



Conceptual Issues

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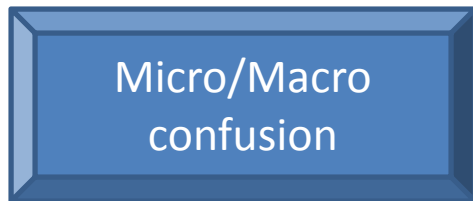
Contents

- Domains of SNA
- Micro/macro confusion
- Concepts of “social network”
- Network theory: how to think like a networker
- Theory and method

Two Design Characteristics of SNA Theorizing

Level of Analysis

- Dyad level constructs (e.g., strength of tie)
- Node level constructs (e.g. centrality)
- Group or network level constructs (e.g., density)



Direction of Causality

- “Theory of Networks”
 - Antecedents of network variables
 - Indep is non-network, dependent is network var
- “Network Theory”
 - Consequences of network variables
 - Indep is network var, dependent is non-network var
- “Network Theory of Networks”
 - Endogeneous change
 - Both indep and dependent are network variables

Domains of Network Theorizing

	Antecedents “Theories of Networks”	Consequences “Network Theories”
Dyad level	<u>How ties come to be</u> e.g., balance theory, propinquity, homophily	<u>Consequences of social ties</u> Social influence; diffusion, adoption of innovation
Node level	<u>How nodes achieve the network positions they do</u> e.g., self-monitoring → centrality	<u>Opportunities & constraints afforded by network position</u> Individual social capital studies
Group or Network level	<u>Evolution of network structure</u> e.g., why do some networks split into clumps? Why are some centralized?	<u>Consequences of network structure for groups/societies</u> Group social capital; small world studies

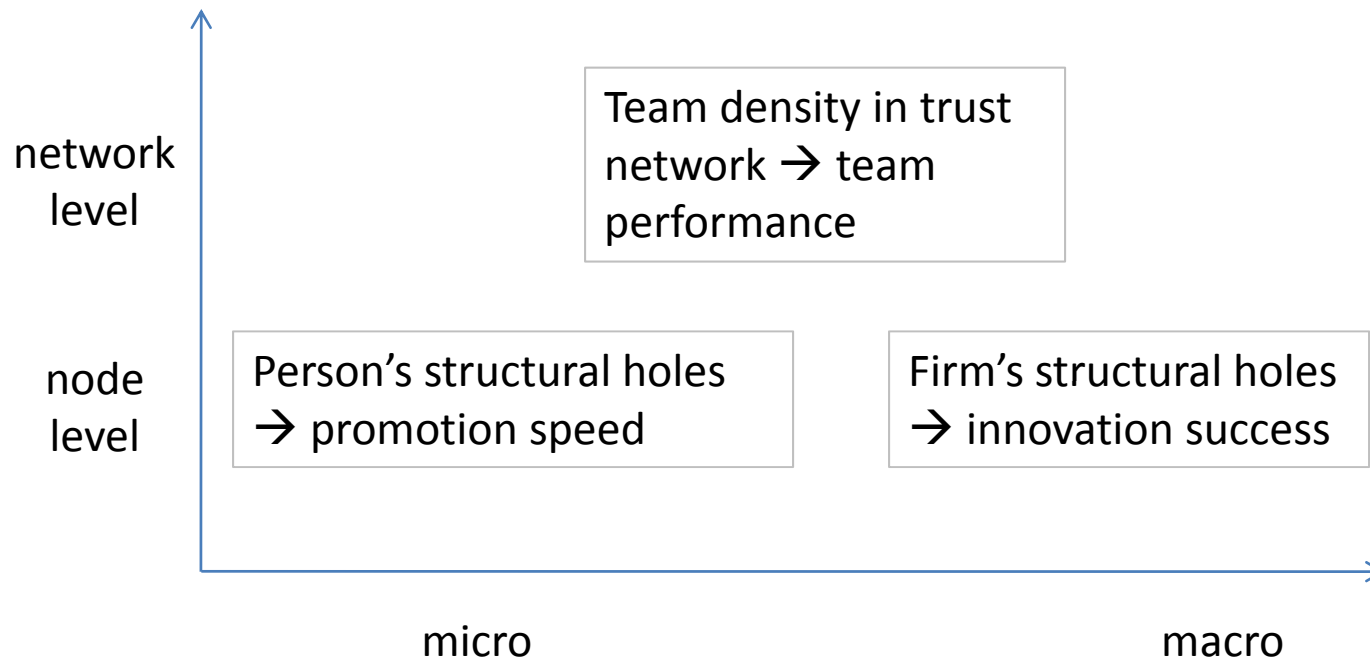
Focus today will be on “network theories” proper

