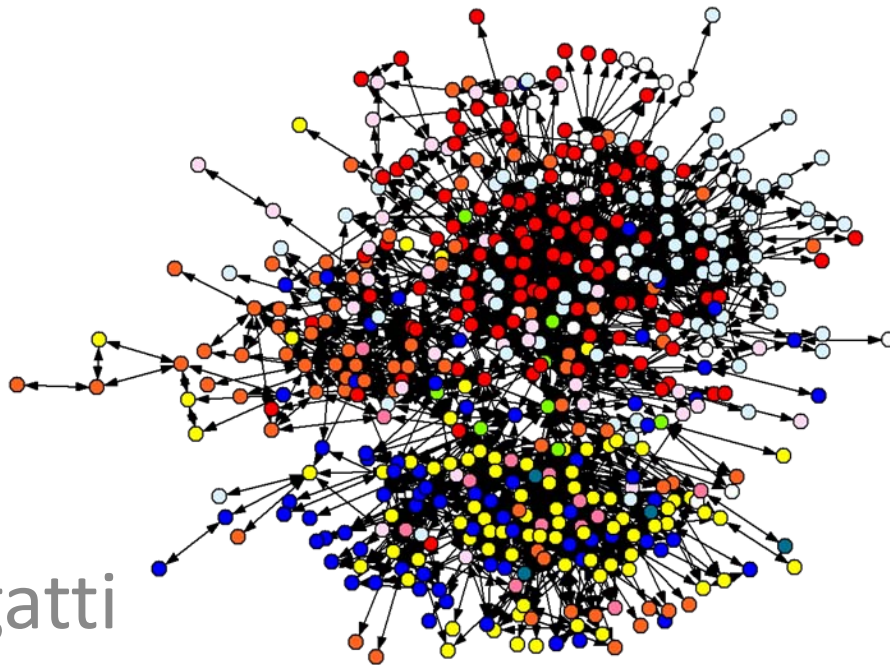




# What are we trying to do in SNA?



Steve Borgatti

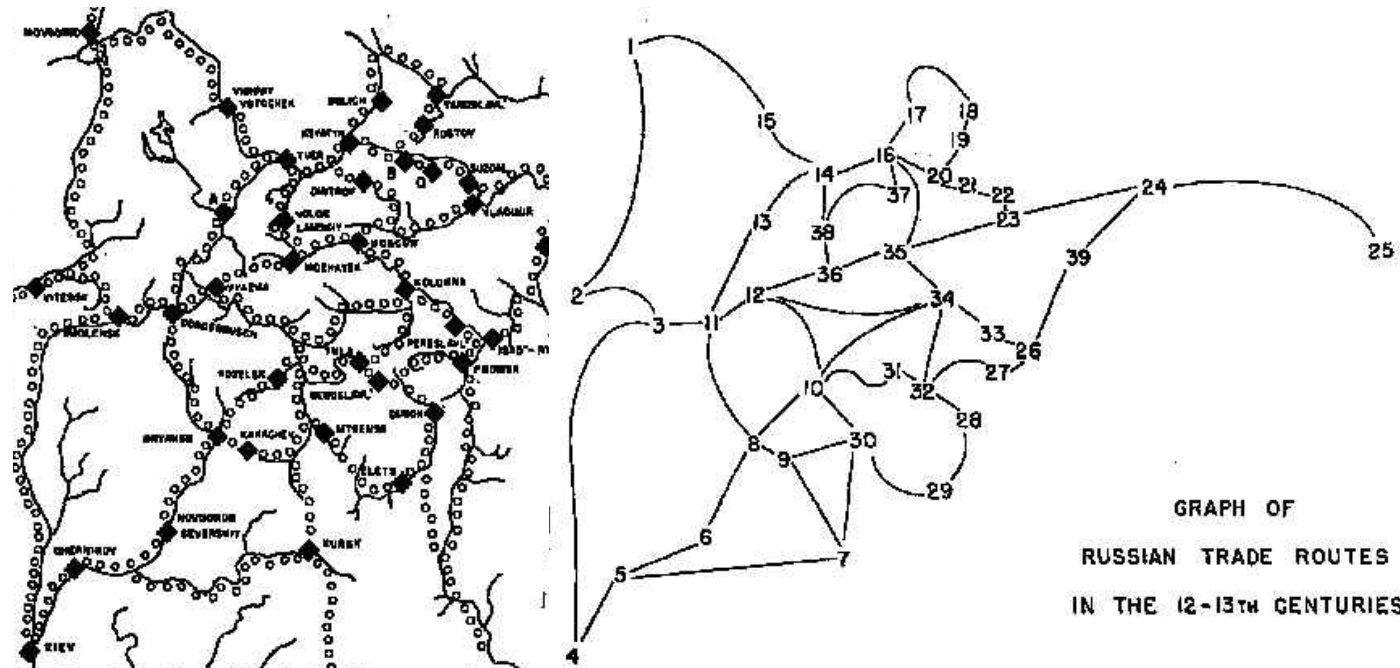
Dept of Mgmt  
U of Kentucky

# What's distinctive about SNA theory?

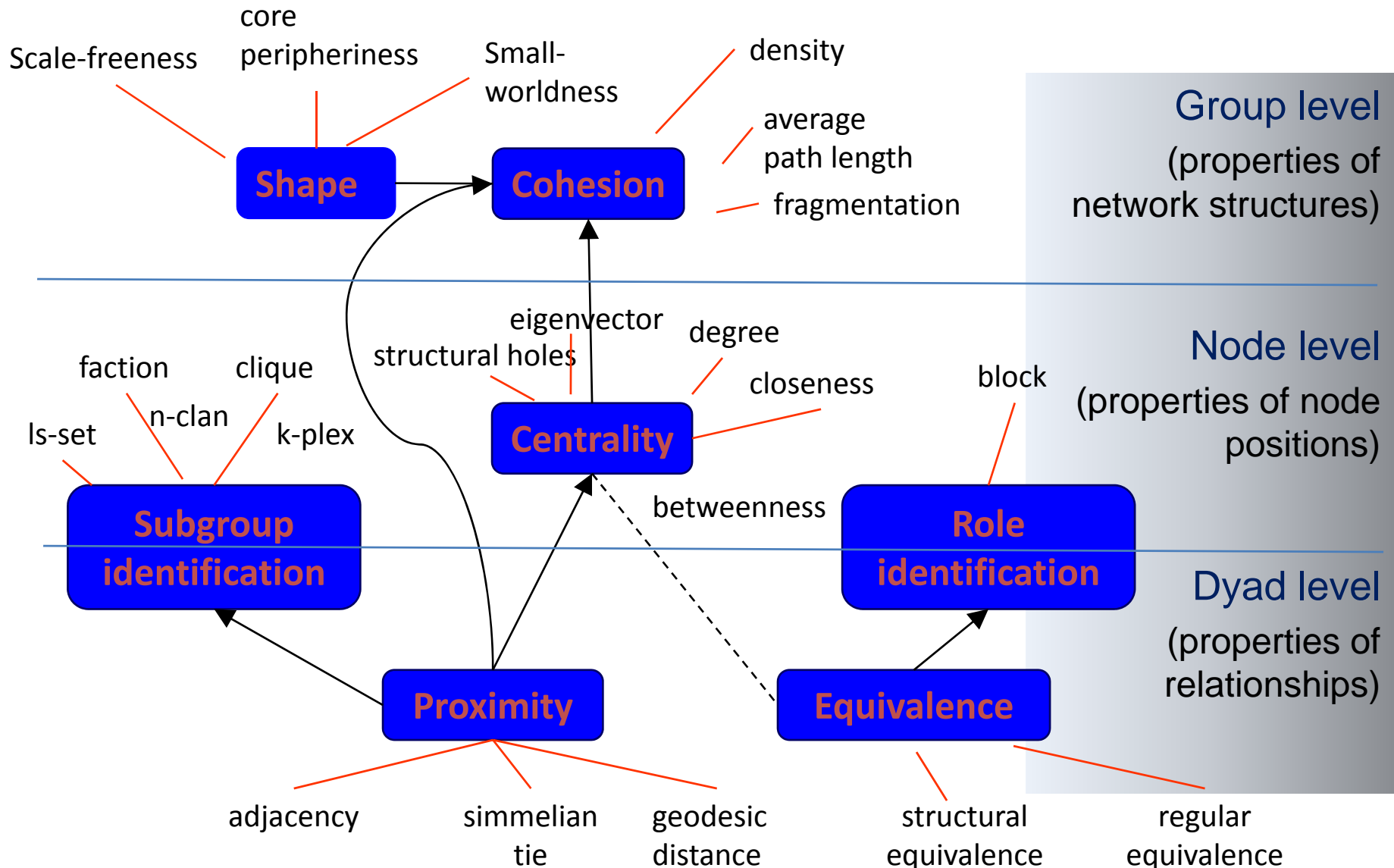
- Social actors not viewed as independent of each other
  - Embedded in a rich web of social relations and interactions
  - Not so much atoms as molecules
  - Lack of independence has theoretical and statistical implications
- Who you are connected to – where you are located in the network – affects what happens to you
  - Social environment /context as determinative
  - Opportunities and constraints you will encounter
- The structure of the network determines outcomes as much as properties of the constituents

