

## Wednesday, September 13, 2006

4:00 PM – 7:00 PM **Attendee and Poster Registration**  
Cotillion Foyer

## Thursday, September 14, 2006

7:30 AM – 5:30 PM **Registration**  
Cotillion Foyer

7:30 AM – 8:45 AM **Morning Refreshments**  
Cotillion South

8:30 AM – 10:00 AM **Opening Session**  
Cotillion North

**Logistics Overview**  
Todd Stewart, Guardians of Honor, LLC

**Introductions**  
Mark Weiss, Senior Science Advisor, Directorate of Social, Behavioral and Economic Sciences

**Welcome: Exploring New Paradigms for Research at the National Science Foundation**  
Ann Carlson, Senior Staff Associate for Policy and Planning, Office of the Director

**Opening Remarks: Simplifying Complexity through the Lens of Change**  
David Lightfoot, Assistant Director, Directorate for Social, Behavioral and Economic Sciences

10:00 AM – 10:30 AM **Break**  
Marriott Foyer

10:30 AM – NOON **CONCURRENT SESSIONS**

**OPTION 1**  
**Poster Session I**  
Marriott Foyer

**OPTION 2**  
**Q&A Drop-in Session about Grant Management**  
K.C. Baukin, Division of Grants and Agreements  
NSF Program Officers  
Cotillion North

NOON – 1:15 PM **Working Lunch**  
Cotillion South

1:30 PM – 3:00 PM **Day I Breakout Sessions**

**Session 1 – Advantages and Difficulties Encountered in Interdisciplinary Research - session 1**  
Facilitator: Amber Story, Program Officer, Division of Behavioral and Cognitive Sciences  
Wilson A

**Session 2 – Advantages and Difficulties Encountered in Interdisciplinary Research - session 2**  
Facilitator: Sarah Ruth, Program Officer, Division of Atmospheric Sciences  
Wilson B

**Session 3 – Broadening Participation in HSD Research**  
Facilitator: Margaret E. M. Tolbert, Senior Advisor, Office of Integrative Activities  
Eisenhower Room

**Session 4 – Data Sharing, Data Archiving, and Infrastructure**  
Facilitator: Cheryl Eavey, Program Officer, Division of Social and Economic Sciences  
McKinley Room

**Session 5 – Ethical and Legal Considerations in HSD Research**  
Facilitator: Rachele Hollander, Former Senior Science Advisor, Directorate for Social, Behavioral and Economic Sciences  
Truman Room

## Thursday, September 14, 2006 (Continued)

### **Session 6 – Relating the Importance of the Human Sciences to the Public / Enhancing Public Science Literacy**

Facilitator: Mitch Waldrop, Communications Officer, Office of Legislative and Public Affairs  
*Johnson Room*

### **Session 7 – Advantages and Difficulties Encountered in Interdisciplinary Research - session 3**

Facilitator: Rita Teutonico, Deputy Division Director, Division of Molecular Biology  
*Wilson C*

3:00 PM – 3:30 PM

#### **Break**

*Outside Cotillion South*

3:30 PM – 4:30 PM

#### **Reports from Breakout Sessions**

*Cotillion North*

4:30 PM – 5:30 PM

#### **Presentation Introduction**

David Lightfoot, Assistant Director, Directorate for Social, Behavioral and Economic Sciences  
*Cotillion North*

#### **The Role of the Social, Behavioral and Economic Sciences in Interdisciplinary Research**

John H. Marburger, III, Director, Office of Science and Technology Policy

5:30 PM – 6:00 PM

#### **Reception and Cash Bar**

*Cotillion South*

6:00 PM - 8:00 PM

#### **Dinner**

*Cotillion South*

## Friday, September 15, 2006

7:30 AM – 3:00 PM

#### **Registration**

*Cotillion Foyer*

7:30 AM – 8:45 AM

#### **Morning Refreshments**

*Cotillion South*

8:30 AM – 10:00 AM

#### **CONCURRENT SESSIONS**

##### **OPTION 1**

##### **Poster Session II**

*Marriott Foyer*

##### **OPTION 2**

##### **Q&A Session about Sharing Results with Media and the Public**

Leslie Fink, Section Head, Media and Public Information Section  
Office of Legislative and Public Affairs  
NSF Program Officers  
*Cotillion North*

10:00 AM – 10:30 AM

#### **Break**

*Outside Cotillion South*

10:30 AM – 11:30 AM

#### **Presentation Introductions**

Mark Weiss, Senior Science Advisor, Directorate of Social, Behavioral and Economic Sciences  
*Cotillion North*

#### **Evaluation and HSD**

Edward Hackett, Division Director, Social and Economic Sciences, Directorate for Social, Behavioral and Economic Sciences

#### **Science of Science Policy and HSD**

Kaye Husbands Fealing, Science Advisor Directorate for Social, Behavioral and Economic Sciences

11:30 AM – 1:00 PM

#### **Day II Breakout Sessions**

#### **Session 8 – Cyberinfrastructure-enabled Science and Engineering**

Facilitator: Frank Scioli, Senior Science Advisor, Division of Social and Economic Sciences  
*Truman Room*

## Friday, September 15, 2006 (Continued)

### **Session 9 – Environmental Sciences and the Human Sciences**

Facilitator: Tom Baerwald, Program Officer, Division of Behavioral and Cognitive Sciences  
*Wilson A*