NETWORK THEORY DOMAINS

	Independent Variable	Dependent Variable	Example Study
Dyad Level	Network tie	Network tie	Network theory of network ties (e.g., net evolution) doing business w/ ea other → friendship
	Network tie	Attribute similarity	Network theory of similarity Friends → similar political attitudes
	Attribute similarity	Network tie	Theory of network ties Smoking → friendship
Node Level	Node level network property	Node level network property	Network theory of node properties Degree → betweenness
	Node-level network property	Individual attribute	Network theory of individual outcome Centrality → performance
	Actor attribute	Node level network property	Theory of node properties Good looks → centrality
Group Level	Group level network property	Group level network property	Network theory of network properties Density → Avg path length
	Group level network property	Other group attribute	Network theory of group outcomes Density → team performance
	Other group attribute	Group level network property	Theory of emergence of network properties Pro women → density of trust ties

Macro/Micro Confusion

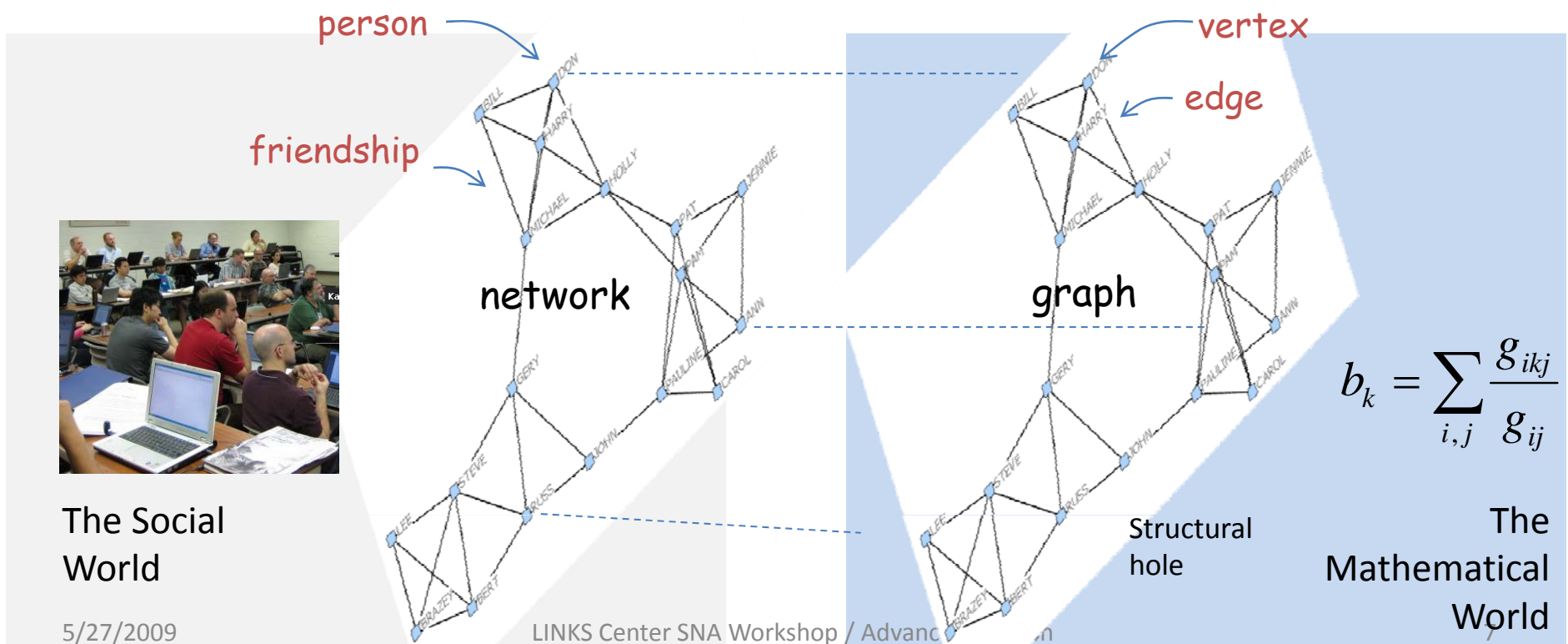
- Levels of analysis (e.g., node, network) in SNA does not correspond to micro/macro in organizational studies