# The network model

- Model groups/populations as networks of ties
  - Function of model is to focus on what's important



# SNA begins by theorizing properties of nets



# SNA proceeds by asking

- What determines these properties?
  - Antecedents or causes of network properties
- What are the consequences of those properties?
  - What do network properties cause?

# Classical Network Research Agenda

NETWORK PROPERTIES	<u>Dyadic Relationship</u> e.g., valence of tie; strength of tie; bridgingness	<u>Actor</u> e.g., betweenness centrality; structural holes	<u>Network/Group</u> e.g., density; avg path length; clustering coef, fragmentation
Antecedents	Who chooses whom and why? Predicting <b>tie formation</b> , maintenance, decay	Who will occupy what position in a network? E.g. predicting <b>centrality</b>	Why does a network have the structure it does? (e.g., scale-free; small world) How do <b>structures evolve</b> ?
Consequences	What rights & obligations are entailed by given relations? E.g., predicting attitude transfer	What are the opportunities & constraints that result from occupying a certain position in the network?	How does a network's structure (i.e., a group's structure) affect what happens to that group?

# Catalogue of antecedents & consequences

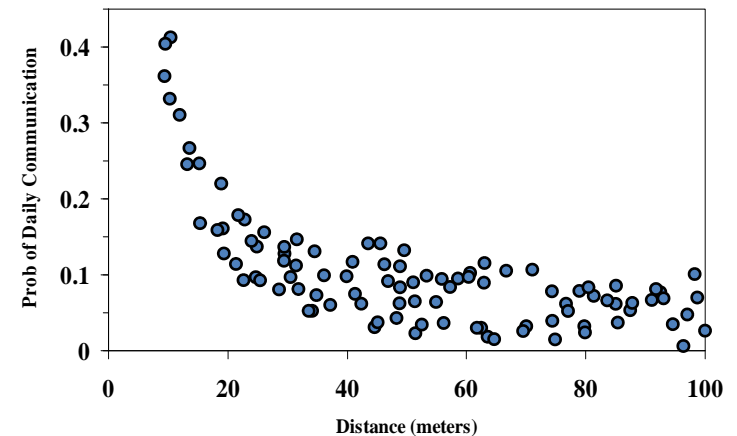
- Review of empirical findings



# Antecedents of Dyadic Relationships

- Structuralist / opportunity-based
  - Spatial-temporal proximity
  - Activity foci
  - Opportunity transitivity
  - Multiplexity
  - Role / rules (e.g., ISO9000)
- Functionalist / needs & benefits
  - Similarity attraction
  - Status attraction
  - Dependence / exchange-theoretic
  - Balance or dissonance theoretic

Communication as a function of physical distance



Confiding between & within genders

	Male	Female
Male	1245	748
Female	970	1515



# Challenges in explaining dyadic relationships

- Multitude of possible tie types
    - Determinants of friendship not same as advice etc.
    - Tend to group at level of expressive/instrumental etc.
  - Context, conditions, moderators
    - When do birds of a feather flock together and when do opposites attract?
    - Cultural differences, goal contexts
  - Separating relational stages/actions
    - Making overtures vs maintaining a relationship
  - Lack of distinction between relations, interactions, flows
- friendship → communication → info transfer

