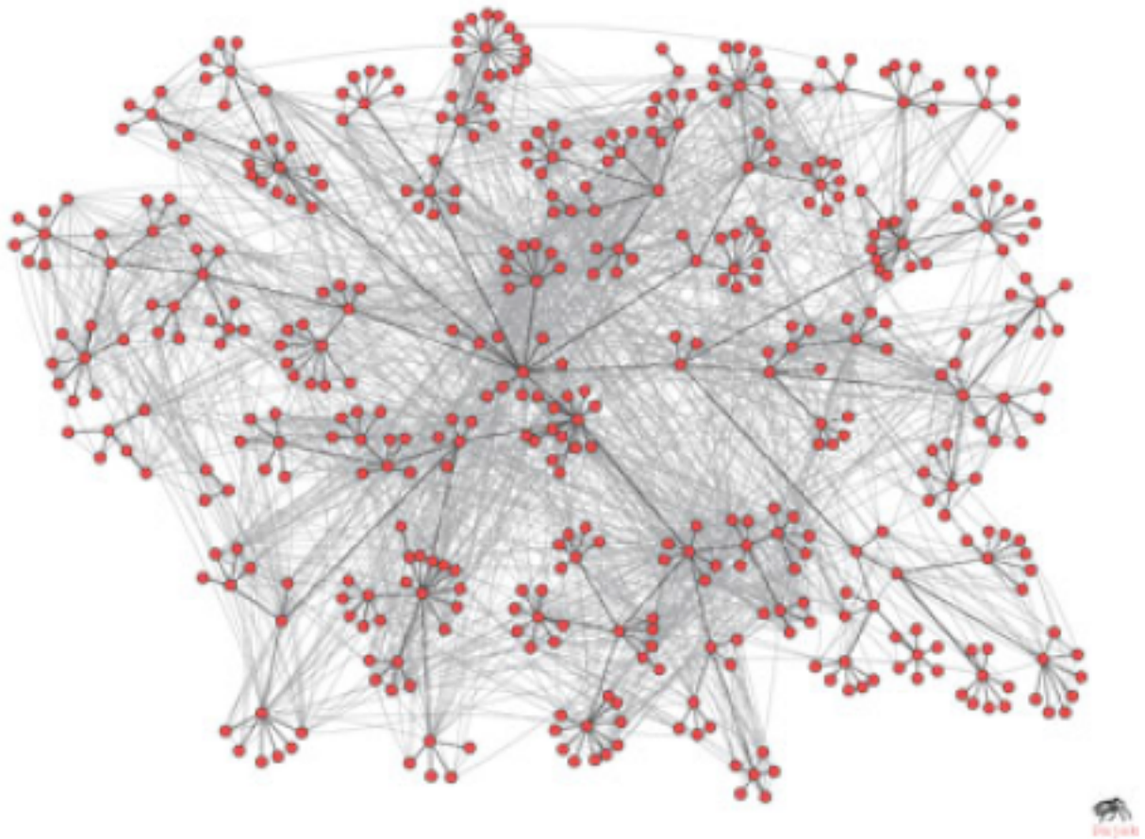


Links = dollars borrowed/lent

ref: Bech and Atalay 2008

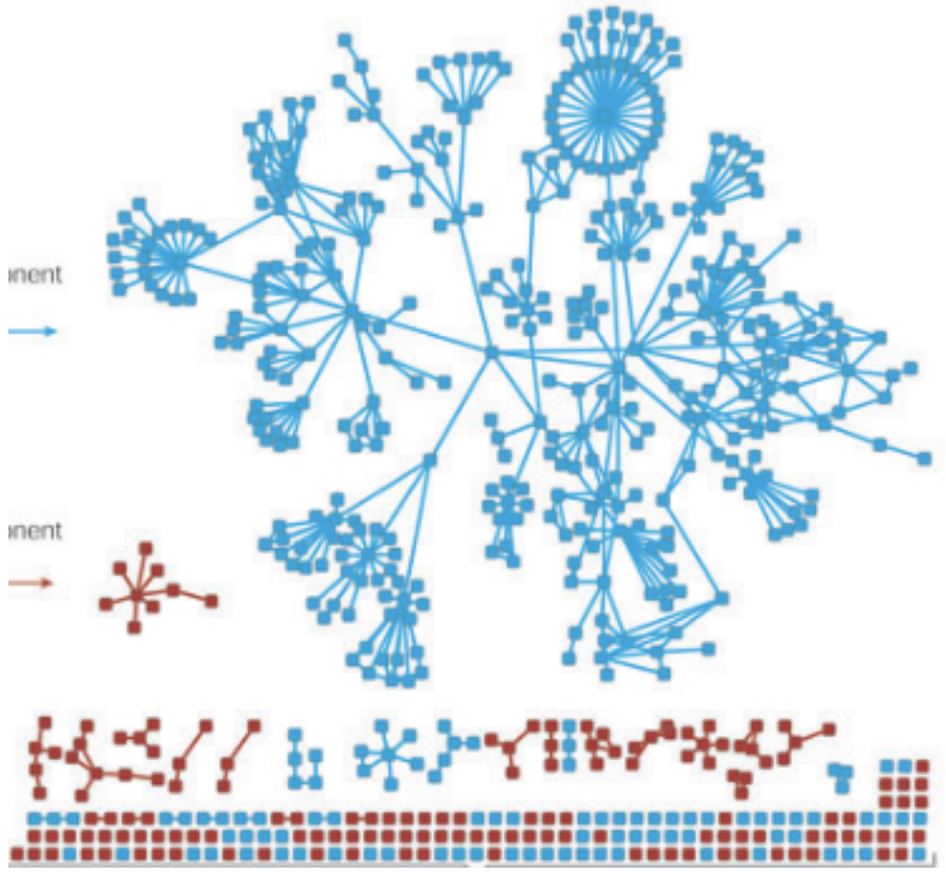
Financial Networks

HP email



ref: Adamic

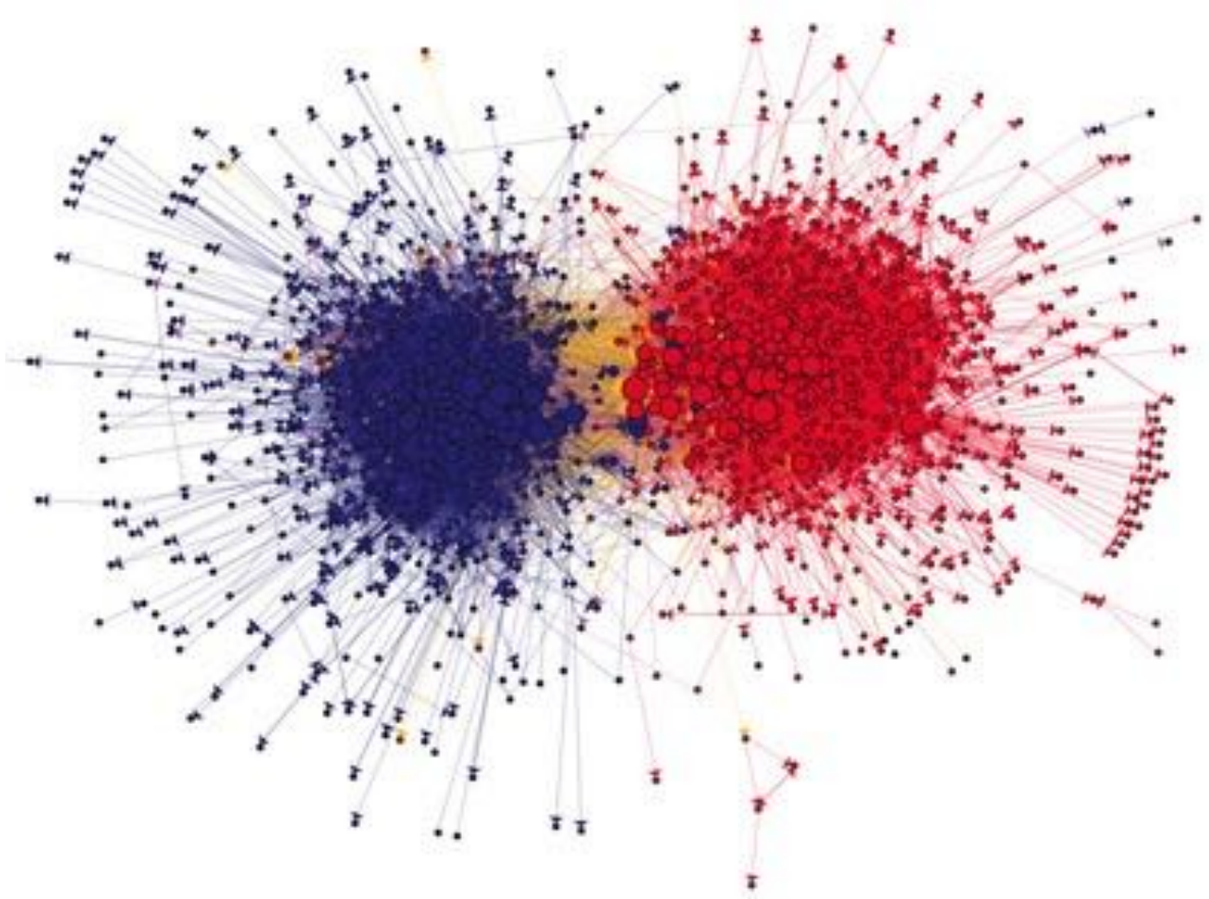