What is network theorizing?*

*No, not an oxymoron

- Built on a model of how things work
 - Network concept. Liminal object btw 2 worlds
 - A primitive theory (or two) of what networks do:
 - Network flow model & network architecture model



$$b_k = \sum_{i,j} \frac{g_{ikj}}{g_{ij}}$$

The Social World

5/27/2009

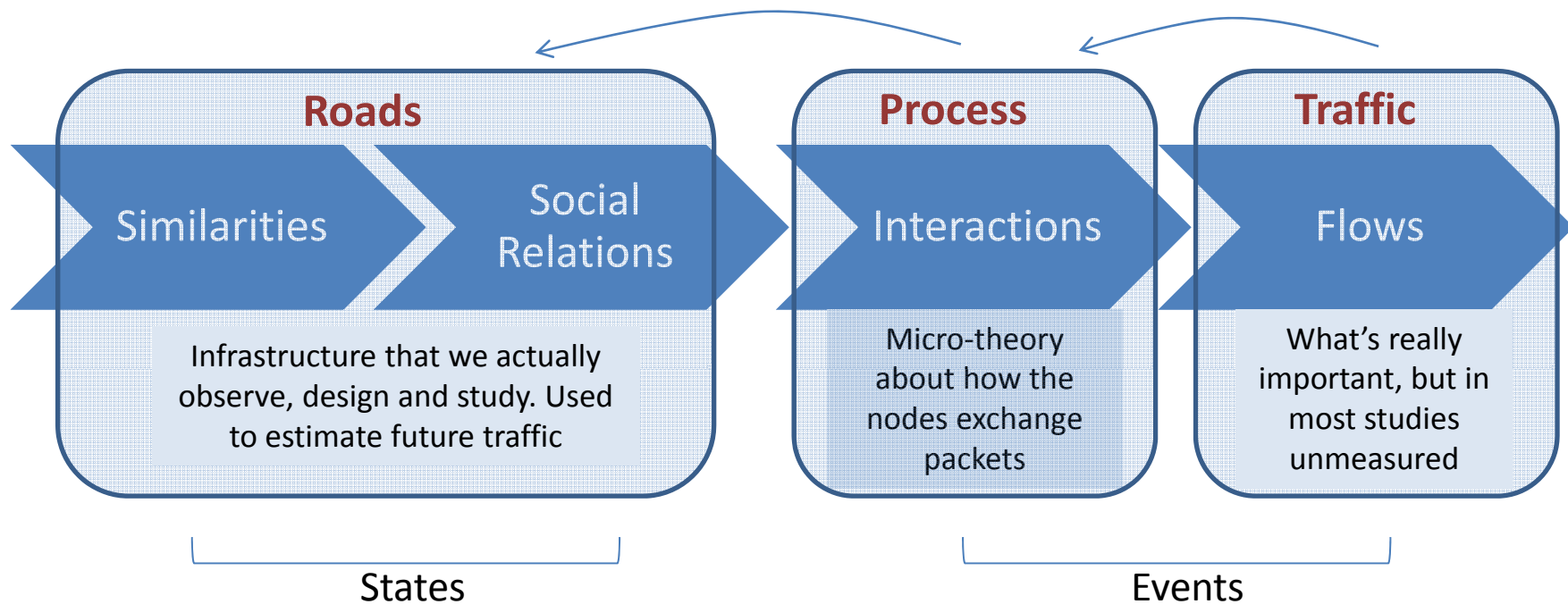
LINKS Center SNA Workshop / Advanc

Structural hole

The Mathematical World

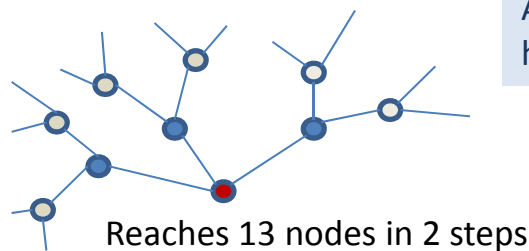
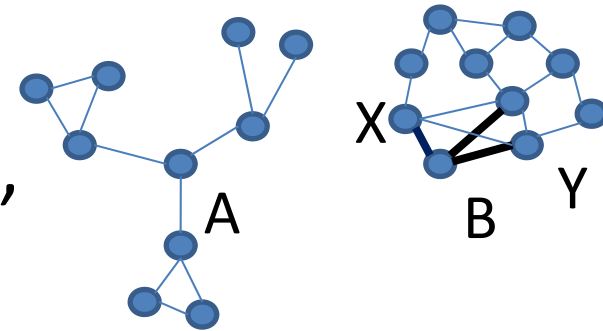
The network flow model

- Stuff flows from node to node through ties
 - Backcloth / substrate model of tie functioning



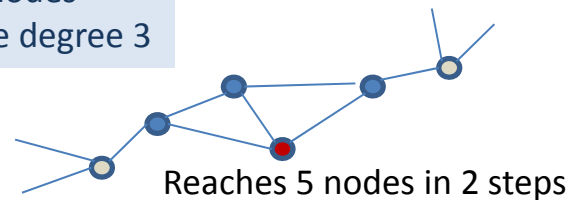
Derivations from the NFM

- Clustering (transitivity)
“harms diffusion possibilities”
 - Rapoport & Horvath ('61)



No Transitivity

All nodes
have degree 3



Moderate Transitivity

- Individuals with more structural holes have information advantages (Burt 1992)