# Classical Network Research Agenda

<b>NETWORK PROPERTIES</b>	<u>Dyadic Relationship</u> e.g., valence of tie; strength of tie; bridgingness	<u>Node Position</u> e.g., betweenness centrality; structural holes	<u>Network Structure</u> e.g., density; avg path length; clustering coef, fragmentation
<b>Antecedents</b>	What determines what kind of relationship will exist between a given pair of actors?	What determines who will occupy what position in a network?	Why does a network have the structure it does? How do structures evolve?
<b>Consequences</b>	What does it mean for a pair of actors to have a certain kind of relationship? What rights & obligations are entailed?	What are the opportunities & constraints that result from occupying a certain position in the network?	How does a network's structure (i.e., a group's structure) affect what happens to that group?

# What kinds of consequences have been studied?

List of favorite topics explained by network theories in Management journals

- Attitude similarity
- Job satisfaction & commitment
- Power
- Leadership
- Getting a job
- Getting ahead
- Employee performance
- Team performance
- Turnover
- Conflict
- Organizational citizenship behavior (OCB)
- Creativity & Innovation
- Unethical behavior

Courtesy of Dan Brass

# Explaining Node Consequences

Dimension	Performance	Homogeneity
Why is ...	$S(A) > S(B)$	$S(A) = S(B)$
Example:	<u>Social Capital</u> studies. e.g. Status attainment as a function of social access to resources	<u>Diffusion/Adoption</u> studies e.g., Adoption of attitude as a function of attitudes of alters
View of DV:	Value-loaded	Neutral
DV typically expressed as:	Monadic Node property e.g., degree of success	Dyadic or Monadic e.g., has same attitude as e.g., which attitude node has
Typical scale type of DV:	Continuous e.g., degree of success	Categorical e.g., 1=same attitude, 0=different attitude

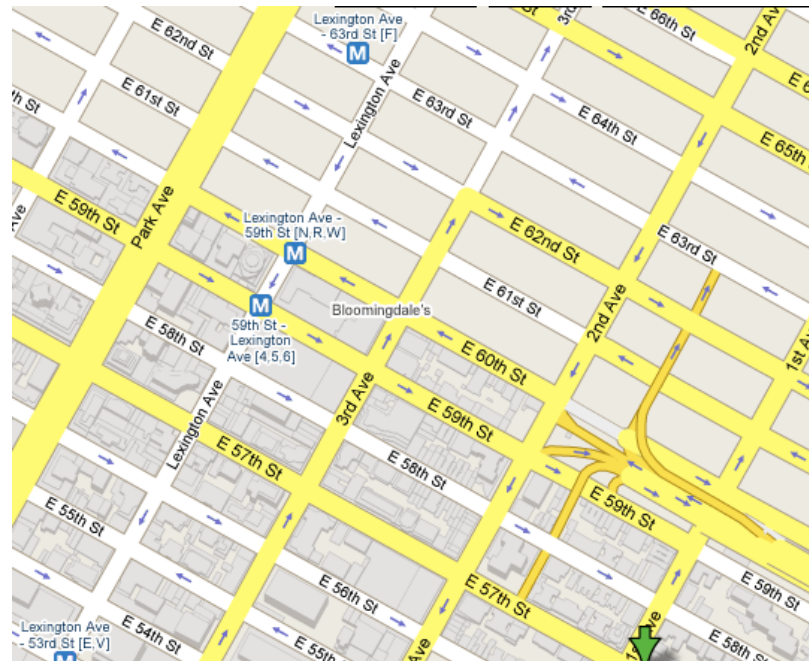
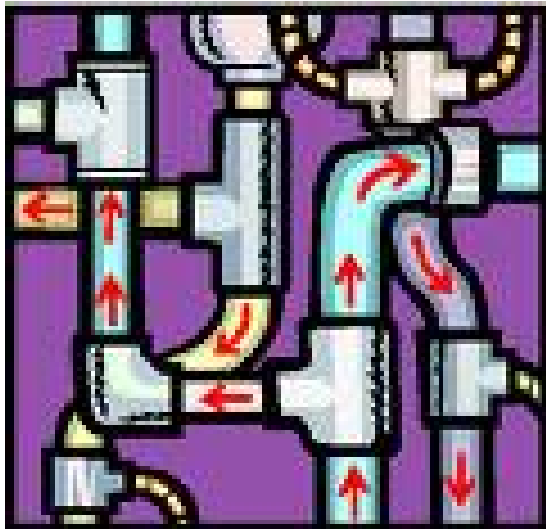
\*DV = Dependent Variable