Cell Phone Calls



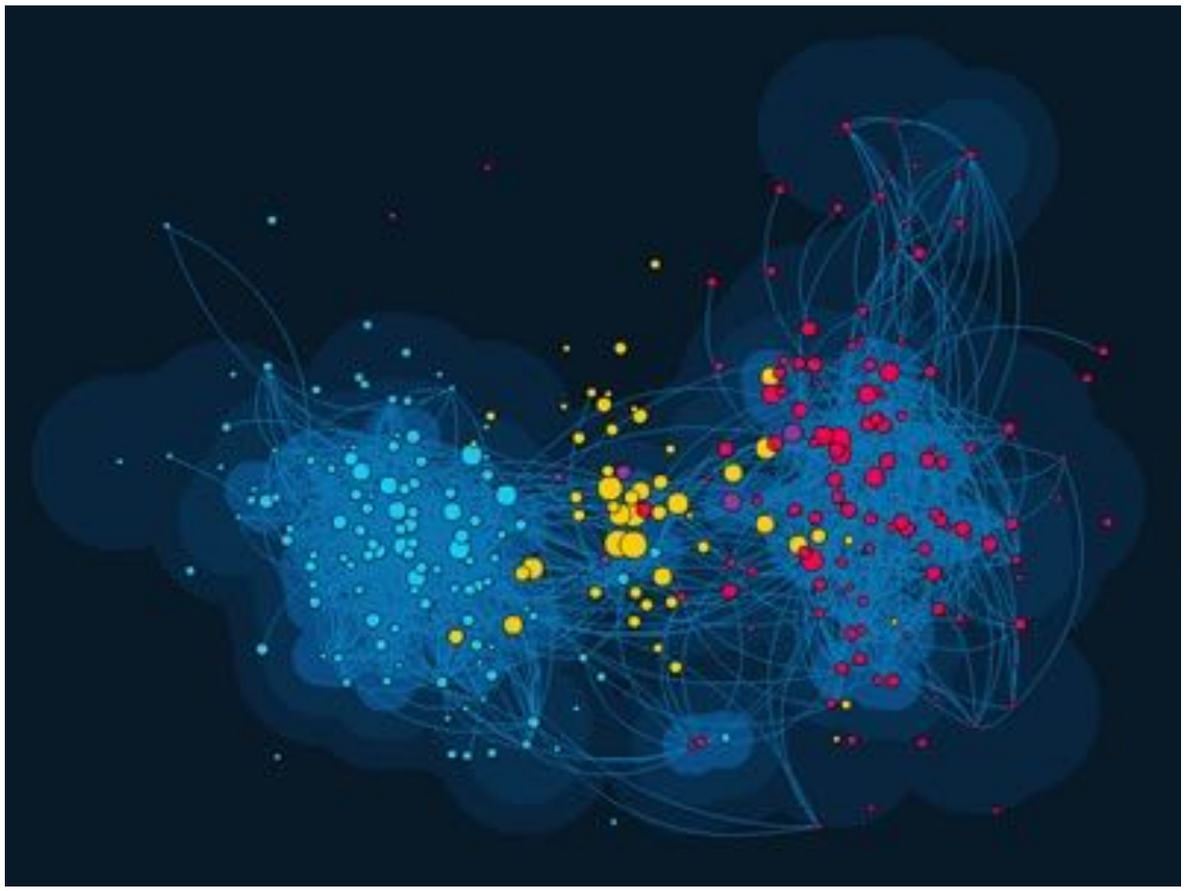
ref: Barabasi

Communication Networks: Email and Cell Phone

2004

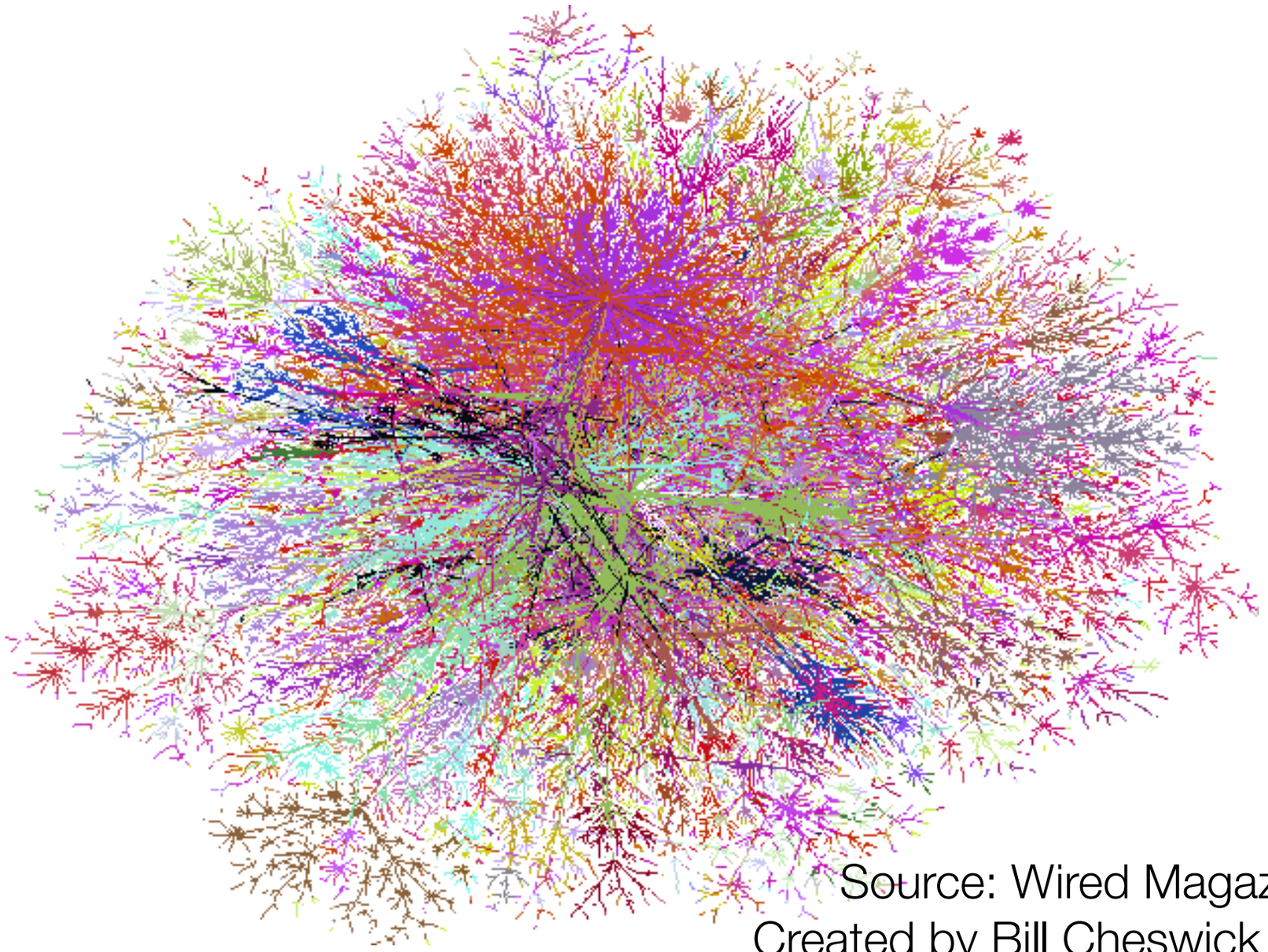


2008



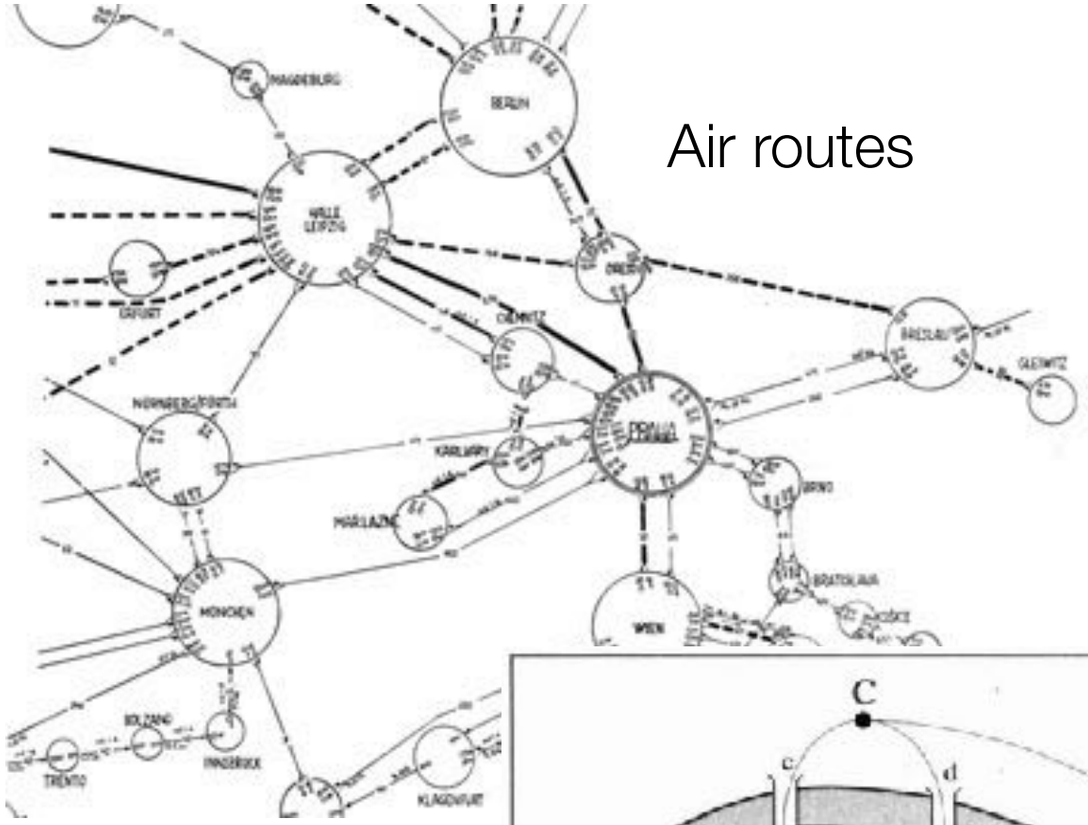