### **Session 10 – Evaluation and Assessment – How Measures Differ Across Disciplines**

Facilitator: Larry Suter, Program Officer, Division of Research, Evaluation, and Communication  
*Wilson B*

### **Session 11 – Integrating Education and Research**

Facilitator: Sandra Schneider, Division Director, Division of Behavioral and Cognitive Sciences  
*Eisenhower Room*

### **Session 12 – International HSD Research**

Facilitator: Bonnie Thompson, Program Manager, Office of International Science and Engineering  
*McKinley Room*

### **Session 13 – Integrating Quantitative and Qualitative Methods in HSD Research**

Facilitator: Anna Kerttula, Program Officer, Office of Polar Programs  
*Wilson C*

1:15 PM – 2:30 PM

### **Session 14 – The Relationship of Basic and Applied Research in HSD**

#### **Working Lunch and Reports from Breakout Sessions**

*Cotillion North*

2:30 PM – 3:00 PM

#### **Final Remarks**

Keith Crank, HSD Competition Coordinator, Directorate of Social, Behavioral and Economic Sciences  
*Cotillion North*

Facilitator: Tom Birkland, Program Officer, Division of Civil and Mechanical Systems  
*Johnson Room*

1:15 PM – 2:30 PM

#### **Working Lunch and Reports from Breakout Sessions**

*Cotillion North*

2:30 PM – 3:00 PM

#### **Final Remarks**

Keith Crank, HSD Competition Coordinator, Directorate of Social, Behavioral and Economic Sciences  
*Cotillion North*

## Cognitive Processes

### **A Sensory Motor Language for Human Activity Understanding**

0433136

Yiannis Aloimonos, Abhijit Ogale, Ken Nakayama and Javid Sadr

We have empirically discovered that the space of human actions has a linguistic framework. This is a sensory motor space consisting of the evolution of the joint angles of the human body in movement. The space of human activity has its own phonemes, morphemes, and sentences. We present a Human Activity Language (HAL) for symbolic non-arbitrary representation of visual and motor information. In phonology, we define atomic segments (kinetemes) that are used to compose human activity. We introduce the concept of a kinetological system and propose five basic properties for such a system: compactness, view-invariance, reproducibility, selectivity, and reconstructivity. In morphology, we extend sequential language learning to incorporate associative learning with our parallel learning approach. Parallel learning is effective in identifying the kinetemes and active joints in a particular action. In syntax, we suggest four lexical categories for our Human Activity Language (noun, verb, adjective, and adverb). These categories are combined into sentences through syntax for human movement.

### **Coordinated Motion and Facial Expression in Dyadic Conversation**

0527485

Steven M. Boker

A combination of methods from nonlinear time series analysis and nonstationary time series analysis was applied for the first time to dyadic conversation data from a previous experiment. The findings are that nonstationarity in head nodding (affirmative nod) during dyadic conversation (i.e., symmetry breaking) increased in proportion to the number of males in the conversation. For head shaking (indication of disagreement), nonstationarity only increased when males were placed in a dominant role in the conversation. Low dominant males and females did not exhibit a significant difference from one another in nonstationarity of disagreement head shakes. In addition, head nodding showed a multifractal scaling structure. Large scale fluctuations had a fractal scaling that was related to dominance whilst small scale fluctuations had a fractal scaling that was related to gender.

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### **Collaborative Research: (DHB) Modeling and Analyzing Individual and Collective Human Spatial Behavior**

0527689

Robert Sekuler, Maja Mataric, Kristina Lerman and Dylan Shell

Our project brings together researchers from the computational science, mathematical modeling, and cognitive science in order to study the individual and collective use of space. The project is currently developing tools for capturing and processing data that can be used for comparison with models, also undergoing refinement, in order to yield an understanding of the link between human collective behavior at different temporal and spatial scales. Our work, which requires collaboration with public venues and museums, is currently focusing on the California Science Center which is allowing us to observe, record and analyze natural crowd behavior. Three major activities, using distinct but complementary technologies, are being carried out in parallel.

First, we have focused on infrastructure and software development for collection of human position data in crowd scenarios. Calibration, testing and debugging both within a laboratory setting and in public areas of the California Science Center has lead us to the current setup with two video cameras with fish-eye angle lenses capturing to a single host computer. We have developed detection software that can operate in real-time for on-line processing that provides an estimate of the number of people in sub-regions of the video frame. This yields a statistical description of people occupying a space without requiring identification or tracking of individuals. Additionally, we have captured planar range-scan data from a pair of laser-range finders, and have developed a background- subtraction driver program to enhance the data extraction process.

Secondly, the team has constructed a virtual model of the California Science Center. Human subjects attempt to navigate through this interactive virtual environment, attaining each of several goal locations or activities as efficiently as possible. This virtual environment allows us to investigate peoples' cognitive representations of space in a social setting. The virtual museum, populated with virtual crowds based on real data collected from the real California Science Center, makes it possible to carry out controlled experimental probes of human participants' behavior in response to a range of environmental and social challenges.