 - Each tie is a bridge to a different information pool

NFM & Transitivity – cont.

- Granovetter's SWT (1973)

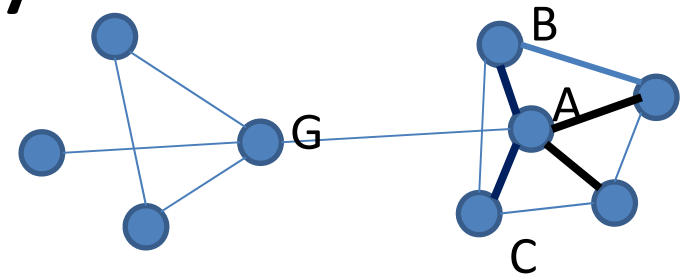
- bridges (ties to people unconnected with your other people) are sources of novel info

- bridging ties are unlikely to be strong ties

- (1) strong ties tend to produce transitivity: you have lots of friends in common
- (2) therefore strong ties are accompanied by myriad other paths
- E.g., if the tie from A to G were strong, then there should be at least weak ties from G to A's other friends, such as B and C, in which case tie A-G is not a bridge

- Ergo, novel information comes through weak ties

- Not every weak tie, just those that are bridges
- The value of weak ties is that some of them are bridges, and bridges are cool



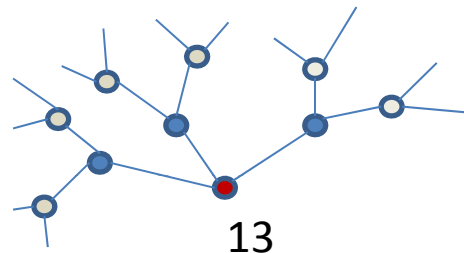
Bridging tie = tie linking focal person with nodes only distantly connected to other friends