ref: Adamic political blogs

Online Link Networks: Lada Adamic Political Blog Networks



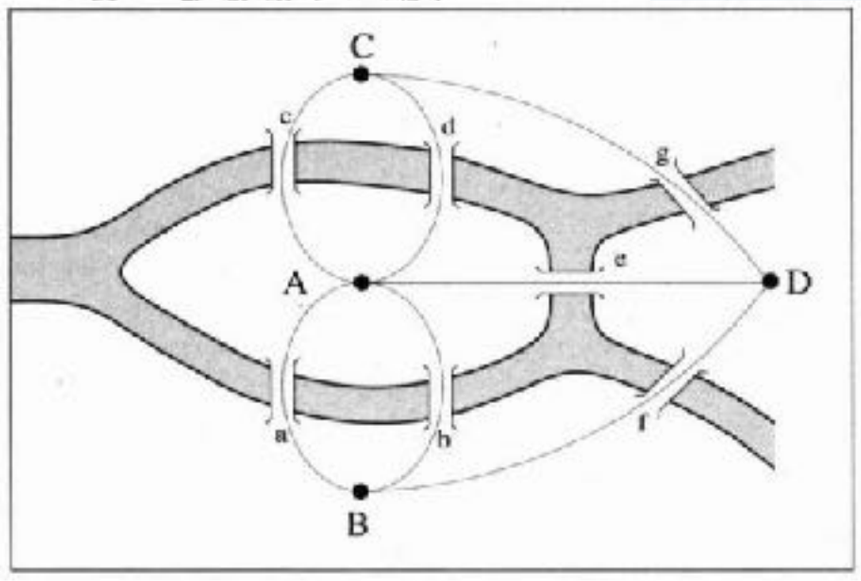
Source: Wired Magazine (1998)
Created by Bill Cheswick and Hal Burch