Thirdly, we have developed a mathematical model to study collective dynamics of museum visitors. The model, which is based on the network flow framework, treats each exhibit in the museum as a node that is connected to other exhibits (nodes) by links. Each node and link is characterized by two parameters: capacity (maximum viewer density the exhibit is capable of supporting) and probability of leaving the exhibit to go to the next one. This model enables us to study how the density of museum visitors changes in time under a variety of conditions, for example, constant vs. intermittent flow, uncrowded vs. crowded conditions, directed vs. bidirectional flow.

Finally, we expect that data and observations generated by each of these three technologies – sensing of individual and crowd movement, goal-directed navigation in interactive virtual environments, and mathematical modeling of collective dynamics-- will be fed into hypothesis tests using the other technologies. Additionally, we expect that our results will be generalizable to a range of other, non-museum environments.

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### **An Embodied Approach to Cognitive Systems: A Dynamic Neural Field Theory of Spatial Working Memory**

0527698

John P. Spencer and Gregor Schoner

Spatial cognition has typically been studied as isolated parts-spatial perception, spatial memory, spatial attention, and so on. Although this approach has had many successes, it has failed to produce a detailed understanding of how the piece-meal processes that make-up spatial behavior occur together in time in a complex, behaving organism with a densely connected, highly interactive neural system. Here, we describe a neurally-plausible theory of spatial working memory (SWM), the Dynamic Neural Field Theory (DNFT). The DNFT specifies how information activated in SWM changes from second-to-second relative to perceived reference frames and long-term memories of previously responded-to locations. This theory also captures key aspects of the development of this cognitive system.

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### **December 2004 Tsunami**

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#### **HSD SGER Supplemental: Cross-Cultural Analysis of Responses to Mass Fatalities Following the Indian Ocean Tsunami of December 26, 2004 & Hurricane Katrina after August 29, 2005**

0522362, 554709

Henry (Hank) Fischer

Less than a year after south Asia suffered its Boxing Day 2004 tsunami, the U.S. Gulf coast was impacted by the devastating Hurricane Katrina. The supplemental enabled us to extend our south Asian mass fatalities management (MFM) work to include the communities impacted by Katrina. How did these impacted communities respond to their mass casualties? How were dead bodies recovered, identified, and disposed? How were relatives of deceased victims notified and victims repatriated? Did ethnicity, socioeconomic status, or nationality affect how bodies were handled?

Two experienced field teams are led by senior faculty, one from the Center for Disaster Research & Education, Millersville University of Pennsylvania, and one from the Center for the Study of Disasters and Extreme Events, Oklahoma State University. The research teams include faculty and students from

sociology, emergency management, geography, psychology, and forensics. Fieldwork protocol from the original SGER is being followed including qualitative in-depth interviews and GPS collection. Interviews have been conducted with personnel at temporary morgues, disaster victim identification (DVI) centers, DMORTS, DMATs, the FEMA DFO, USAR's and so forth as relevant—in addition to emergency organizations, first responders, government officials. The research is ongoing.

The MFM process observed generally conforms the limited literature that does exist: search and recovery, stockpiling and transportation of bodies, establishing temporary morgues, cleaning bodies, embalming and storing the remains, identification, issuing a death certificate, distributing the body to a funeral director and presenting the body for viewing. Culture, resources, scale and scope as well as socio-economic aspects result in variation in MFM.

We have been analyzing how the process and stages of MFM vary cross-culturally in Thailand, Sri Lanka, India and the United States. Preliminary findings suggest the MFM process appears most similar between the U.S. and Thailand and more distinct from India and Sri Lanka. For example, both Thailand and the U.S. appear to elongate the identification stage. The availability of key resources, particularly funding, refrigeration facilities and forensics expertise coupled with cultural values underlie this choice. Second, options for managing fatalities have varied due to several event-specific conditions. For example, within India, damage to transportation sectors delayed arrival of external resources. Within the U.S., the New Orleans flood impeded body recovery while in Mississippi the extensive debris field elongated the recovery phase. Third, decision-making rationale for how bodies were managed appears initially to have been similar but with different consequences. For example, India expeditiously buried or cremated its dead within 4-7 days in order to “get to the living.” Within the U.S., body recovery lagged in order to “save the living.” Finally, some degree of emergence appears to have occurred in all countries including emergent relationships, tasks and structures. For example, within India, emergence occurred at all levels of government as well as local citizen response. Comparative analysis including a U.S. context further elucidates the properties of the emergence concept as it relates to MFM and the varying events, locations and contexts.

Hurricane Katrina disproportionately impacted the poor, racial and ethnic minorities and women—as did the tsunami—our understanding of mass fatality management for socially and economically vulnerable populations should be enhanced by the completion of the current project. Implications for improving and sensitizing related policy and practice are expected to result.

Project Website under development: [www.millersville.edu/~CDRE/satrf.html](http://www.millersville.edu/~CDRE/satrf.html)

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### **Decision Making**

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#### **A Mind for the Market: An fMRI Study of Attribution of Mental States to Financial Markets**

0527491

Antoine Bruguiere, Steven Quartz and Peter Bossaerts

A seminal finding in experimental finance is that successful traders can infer other traders' knowledge from prices and quantities but it remains unknown how this inference takes place. Standard economic theory assumes that traders treat markets as non-intentional, and thereby use a learned, mechanistic relationship between information and prices. We developed a novel neuro-finance approach that integrates experimental

financial markets with functional magnetic resonance imaging (fMRI) and verify our hypothesis that traders anthropomorphize markets as opponents with their own beliefs, intentions and even emotions, applying Theory of Mind (ToM) to "read the market." This approach first collects trading data with an experimental market and then replays the trade to fMRI subjects. We found that market participation engaged brain structures known to be crucial for the attribution of mental states and social emotions, including paracingulate cortex, anterior cingulate cortex, amygdala and insula. In effect, our subjects treated the market as a human opponent with a mind of its own.