# Explanatory Paradigms

- It's the environment, stupid!
  - Hallmark of SNA is to look outside the node to explain what happens to the node
  - Very rich conception of environment that includes
    - Not just who you are connected to, but
    - How your contacts are connected to each other, and, ultimately
    - Your position in the larger network
- Within this basic concept, multiple approaches
  - Flow perspective
  - Architecture perspective
  - Adaptation perspective
  - Cognitive association perspective

# Flow Perspective

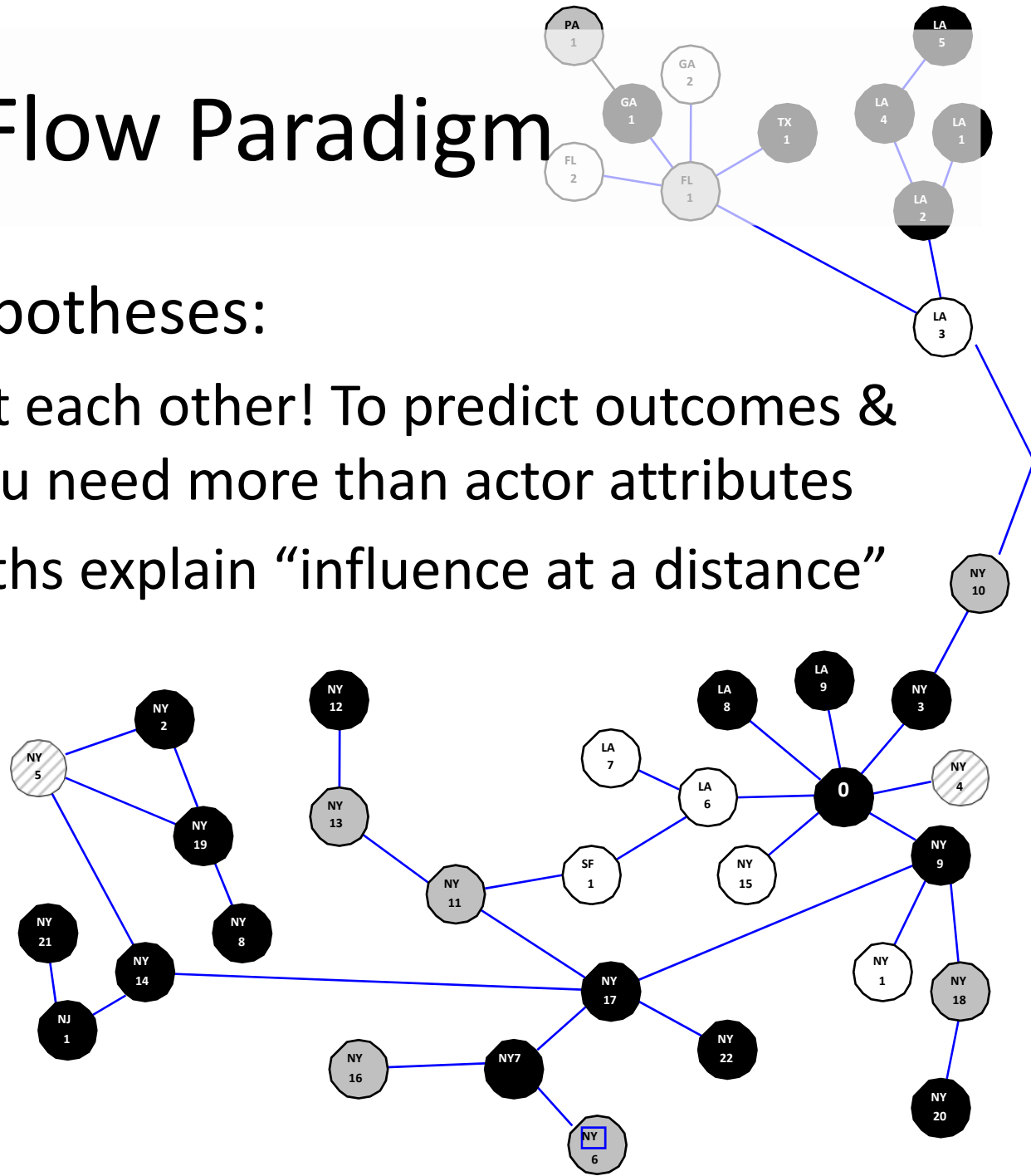
- Ties are conduits, such as pipes, through which things flow
  - Resources, information, innovations, viruses, etc
  - Roads and traffic