Physical Networks: Internet Servers



Air routes

Subway



Seven Bridges

Physical Networks: planes, trains and automobiles

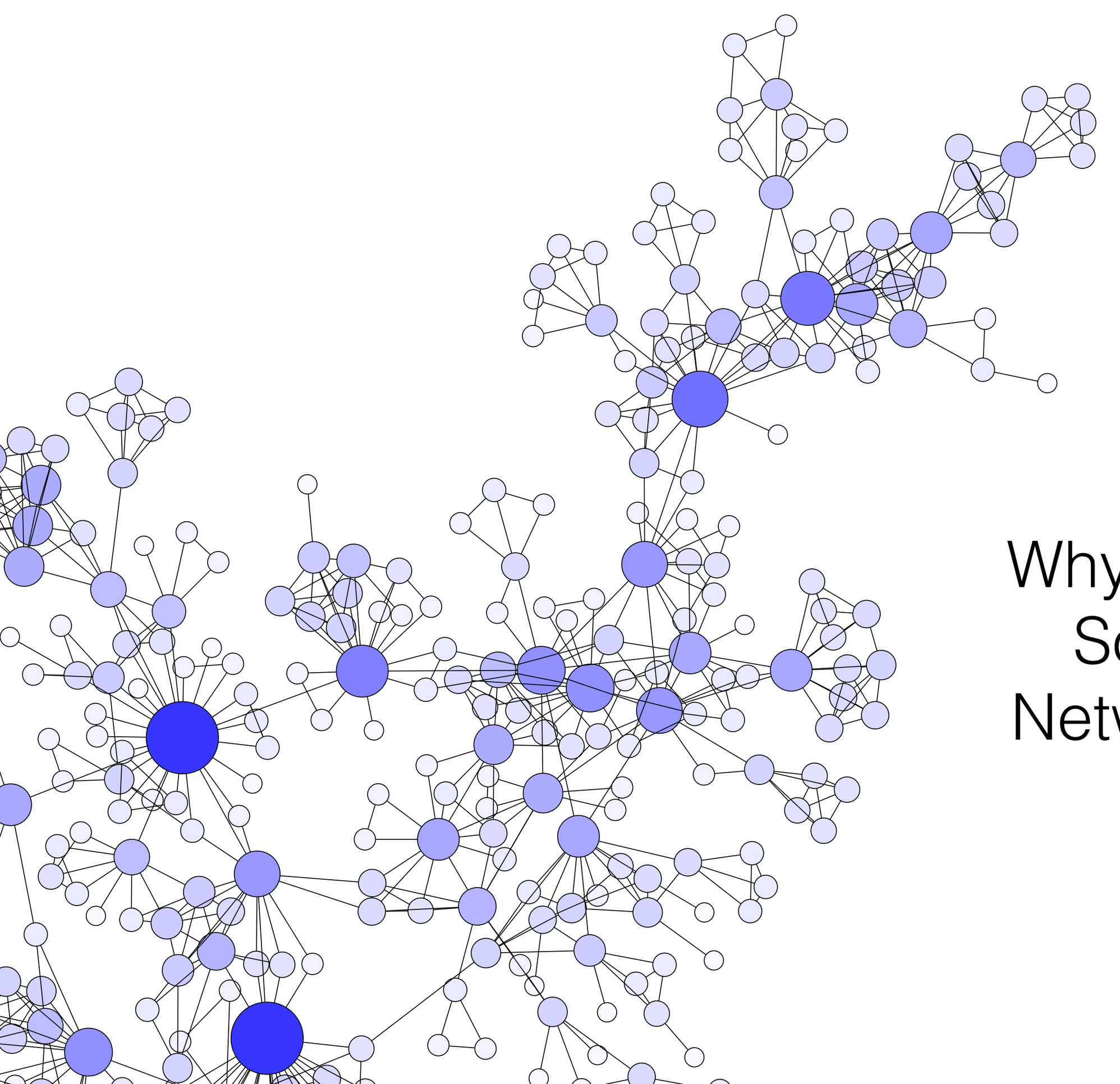
Manhattan Flickr Tracker

ref: Crandall et al 2009

Medieval Trade Networks

