

# Local Rules to Global Structures

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- **Exchange** (marriage rules, gift giving, markets, ...)
  - dyad based
  - generalized vs. dyadic exchange cycles
  - implications for social control and persistence
- **Balance** (affect, dominance, ...)
  - triad based
  - transitivity (in digraphs) and consistency (in valued relations)
  - determine linear hierarchies and clustering

The promise of the micro-macro link: rules of aggregation

Challenge has been to estimate the generative properties from data

# The past

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## Modeling progressed slowly

Dyadic independence models

- $p_1$ , +covariates, stochastic blockmodels

Dyadic dependence models

- Markov random graphs,  $p^*$

*Spatial statistics provided much of the foundation for progress*

## Stumbled when it got to estimation – for about 10 years

originally seen as a computational resource issue (MCMC solved this?)

eventually revealed another modeling problem hiding within (degeneracy)

# The present

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## Estimation problem largely solved

- Better models
- Better algorithms
- Better diagnostics
- Better programs
- Better data

*... anyone willing to bet that networks don't all have the same structure?*

## Generating complex, realistic networks follows

- Cross-sectional realizations come right from the MCMC algorithm
- Dynamic evolving networks
- Dynamic *stationary* networks

# The future

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## Having met the RHS

- We have some new models, and their parameter estimates
- But they will take some time to understand

## Need to build intuition

- Model diagnostics and goodness of fit
  - Failure to converge
  - Failure to fit the model statistics well (degeneracy)
  - Failure to fit unmodeled statistics well (residual structure)
- Simulation will play a central role

## Easy to mistake the simple ERGM form for a simple model

- Bad idea, but probably a good sign

# In the current pipeline

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## Developing well understood change statistics

- the terms on the RHS -- each has to be built by hand

## Sampled and missing data

- without sampling, we're an eccentric science
  - Can't collect a census every time you want to do empirical work
- missing nodes may be harder than missing edges

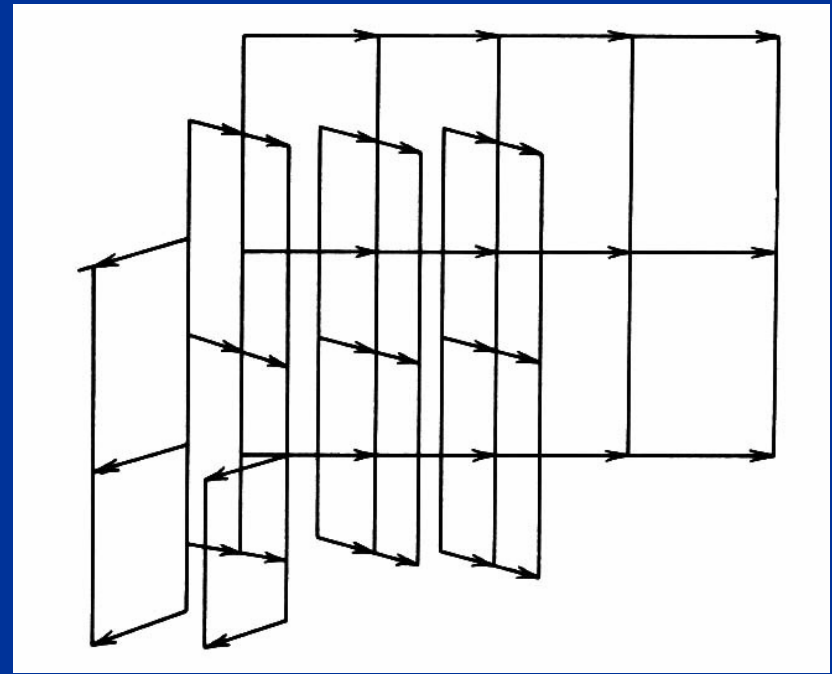
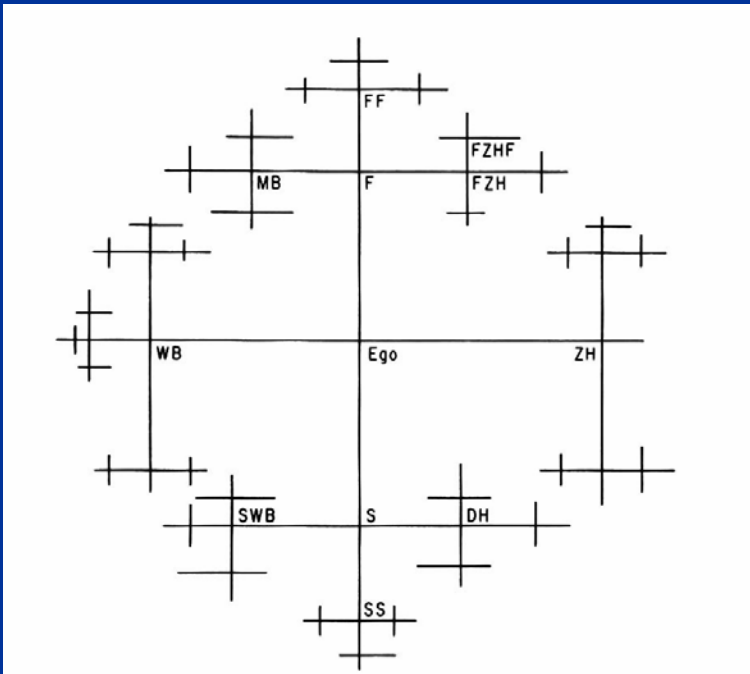
## Multiplex networks

- cross-sectional and dynamic

## Model based latent space analysis (largely done)

- clustering, position
- Integration with measured covariates

# Kinship and marriage exchanges (White, 1963)



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Thank you