# Flow Paradigm

- Canonical hypotheses:

- Actors affect each other! To predict outcomes & behavior, you need more than actor attributes
- Network paths explain “influence at a distance”



Discovery of HIV by Bill Darrow at the CDC

Network of sexual relations among first AIDS patients

# Flow-based Theories

## Explaining PERFORMANCE

- Social Resource Theory (Lin; Flap).
  - Successful people are those that suck resources (e.g., money, information) through their social ties
  - You are only as good as your personal network

$$S_i = \sum_j a_{ij} S_j$$

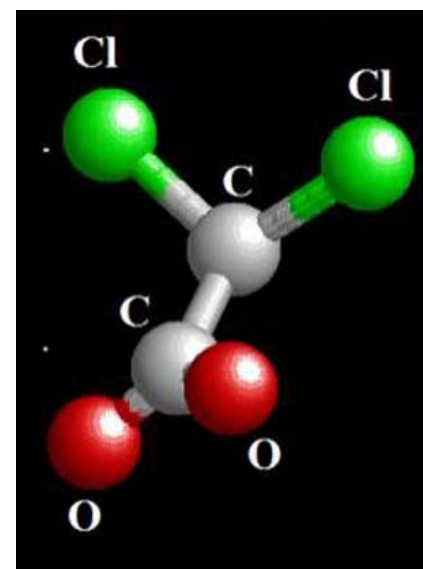
## Explaining HOMOGENEITY

- Diffusion Models
  - Attitudes, ideas, diseases etc transmitted from person to person via interaction
  - Mechanisms such as influence, imitation, learning
  - Specific submodels specifying conditions under which, say, imitation occurs, or the number of converts are needed in your personal network before you convert



# Coordination Perspective

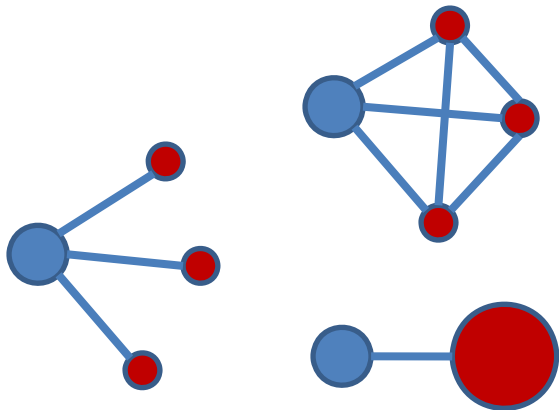
- Ties seen as girders, beams, joists, columns, etc that create framework or structure
  - Ties bind together nodes into a larger object with new function
    - Emergent properties; sui generis
  - Constructing molecules from arrangements of atoms
    - Again, properties of the whole are not the same as those of its constituents