ref: Easley and Kleinberg

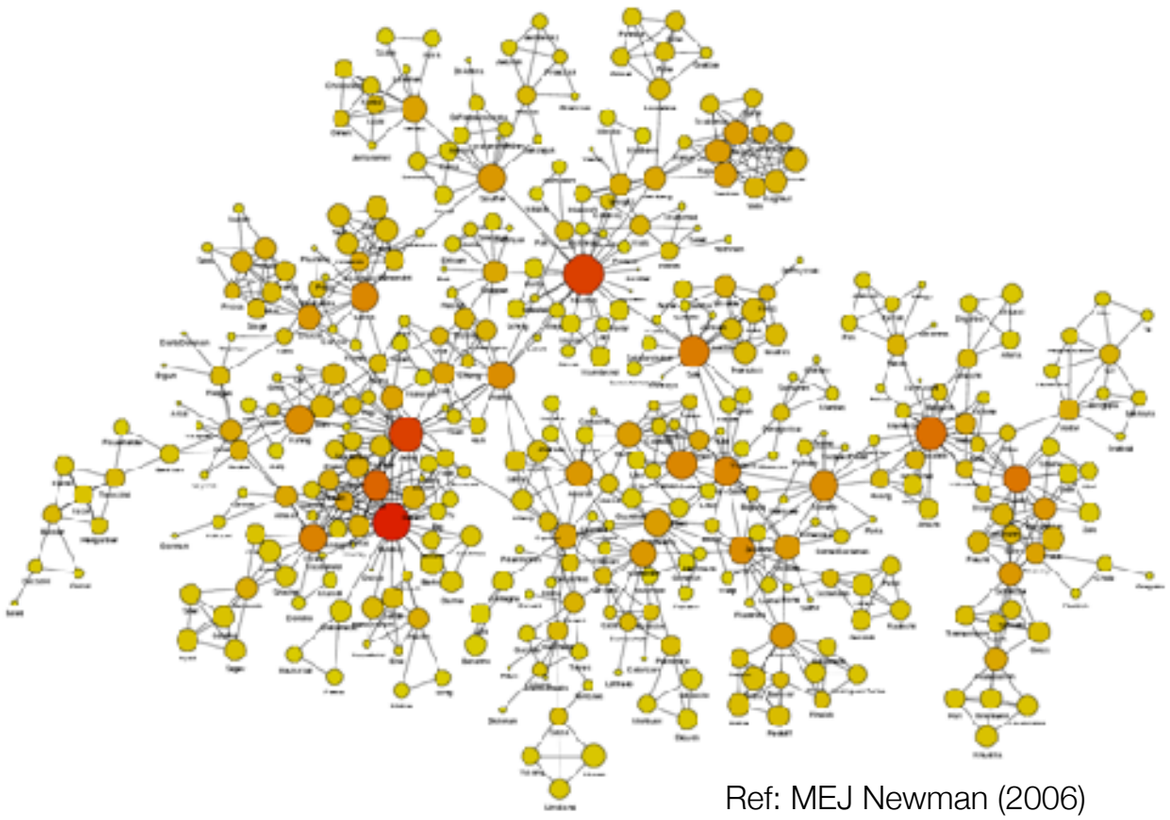
Physical Networks: Movement



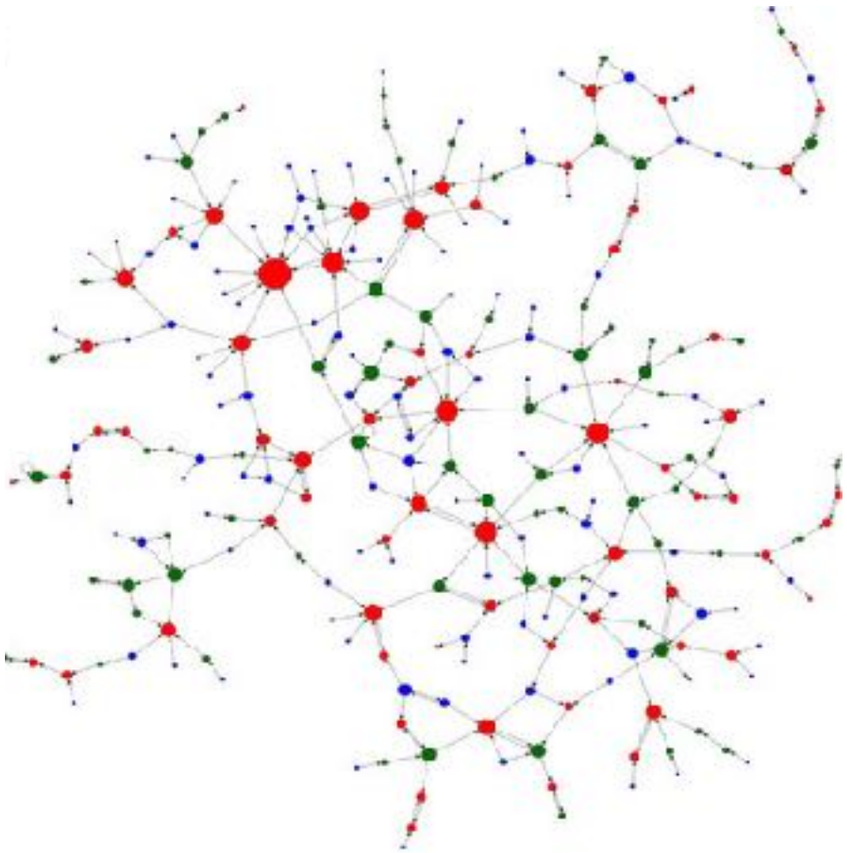
Why Study Social Networks?

Why study social networks?

Network structure reflects social structure



Ref: MEJ Newman (2006)