Further, activation in the lingual gyrus revealed that, contrary to standard theory, traders pay attention to all orders, not just trades. Our findings extend the role of ToM to complex systems with anonymous human interaction.

The potential implications are far-reaching: mentalizing may determine trading success more than personality traits or ability to overcome computational or judgmental errors, and over-mentalizing (attribution of incorrect beliefs, intentions or emotions to markets) may be the cause of anomalous behavior, such as "irrational exuberance."

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### **Decision-making in Rangeland Systems: an Integrated Ecosystem-Agent-based Modeling Approach to Resilience and Change (DREAMAR)**

0527481

Kathleen A. Galvin, Randall B. Boone, Dennis S Ojima and Philip K. Thornton

Rangelands comprise about 25% of the earth's surface and these landscapes support more than 20 million people and most of the world's charismatic mega-fauna. Most of the people who live in these regions of the world herd domestic livestock and some do limited cultivation so they are dependent directly on the environment for most of their livelihoods. But change is rapidly changing the environments upon which these people depend through such factors as population pressures, land use and land tenure changes, climate variability, and policy changes which affect their ability to earn a living. This project is about understanding uncertainty and change in this linked human-environment system. Through an integrated modeling approach based on an appropriate theoretical framework that makes use of extensive empirical research we are addressing issues of societal resilience under change.

Through the development of agent-based modeling efforts (in a model we call DECUMA) linked to extant ecological models (Savanna and Daycent) we are investigating the societal factors that enable households in these systems to make land use decisions that affect resiliency to uncertainty. Decisions that people make are expressed in land use and it is here that we look at the effects of those decisions on ecosystem services. In other words, what enables people to cope with change so that the social system and the ecological system can still provide for people and the animals that inhabit these systems? With work we have done in Mongolia, the northern U.S. Great Plains and in East Africa we are investigating how change affects the coupled human-ecological system.

Why is this important? Research that focuses on household and community behavior is important because it is at that level where fundamental decisions are made regarding events and changes and it is here where resilience is manifested. The notion that broad recommendation domains can be identified for a broad set of people coping with change is becoming increasingly hard to believe given the spatial and temporal heterogeneity of the systems we are looking at, and the complexity of the world we now live in. In the future we are going to have to be much smarter in the way that we match potential "clients" with potential

policy or technical interventions. The only way the research community is going to make great progress in attaining objectives that do confer resilience (on social and ecological systems) is through much better targeting ability, a large part of which seem to be intimately entwined with understanding how households make decisions.

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### **Complex Reasoning and Learning Environments of the Future**

0433373

Eric R. Hamilton

This project integrates multiple research strands in exploring means to reliably increase and to assess complex reasoning in formal learning environments. The original HSD proposal outlined a rationale for studying problem-solving performance through the lens of model-eliciting activities (MEA) – a class of problems that feature authentic, real-world situations and the need to work in teams -- much like the scenarios involved in a large swath of the problem-based learning and case reasoning literature, described in greater detail at <http://modelsandmodeling.net>. MEAs are further structured, though, to enable both teachers and researchers – and students themselves – to observe the evolution of conceptual systems as students express, test and revise solutions or models to the problems. We are in the process of expanding the work of this project with British and Chinese partners in testing the MEA model through problem-solving settings involving students on the same team working from different countries.

One rationale behind the original project is that in undergraduate education writ large, and at the Air Force Academy more specifically, it appears that students fail to progress appreciably in their critical thinking skills over four years of schooling. The recent volume by former Harvard President, *Our Underachieving Colleges: A Candid Look at How Much Students Learn and Why They Should Be Learning More* highlights some of the factors that lie behind a broad failure of higher education to nurture and enhance the critical thinking of students. There is no question that over four years students acquire new understandings, knowledge and skills, yet that is not the same as acquiring the capacity to engage in the complex and creative reasoning competencies that anyone involved in undergraduate education desires for their students and that are important for the nation's prosperity and security.

A second strand of the HSD project stresses means to assess complex reasoning skill. We have developed and tested two types of tools and are currently exploring a third. The most important of those to date are Reflection Tools (RTs), which furnish a means for learners to make explicit the range of social dynamics they have experienced in a modeling or problem-solving sequence, but with those dynamics tied to the specific properties of the problem the group is attempting to solve. Reflection Tools evoke from learners structured observations about their interactions in modeling, and they are designed for use by learners, professors, and researchers. (For this reason, they are also useful in a new research methodology called multi-tier design experiments (Lesh 2002; Lesh 2006)). One unit of analysis for an RT is the individual modeling episode of the learner, yet the value for an RT is in documenting the evolution of modeling experience and competencies over multiple episodes. They are designed in part to promote not only metacognitive activity by the learner in problem solving but also the development by the learner of more sophisticated metacognitive systems and analytical tools that emerge from such systems.