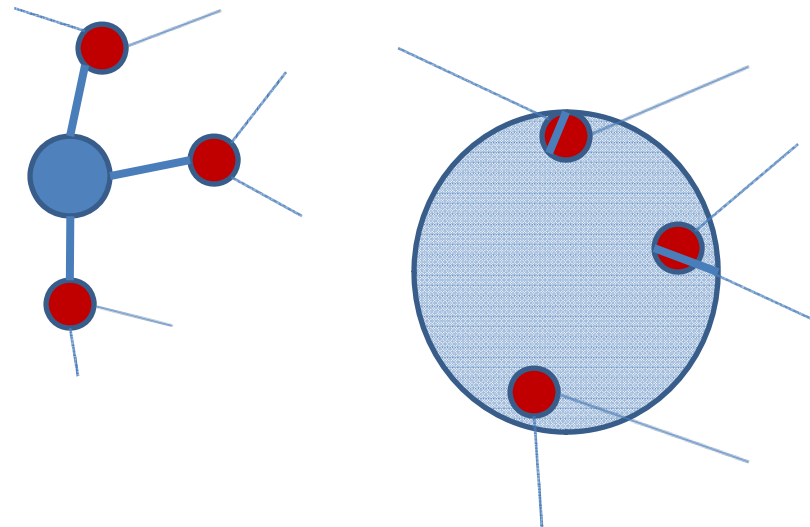
# Coordination theories

## Explaining PERFORMANCE

- Power benefits of structural holes (Burt)
  - Easier to negotiate with 3 separate nodes acting independently than 3 connected nodes acting as 1
    - E.g., WGA union



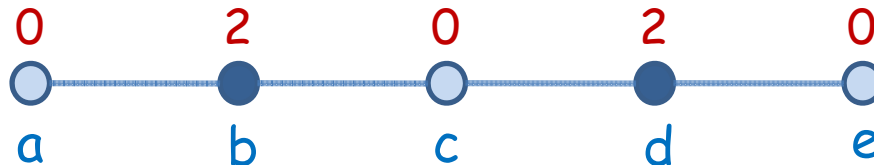
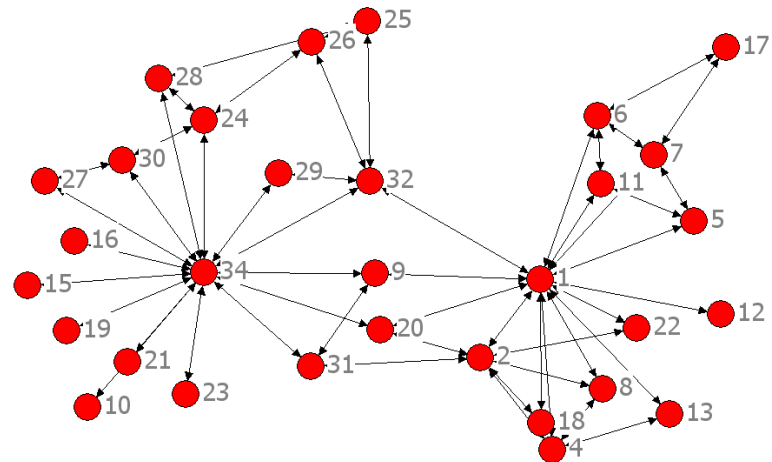
- Agents
  - Others act on your behalf, effectively becoming another arm





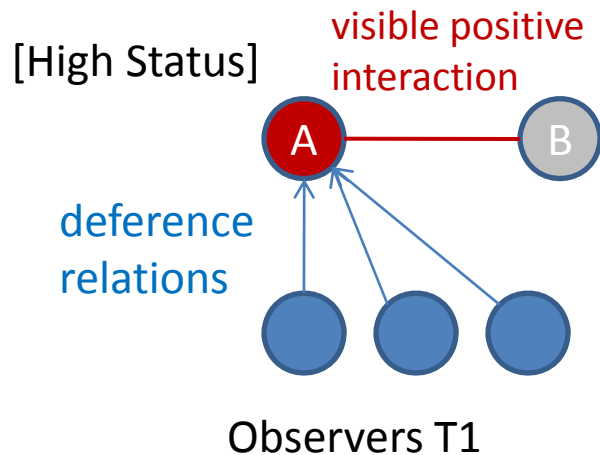
# Adaptation Perspective

- Ties seen as defining a social environment
- Node respond similarly to similar environments
- Homogeneity example:
  - Equally central nodes develop similar personalities
- Performance example:
  - In bargaining situations, a node's bargaining strength depends on the weakness of its partners



Experimental  
exchange nets

# Cognitive Association Perspective



## Explaining HOMOGENEITY

- Inference of similarity due to association
  - True in its consequences