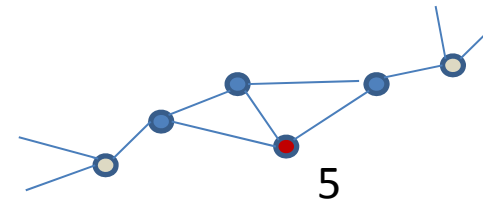
Small World Research



- Rapoport & Horvath noted that transitivity “slows” flows

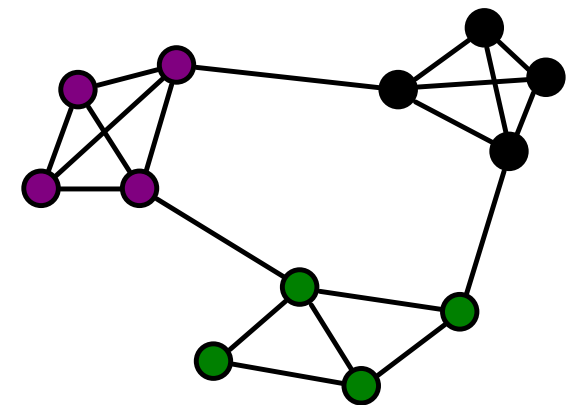


No Transitivity



Moderate Transitivity

- Transitivity creates clumpy networks
- Milgram found that path distances in the human acquaintance network were incredibly short.
- Watts & Strogatz showed that just a few random ties radically shorten distances
 - These random ties are mostly, you guessed it, bridges



Holes, Weak ties, Small worlds

- Network + flow = network flow model
 - Derive “transitivity slows flows” theorem (Rapoport)
 - Bridges provide short paths to novel flows (Watts)
 - Append correlation between bridges and strength of tie (Granovetter)
 - Append correlation between bridges and structural holes (Burt)

Other derivations from the NFM

- More ties → more exposure → more capital*
- More ties to nodes that have more ties → more exposure → etc
- More ties to resource-rich nodes → more benefit (aka “social resource theory”, Lin, 1982)
- Nodes close to most others → earlier exposure (Sabidussi, 1966)
- Nodes along best paths → opportunities to filter, color, control flows (Freeman; Brass) → benefits
- Etc, etc.