A second tool involves Learning Progress Maps (LPMs), as they are in current development (by Lesh and colleagues at Indiana). LPMs treat “big ideas” in a domain as “mountains”, with related and necessary subskills to be the contiguous valleys and ridges, and a coloring scale to represent performance competencies for concepts and skills. LPMs rely heavily on computational and graphical modeling to

produce a much higher bandwidth for effectively expressing the status of a conceptual system than a scalar value can provide, but do not require the extensive processing time associated with examining work portfolios.

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### **The Implications of Incomplete and Imperfect Information for Multinational Management of Transboundary Marine Fisheries**

Robert McKelvey, Kathleen Miller and Peter Golubtsov

A basic premise in renewable resource economics is that competitive exploitation of a common property resource is destructive, both of the resource base and of the economic rentals inherent in its utilization. In the context of marine fisheries, the usual remedy is through the institution of a central regulatory agency, with authority to impose fleet size constraints and annual harvest allocations.

Complicating such regulatory management are uncertainties inherent in the changing demographics of the fish stock--temporal changes in the stock's density and its distribution across its range. These depend in turn on changes in the oceanic environment, such as El Nino events, that alter features such as surface temperature, nutrient content, and the paths of ocean currents. Thus accurate information may not be available when the managers need to set their harvest quotas. This is particularly important for anadromous fisheries (e.g. salmon) and small schooling pelagics (such as sardines, herring, and anchovies).

For transboundary fish stocks, whose ranges cross the boundaries of national jurisdictions, an additional complication arises. Particularly for highly migratory fish stocks, e.g. tuna or swordfish, the range of the harvested fish stock will intersect the extended economic zones (EEZs) of many coastal countries and may even extend out into high seas areas where fleets from all countries are free to harvest. In this case fishery regulation will, by treaty, be through a multinational Regional Fisheries Management Commission (RFMC), whose members include all coastal nations within the stock range plus all other nations no matter how distant, whose fleets participate in the harvest. At issue among the member states will be the overall size of the annual catch, and the allocation of its benefits, both current and long run.

In this project we treat the transboundary marine fishery as a stochastic, imperfect-information dynamic game. Complexity enters from two principal sources: from incomplete and imperfect information about current and future stock size and distribution, and from incomplete understanding of the complex strategic interplay among the diverse countries involved in the fishery in distinct ways: as harvesters, owners of access rights, and as members of the RMFO. We have constructed two distinct game models, each involving both of these, but emphasizing one or the other.

The Split-Stream Stochastic Imperfect Information Model focuses on stochastic demographic information, but involves only two coastal states whose fleets operate only in home waters. We compare the results of competitive vs. cooperative dynamic harvesting.

The outcome of the cooperative game is, as expected, that more accurate information, always will enhance the fleets' outcomes. In the competitive game the results are more complex. In many cases one finds that the impact of enhanced information is negative. In particular, for a totally symmetric game, increasing the quality of the players' information may actually lower their returns. That is, in these cases the net impact of enhancing information is simply to intensify destructive competition. This result demonstrates in particular that striving for information transparency may be entirely inappropriate in this context.

The RFMC Strategic Model (which currently is being refined) elaborates the institutional structure of the dynamic fishery. Specifically it assumes that the diverse fishery-involved countries interact cooperatively within the Commission to set long-term goals, but interact competitively during the current harvest season, though within the regulatory framework developed by the Commission. It also allows for temporal changes in oceanic environment, but assumes accurate current knowledge of stock size and distribution.

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### **Developing a Measure of Voluntary Consent for Protocol-Based Treatment Decisions**

0527618, 0527351, 0527547

Robert M. Nelson, Mary Frances Luce, Tom Beauchamp, William Reynolds and Victoria Miller

The individual choice to participate in research (i.e., consent) should be informed and voluntary. The empirical study of consent has focused on the information and decision-making aspects of consent. Few empirical studies examine the voluntary aspect of consent, due largely to the lack of an instrument to measure "voluntariness." Absent such an instrument, it is difficult to distinguish between appropriate and "undue" influences on informed consent. Primary objective: develop measure of voluntary consent (decision-making control instrument or DMCI) for parental decisions re. protocol-based treatment of child. Secondary objective: explore relationships between DMCI and measures of decision-making preference, coping style and affect.

The objectives will be met through three specific aims: (1) Item Generation: Create item pool assessing all major dimensions of decision-making control for a sample of parents, using (a) literature review on voluntary choice and related constructs; and (b) focus groups with parents who have made protocol-based treatment decisions, clinician-investigators, study coordinators and other non-physician clinicians. (2) Scale Construction: Construct a voluntary consent scale (DMCI) by administering item pool to parents within 2-5 days of their decision concerning protocol-based treatment for their child. (3) Construct Validity: Examine relationship between DMCI total score and measures of decision-making preference, coping style and affect, using same sample of parents.