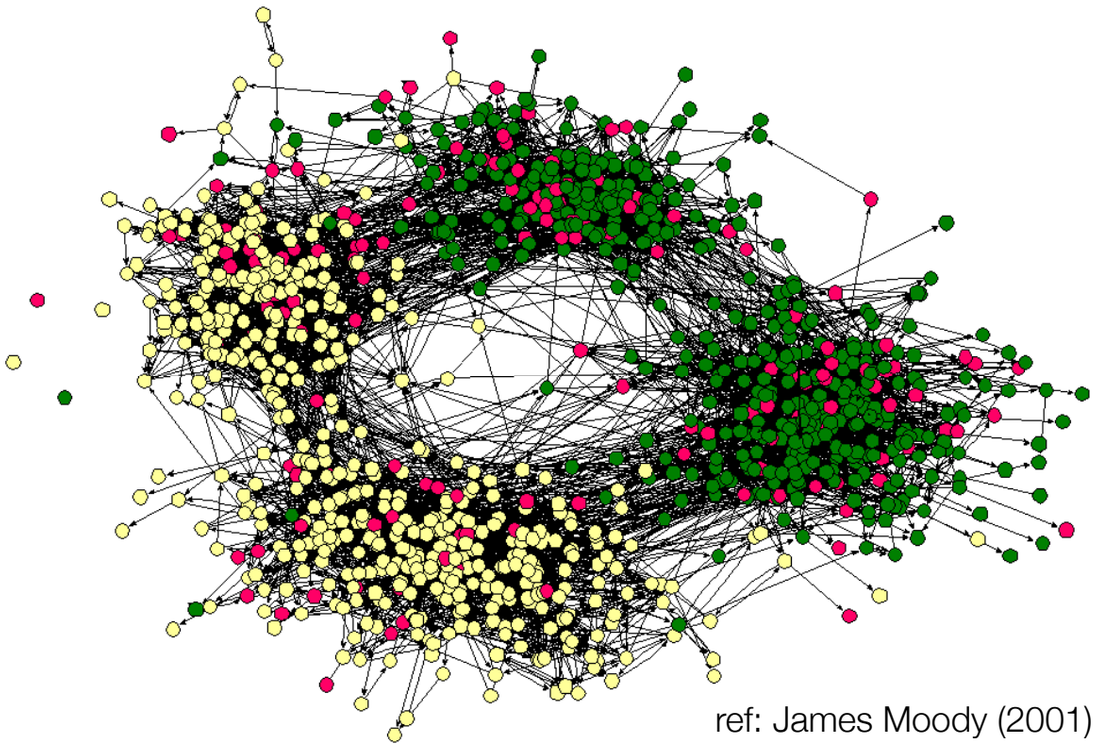
advice network

graphic: Wardil and Hauert
data: Jackson et al

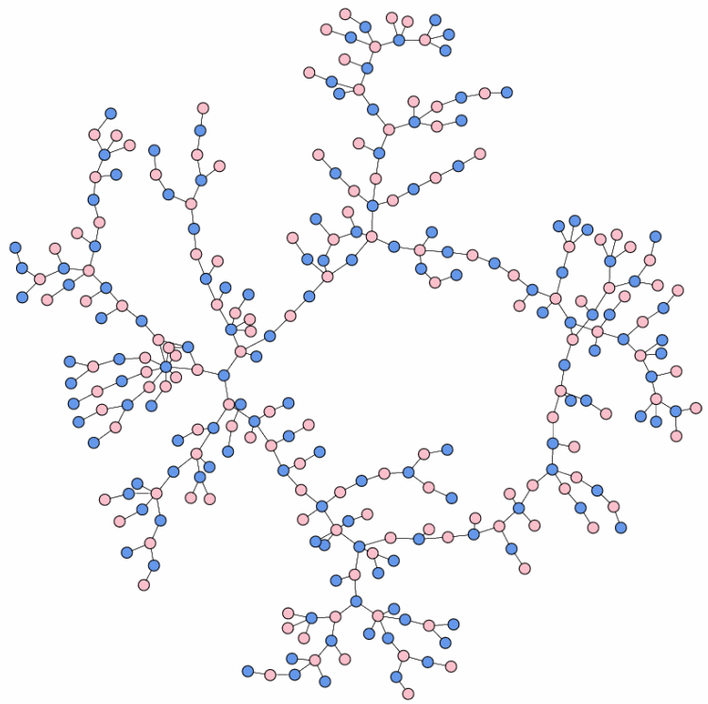
How is a group organized?
Who is important?

Why study social networks?

Network structure *reflects* behavior



ref: James Moody (2001)



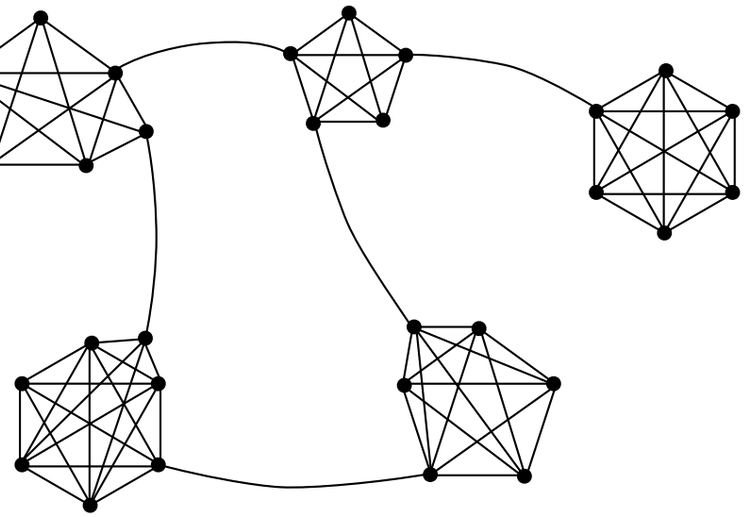
ref: Data by Bearman et al (2004)
Graphic by M.E.J. Newman

Networks are created by individual interaction (behavior), and thus reveal the rules of engagement!

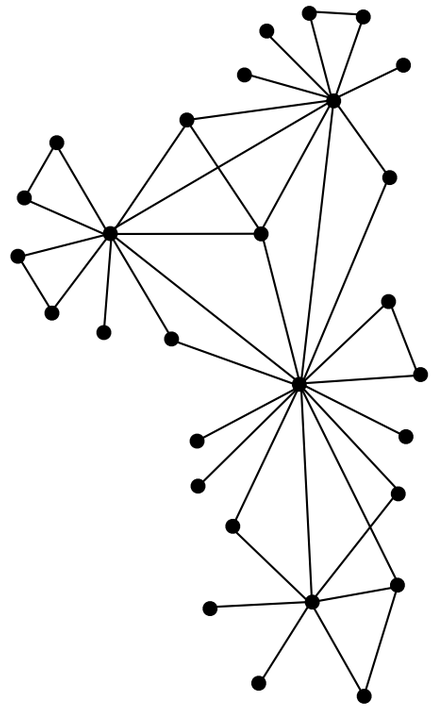
Why study social networks?

