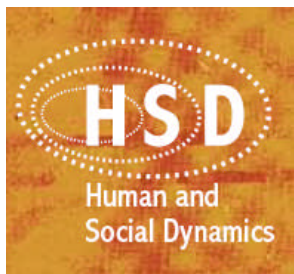# Breakout Sessions 2: Future

○ Session 1 – Complex Systems

○ Session 2 – Networks

○ Session 3 – Environmental Dynamics

○ Session 4 – Security and Conflict

○ Session 5 – Infrastructure

○ Session 6 – Interdisciplinary research and education

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Complex Systems

- Distinguish merely complicated systems from complex systems
- Need for increased communication to lessen knowledge gap between empirical work and mathematical (computational) modeling work
  - In this connection, need a workshop to talk and achieve a common vocabulary
- Better understanding principles of complex systems
- … work on metrics
- More work on interacting (coupled) complex systems
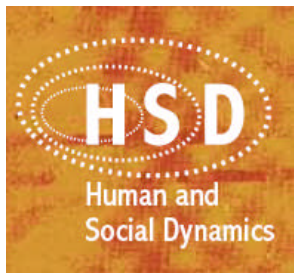
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Complex Systems

○ Work to achieve better transitioning from research to practice, so that people who run complex systems are not tied to outmoded ideas such as optimality rather than resilience.

○ Would be nice to have workshop where take a few case studies and understand the system at all levels

○ More work on interacting (coupled) complex systems

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Networks

- Networks across temporal, spatial, and size scales
  - Methods, tools, and theories that bridge scales
- Sampling, measurement, and boundary problems
  - "Groups" versus "populations"
  - Measurement models, error
- Tie content and its implications
  - Processes on nodes and ties
  - Co-evolution of node-level and tie-level processes
  - Knowledge systems and other structured phenomena
- Translation of network-related concepts/findings to policy and the general public

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Environmental Dynamics

- **Uncertainty:** Irreducible, modeling challenges, data reliability/validity; extreme events, responses to, self-organization.

- **Systems perspective**: Greater emphasis on earth systems and integrative themes (complexity, networks), feedback networks, coupled systems; Resilience and need to *understand how systems work* (e.g., institutions)

- **Perceptions and cognitive perspectives**: How people respond to uncertainty and relation to understanding of systems, preservation of wild spaces

- **Spatio-temporal scales:** Critical for understanding the above three, including threshold events—transitions, links to extreme events, linear vs. non-linear; from individuals to state to global

Security and Conflict

- Some Concrete Activities:
  - Sponsor Conflict Workshops
  - Bring PIs together
- Foster Better Data Infrastructure
  - Create Clearinghouse of existing datasets (what is there)
  - Create "Plug n Play" datasets
  - Publish Best Practices of data collection
  - Publish Open source dataset (but not dumbed-down)
  - Foster ways to collect and disseminate this data
  - Create an Expert Wikipedia
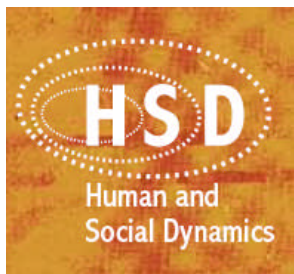
Security and Conflict

- Topic Areas
  - Beliefs, norms, memes, motivations, propaganda in communication
  - Cultural modeling
  - Predicting conflict (need for longitudinal data) &
  - Predicting the emergence of threat
  - How to fight fair
  - Non-state actors, NGOs, and Humanitarian agencies
- Intervention studies: what fosters cooperation
- Foster an integrated approach
  - Linking levels of analysis (individual, state, non-state)
  - Foster international collaborations
- Create an Expert Wikipedia
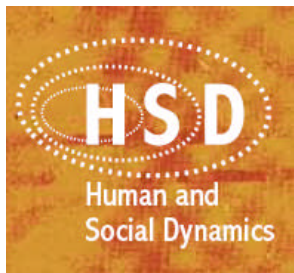
Infrastructure

- Opportunities
  - Increasingly vast amounts of data available as by-product of behavior
  - Opportunities to apply computational thinking to social science problems
  - Leverage NSF investments in social science by sharing data, tools, analyses and by integrating multiple data sets

Infrastructure

○ Challenges

- Addressing big science problems with little science budgets
- Assumption that social science has small-scale data has led to historic underinvestment in infrastructure
- Need standards to facilitate sharing of data across disciplinary boundaries
- Need to address unique characteristics of social science data (e.g., need for privacy)
- New kinds of data require new approaches to analysis, new institutions to collect and curate

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Infrastructure

○ Recommendations

- Encourage projects to make data, tools, analyses available as part of dissemination

- Provide supplementary funding to support cataloguing and to ensure sustainability of access

- Consider other mechanisms for supporting sharing, e.g., disciplinary repositories, access to experts

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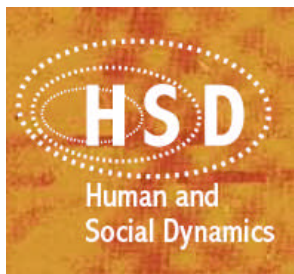
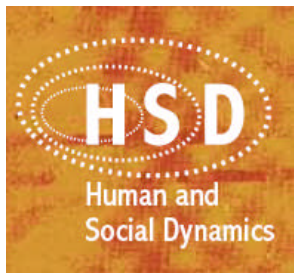# Interdisciplinary research and education

Graduate education

- Interdisciplinary education seems to be training people for a field that doesn't exist
- Creating opportunities for students to interact with people in other fields is at least as important as creating courses or programs that are interdisciplinary
- It depends on the field: How do we identify areas where it is fruitful to collaborate?
- Do we train students in "interdisciplinary work" or in their own field, but with exposure to other fields?

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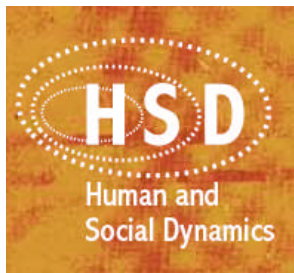
Interdisciplinary research and education

- More of an issue at the graduate level than at the undergraduate level.
- Successful interdisciplinary training/research provides time for learning basic background in other fields, different approaches to analyzing data, etc.
- Workshop mode seems to work well, maybe better than extensively interdisciplinary program, which adds a year or more to students' coursework – students get to know each other across fields, stay in touch.
- Core skills needed in different fields are so different that it may not be optimal to try to train "interdisciplinary" grad students per se.
- Modeling to students
- "just in time" training in other disciplines
- Opportunities for interaction with people in other disciplines is as valuable, perhaps even more valuable, for students than creating full-fledged interdisciplinary program.

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HSD issues

- Forming viable teams
  - Will individuals collaborate?
  - Is there a common interpersonal thread?
  - Considering evidence of prior collaboration?
  - Need to use prior research on successful interdisciplinary collaboration when evaluating (and suggesting guidelines for proposals)
- Supplements to program grants to encourage interdisciplinary components