Preliminary Results (Item Generation): Focus Groups and Interviews; other instruments:

We have conducted 4 focus groups and 9 interviews with key stakeholders who participate in the consent process. Participants include researchers (5), research personnel (26), and parents (8). Preliminary analysis suggests that participants have varying interpretations of meaning of voluntariness. For example, researchers range from believing that all of their patients make voluntary decisions to participate in protocol-based treatments to believing that none of them do. Existing instruments were used to generate items for DMCI item pool, based on constructs relevant to concept of "voluntary choice." These instruments measure self-determination, self-efficacy, control, and decisional conflict. Items were adapted using 3 criteria: (1) assess beliefs about self, not world; (2) refer to specific decision about child's treatment, not decisions in general, and (3) assess beliefs about decision making process, not about outcomes of decision.

Discussion:

Analysis of interview data and investigator team meetings will determine ultimate composition of item pool. Unresolved questions include: (1) Do we include "confounders" (i.e., items that may co-vary with voluntariness, but are conceptually independent) in item pool? Examples include perception of adequate information, pressure from external (e.g., situation) or internal (e.g., emotions, trust) sources, and delegation of decision; (2) If we include confounders in item pool, how specific do items need to be? For example, must we anticipate sources of pressure and ask specifically about each of them or simply ask about

perceived pressure in general? (3) We are adapting items from measures of locus of control, which include "chance" as a source of external control. What does "chance" mean in the decision making context? (4) The notion of detachment/dissociation from decision process has emerged in parent interviews and is a component of Self-Determination Scale. To what extent is this concept relevant to voluntariness? Being detached from decision may imply passivity (resignation, incapacitation); should we include items to evaluate passivity with items on active involvement?

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### **Environmental Human and Social Dynamics**

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#### **Environmental Institutions, Practices, and Identities**

0527318

Arun Agrawal, Krister Andersson, Daniel Brown, Elinor Ostrom and Rick Riolo

Our project seeks to account for changes in environmental identities, defined as the sets of beliefs and preferences of agents in relation to the environment? We hypothesize that changes in environmental identities are a result of changes in the types of institutions that shape individual agents' practices around environmental resources. This general hypothesis decomposes into two specific hypotheses we seek to test through research. In situations characterized by high levels of social and ecological unpredictability, environmental identities are likely to be linked more with traditional institutions. Conversely, where the level of predictability is high, institutions introduced by external actors such as governments and NGOs are likely to be more successful in changing individual environmental identities by creating new incentives for different. The project focuses on forests and woodlands as examples of environmental resources in three countries -- India, Uganda, and Bolivia -- to collect data that will allow us to test the above hypothesis. We aim to collect data at two points in time. The first will be prior to changes in environmental institutions guiding local environmental practices and attendant beliefs and preferences of respondents about different dimensions of forests, their use and management. The second will be after new institutions have been introduced in the selected sites. To analyze these changes, we will undertake statistical analysis of the collected data, and build agent-based models of distribution of beliefs and changes in belief patterns. Currently, the project has begun its first round of data collection in the selected countries. Our preliminary data analysis reveals little correlation between social structural factors such as gender, class, ethnicity, and environmental beliefs of respondents.

#### **Paleoclimatic Change, Landscape Evolution, and Cultural Transformation in far Western Tibet, 2500 BP-Present**

611320

Mark Aldenderfer, Jonathan Overpeck, Jon Peletier, Julie Cole, Kam-biu Liu, Houyuan Lu, Wang Luo and Gregory Hillis

More than four billion people today in the Himalayan and trans-Himalayan nations depend upon the Asian summer monsoon for their livelihood. Disruptions in the timing, amount, and location of monsoon rainfall can seriously affect the livelihood of these people, and create widespread economic, social, and health-related problems. Unfortunately, our understanding of the linkages between monsoon variability and human institutional response is less comprehensive than is desirable primarily because of a lack of long-term instrumental records of monsoon variability and few historical documents that describe how the peoples of the region have coped with this variability. One approach that offers the potential to develop real insight into

this problem is historical ecology, a research orientation that seeks to obtain simultaneously data on climate change and human response to it over long time frames. In this project, a team of researchers from disciplines as disparate as paleoenvironmental science, geomorphology, archaeology, and archival studies will study the causes and consequences of a hypothesized abrupt shift in the intensity of the Asian monsoon around AD 1300. In far western Tibet, the focus of this research, this shift is believed to have led to significant changes in the subsistence economies of the peoples of the region, including famine, migrations, and major changes in political economy. This project will undertake a thorough examination of the causal forces behind monsoon variability as well as a comprehensive documentation of the variety of responses made by human institutions (ranging in scale from the household to the regional polity) to variation in monsoon intensity and character at different temporal scales. This project, then, is of major concern to all Himalayan nations. Although in its initial stages, the project has already gained some insights into regional geomorphic process and the archaeology of the region.

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### **Modeling the Synergistic Effects of Social and Ecological Change in the 19<sup>th</sup>-Century North American Cod Fishery**

0433497

K. Alexander, W. Leavenworth, S. Claesson, G. Smith, L. Rains, S. Brennan, K. Magness, R. Dunn, A. Cooper, A. Rosenberg, J. Bolster, R. Gee and T. Law