Network structure *affects* behavior and outcomes

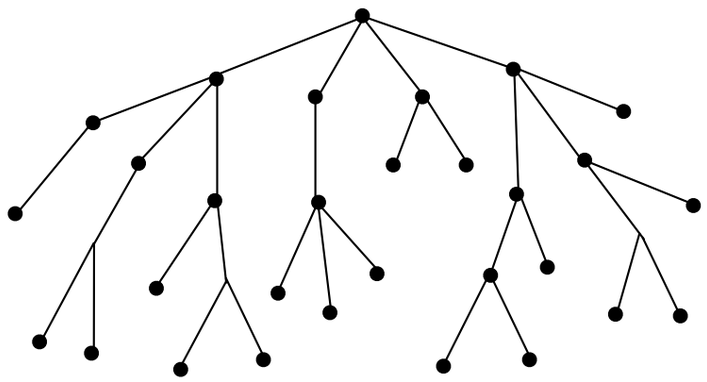
Silos



Decentralized



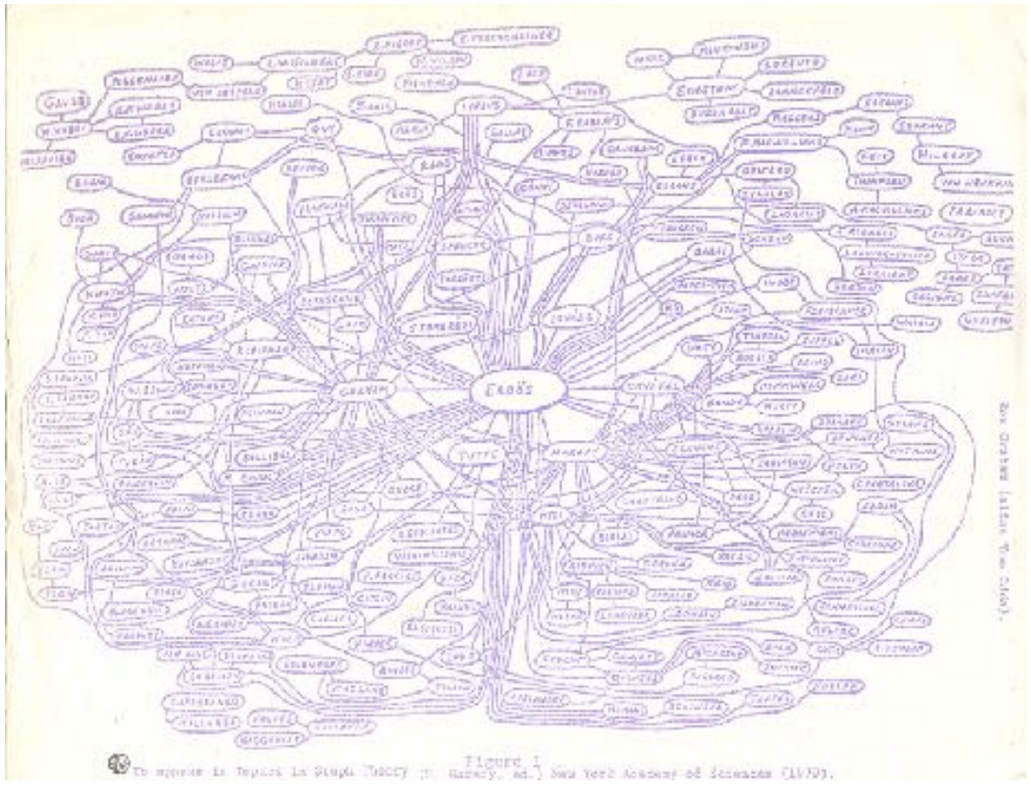
Hierarchy



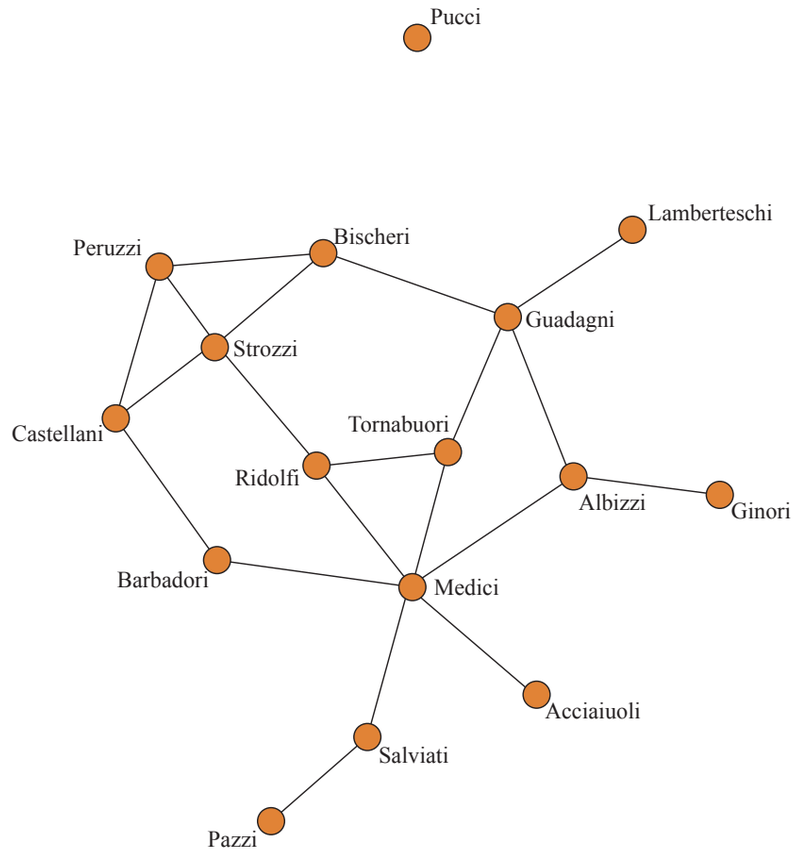
Examples: spread of information, bargaining power, job search

Why study social networks?

Network structure matters for the individual.