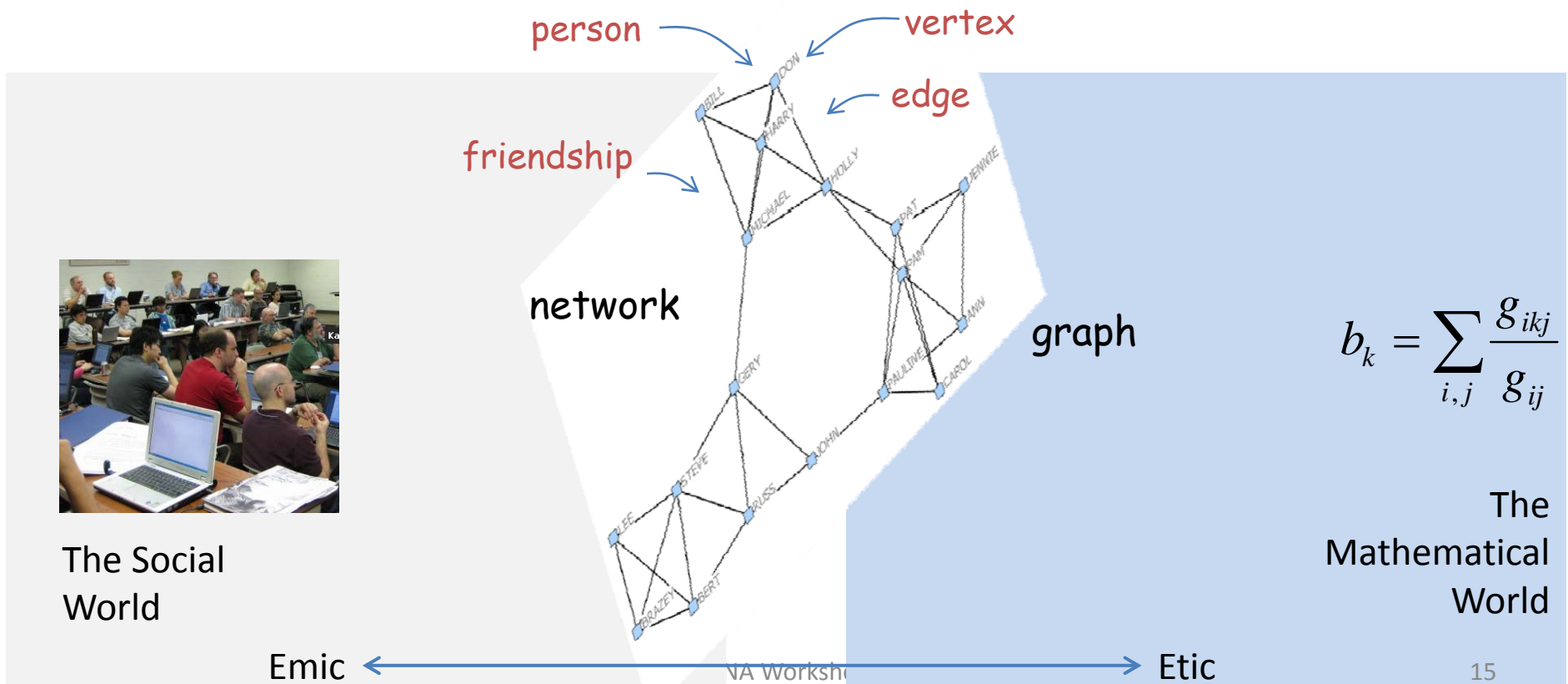
*If what is flowing through the network is a “good”, as opposed to, say, a disease.

Theory/Method Confusion

- Theorizing about the network model and the consequences of certain positions in the network (of nodes or ties), or certain structures of the network is
 - Incredibly fertile and generative
 - Implicitly creating plethora of theoretical constructs, such as the bridge
 - Can be done mathematically and formally
 - Social scientists tend to confuse formal concepts with methodology – it's a measure, right?

Network as liminal object

- Network object is meaningful to both natives and researchers – this is strength and a curse



$$b_k = \sum_{i,j} \frac{g_{ikj}}{g_{ij}}$$

The
Mathematical
World

Don't hate me because I'm beautiful



2 concepts of social network*

	Nominalist	Realist
Definition	<p>Every kind of tie defines a network, such as a friendship network, or an acquaintance network. Each kind of tie defines a different network on the same set of nodes.</p> <p>Networks can be disconnected, even empty</p>	<p>Network is group of interconnected nodes. Disconnected parts are different networks.</p> <p>Network contrasts with “hierarchy” or “market”. Network connotes group which:</p> <ul style="list-style-type: none"> -Has more “lateral” ties than “vertical” ties -Uses informal ties to achieve coordination -Has relatively empowered or autonomous members (e.g. “network organization”)
Research Questions	<p>How do ties develop/decay?</p> <p>How does network structure change over time?</p> <p>What is structure of network?</p>	<p>How to “anticipate social networks” or “predict when networks will emerge”</p> <p>What are consequences of belonging to multiple networks?</p>
Method Questions		<p>What’s the best set of questions to get at the network?</p>

Two views of network within the nominalist camp

NOMINALIST		REALIST
Graph Theoretic	Statistical	
<p>Network as collection of ties – ordered or unordered pairs.</p> <p>Non-ties do not exist. Only ties can have values.</p> <p>$(u,v) \in E(G)$</p>	<p>Dyadic variable X gives state of dyad – there is a value for every pair of nodes</p> <p>e.g., $x_{ij} = 1$ if friend, $x_{ij} = 0$ otherwise</p>	<p>Network as special kind of group with a particular structure</p>