During the past year, the Gulf of Maine Cod Project (GMCP) at the University of New Hampshire has focused on Maine codfishing vessels licensed in the Frenchman's Bay Customs District from 1861 to 1865, to determine sociological and environmental factors influencing this fishery. These vessels, averaging just 45 tons, sailed out Blue Hill Bay, Frenchman's Bay, Gouldsboro Bay, near Mt Desert. Ninety percent fished in the Gulf of Maine from Monhegan out to Jeffrey's Bank, and up to Grand Manan in the Canadian Bay of Fundy. We compiled 75299 daily records from 524 logs in a relational database, containing: daily landings and effort, vessel location, occasional descriptions of weather, conditions at sea, bottom conditions, other marine species, and the presence or absence of bait. Then we compiled sociological data from US Census records on crewmembers and owners of Frenchman's Bay vessels, including: residence, house number, age, occupation, wealth, head of household, and household wealth in real and personal estate, for the owners, captains, shoremen and crew of each vessel each year—3230 lines of data each representing one man-year. The 63 different occupations listed for Frenchman's Bay fishermen indicate the importance of fishing in this mixed rural economy and the integration of fishing and farming along the coast. Rather than maximize profit, families such as the Grants of Blue Hill Bay apparently targeted an income, fished until they reached it, then stopped fishing— a strategy we call cash crop fishing. Correlating sociological data on owners, crew, homeports, economic strategy and profit with fishing strategy, catch expectation, availability of bait, and actual landings, will enable us to identify how decisions were weighed and risks managed.

Mapping has begun GIS dataset contains 211 ports and harbors frequented by these vessels, and 216 fishing grounds. Twenty-one fishing grounds are zones encompassing smaller banks that we designed from fishing patterns observed in the logs. Frenchman's Bay fishermen often identified fishing grounds by coastal landmarks. This is problematic when every bay north of Portland contains locations with the same name. "Duck Island Grounds" are found near both Boone Island and Mt. Desert. Two "Long Island Grounds" are in Blue Hill Bay, and one near Grand Manan. Four "Middle Grounds" include Stellwagen Bank, one near Mt. Desert, one near Grand Manan, and one on the Scotian Shelf. The fishing zones standardize these locations and allow catch to be aggregated in a variety of ways. In addition we identified 39 grounds mentioned lying close to shore in the logs that are entirely new, or are described differently in the literature. . Ralph Stanley, Maine wooden boat builder and a descendant of Enoch Stanley, a captain whose logs we

have transcribed, has generously shared his knowledge of the fishing locations the Stanleys employed in the 1800s. MacArthur Fellow Ted Ames has also shared local fishing lore. We are currently mapping the geographic distribution of homeports, hometowns, and landings. Fishing families, individual fishermen, and fishing ports can be related to the distance, expectation of catch, and difficulty of reaching fishing grounds in this spatial model.

In order to model decision-making we needed a baseline for expected catch on the fishing grounds. We found that the aggregated weight of cod landed between Monhegan and Grand Manan within 40 miles of the coast in 1861 was approximately 12,500mt. These fish, averaging 7.5 lbs, were caught by 223 Frenchman's Bay vessels, which comprised only 15% of the Maine fleet of codfishing vessels that year. Eighty nine percent were landed less than 20 miles from shore. Frenchman's Bay fishermen in 1861 caught more cod than were landed in the entire Gulf of Maine in 1998, 1999, and 2000 combined. These results have profound implications for understanding long-term change in Gulf of Maine marine ecosystem, and for understanding how humans respond to such relative abundance.

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### **Robustness-Vulnerability Tradeoffs in Renewable Resource Management**

0527744

Oguzhan Cifdaloz, John M. Anderies, Marco A. Janssen, Armando A. Rodriguez and Jeffrey Dickeson

This paper presents fundamental performance, robustness, and vulnerability tradeoffs in the context of renewable resource management. Using the traditional Gordon-Schaefer model of a fishery, we show that the common management objective of maximizing discounted returns may result in optimal policies that are very sensitive to parametric uncertainty. A consequence of this inherent sensitivity to uncertainty is a significant economic downside and limit cycle behavior in the presence of parametric perturbations. To quantify this economic downside, we develop two precise notions of performance sensitivity with respect to model parameter uncertainty. Each is used to illustrate how optimal performance can be sacrificed (traded-off) for reduced sensitivity, and hence increased robustness, with respect to model parameter uncertainty. We examine a large class of control policies and compare their performance using Pareto sensitivity-performance trade-off curves. We specifically examine sensitivity (and hence robustness) with respect to each of the following seven key model parameters: intrinsic growth rate, carrying capacity, catchability, initial biomass, price, cost, and discount rate. Key insights that emerge from our analysis are as follows: (1) the classic optimal control policy can be very sensitive to parametric uncertainty - leading to an unacceptable economic downside as well as limit cycle behavior, (2) even mild robustness properties are difficult to achieve for the simple Gordon-Schaefer model used, and (3) increased robustness with respect to some parameters (e.g. biological parameters) may result in increased sensitivity (decreased robustness) with respect to other parameters (e.g. specific economic utility function parameters). We thus illustrate fundamental robustness-vulnerability trade-offs and the limits to robust natural resource management. Fundamental relationships between parameter sensitivities are established. Also presented are control-effort based ideas for achieving sensitivity reduction with respect to specific parameters of interest. While the paper mainly focuses on single-parameter uncertainty and worst-case economic downside, it is shown how the robustness framework presented may be extended to address dynamic and multi-parameter uncertainty.