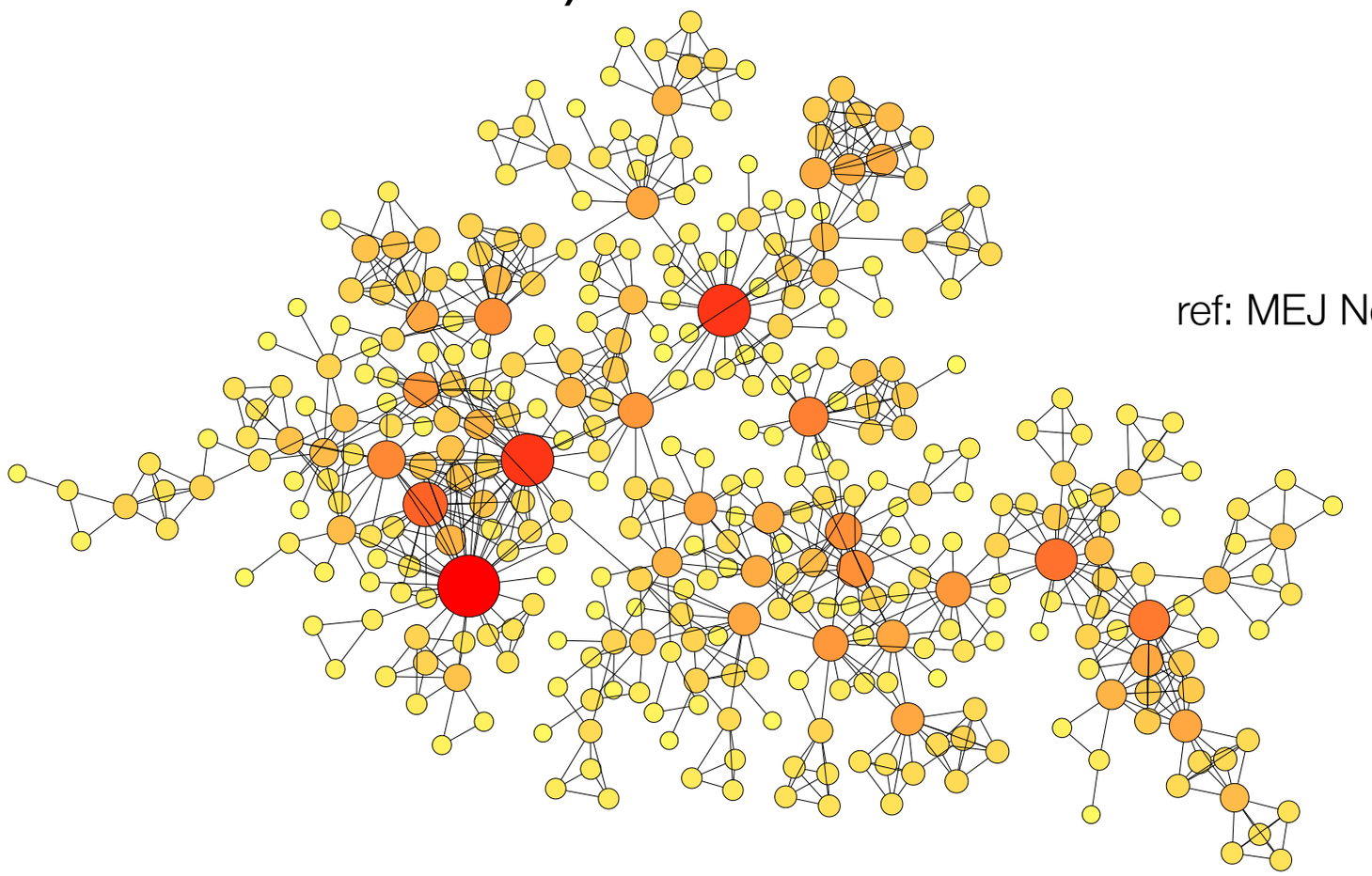
Ref: The Erdös Number Project,
Jerry Grossman and Patrick Ion



A person's position on a network reflects their role in the network, and affects their outcomes.

What makes networks special?

Networks are heterogeneous (in a way that we can understand)

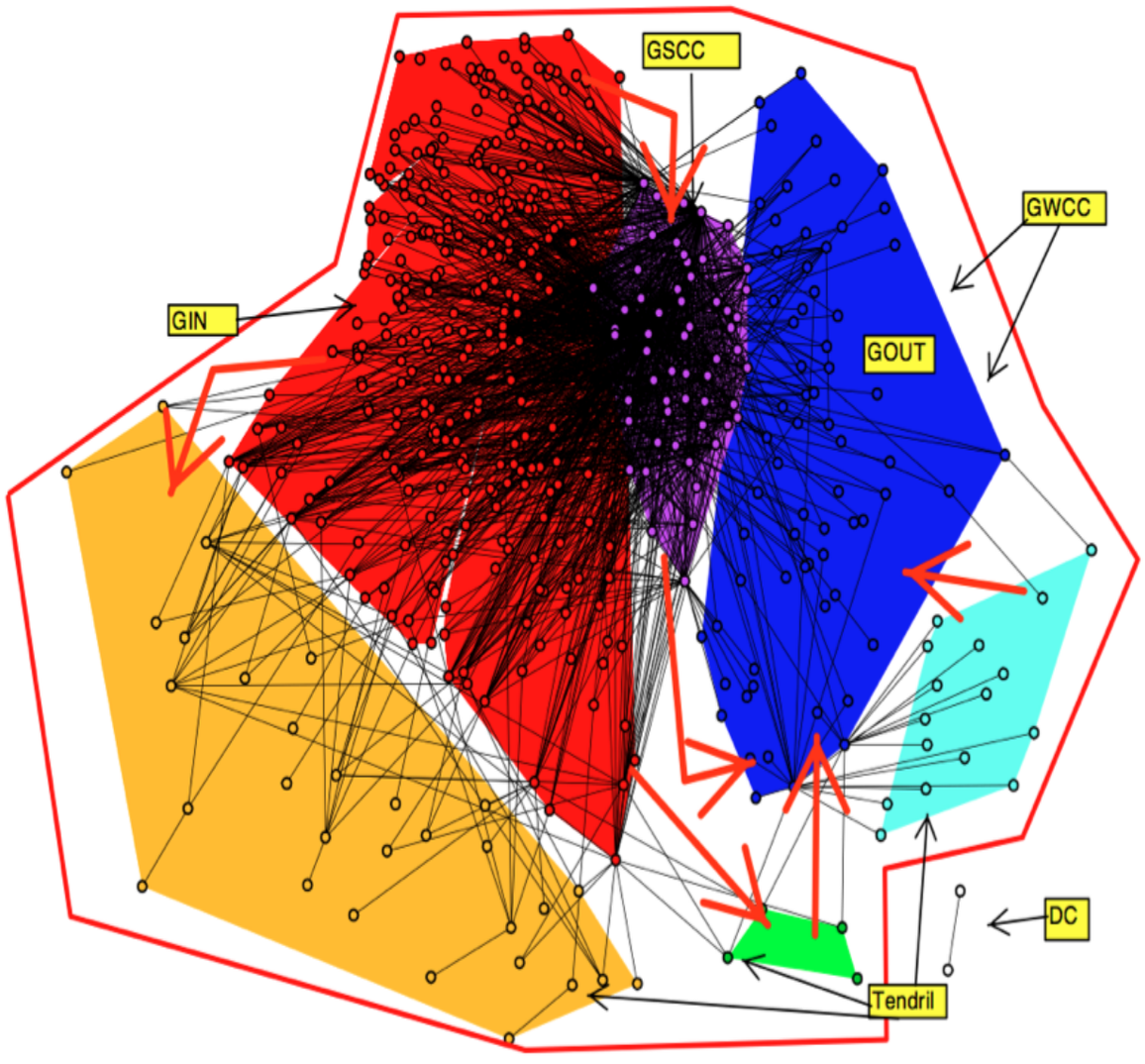


ref: MEJ Newman (2006)

The reality of social and economic interaction is messy, and social networks give us methods to deal with that messiness

What makes networks special?

Interconnection = possibility of cascades



When our behavior is influenced by the behavior of others, small events can have big effects

ref: Bech and Atalay 2008