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### **Understanding Land-use Transitions in Montane Mainland Southeast Asia: The Demise of Swidden and the Intensification and Expansion of Rubber**

0434043

Jefferson Fox, Benchaphan Ekasingh, Yayoi Fujita, Louis Lebel, Nicholas Menzies, Khamla Phanvilay, Janet Sturgeon, David Thomas, Stephen Walsh and Xu Jianchu

Montane mainland Southeast Asia is a region of great biological and cultural diversity that has come under close scrutiny in the last several decades as a result of both real and perceived deforestation, land degradation, and most recently, the conversion of traditional agricultural practices to more permanent cash crop agriculture driven by regional and global markets. This project seeks to understand how resource management systems in montane mainland Southeast Asia are changing in the wake of commodification of resources in order to appreciate how these changes may affect sustainable resource use, landscape transformation, and land cover.

### Progress and (Preliminary) Outcomes:

The project developed narratives of economic, demographic, institutional and cultural change in the region to further our understanding of land cover change and its implications for society and nature. This year we focused on understanding the conversion of upland fallows to rubber in light of the rising price of rubber on the Chinese market. Interviews with local officials and statistical data in China, Laos, and Thailand helped to build a picture of the impacts of changing policies and markets on land use, and on administrative responses to change.

Rubber was first planted in Xishuangbanna (southern Yunnan, China) in the early 1950s by the national government to meet state demands and in response to international trade sanctions. Through the 1970s rubber plantations were the exclusive domain of state farms, organized industrial enterprises, with a labor force of migrants from other parts of China. In 1983 the central government allocated forested land to households and villages. In Yunnan, the provincial government used the program to restrict swidden agriculture through land titling and demarcation and to oblige households to regenerate forest resources. The result was a massive increase in land planted to rubber and as a consequent loss of forest resources. In Thailand the national government seeks to increase the amount of rubber planted in the North by 48,000 hectares and by 64,000 hectares in the northeast by the end of 2006. By 2020 the total area planted to rubber is projected to increase nearly 500,000 hectares to approximately 2.4 million hectares. In Laos strong market demand from China for latex and investor interest from China, Vietnam, and Thailand have caused a rapid increase in rubber planting. To date, most of the rubber planting in northern Laos has been driven by smallholders drawing on family and ethnic linkages across the border with China for technical support. However, there is little institutional support or understanding about how current investor interest can be best channeled to maximize potential returns to the national economy and as well as ensure socially and economically just smallholder rubber production.

Extensive interviews throughout the study region suggested that rubber expansion is limited by temperature (rubber dies at temperatures below 0° C, and is damaged by temperatures below 4° C) We generated a minimum temperature surface for southern Yunnan and northern Laos by using Mountain Climate Simulator (MTCLIM) to extrapolate minimum temperatures from four meteorological stations. We used fuzzy cognitive mapping, analytical hierarchical processing (AHP), and narratives of economic, demographic, institutional, and cultural change to develop rules for a cellular automata (CA) model of the expansion of two crops, rubber (uplands) and rice (lowlands) from 1988 to 1999. The CA model grows rice and rubber annually and outputs maps as well as landscape and class level pattern metrics at each time step.

Project Website: <http://www2.eastwestcenter.org/environment/MMSEA/>

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## Boundary-Setting in Mental and Ecophysical Models

0433165

Bryan Norton

Scale matters! In particular, scale matters in the formulation of environmental problems, and problem formulation remains the weakest point in environmental management processes. One particularly thorny set of issues have to do with the spatial scale chosen to "model" these problems. Accordingly, our research question is: How do people—scientists and other stakeholders in management disputes—"bound" (spatially and temporally) the systems to which they attribute a problem?

Our researchers examine how scale issues affect environmental problem formulation in 5 areas:

1. Douglas Noonan, Co-PI, and Carolyn Fonseca (Ph.D. student) are studying the impact of scale choices in modeling Environmental Justice, and developing hedonically based guidelines for choosing appropriate scales.
2. Bryan Norton, PI, is seeking an operationalization of the concept of "sense of place"(SOP) which "shapes" the mental and ecophysical models that are used in many cases.
3. Paul Hirsch, Ph.D. student, will study the legislatively mandated process of establishing water management districts Georgia as a case of spatial bounding in action.
4. Asim Zia, Researcher, San Jose State U., and Paul Hirsch are doing discourse analysis of newspaper and scientific publications to document changing conceptions of pollution that catalyzed the apparently important case of "macroscoping" in the Chesapeake Region.
5. Sara Metcalf (Ph.D. student, U. of Illinois) and Asim Zia will develop proto-type agent-based modeling simulations to test alternate theories of sense of place and their impact on scalar choices in the formulation/ management of environmental problems by individuals and communities.

Our work gets its empirical anchor from previous work showing strong empirical evidence for spatial discounting: People's concern for places and events erodes over distance.

We are trying to understand how people "model" (mentally and culturally) environmental problems.

Tentative conclusions:

- Measurements of environmental injustice are highly sensitive to the scale of the data analyzed.
- It seems unlikely, given the data, that concern for a risk or amenity is independent of location.
- The choice to model decrease of concern across distance raises two possibilities:
- Concern decreases proportionally to distance in all directions.
- Concern decreases irregularly due to individual differences, including strength of subjective "sense of place" (3 aspects: attachment, identity, dependency).
- Stakeholders and scientists employ "models" of problems shaped by their values and concerns.
- Models of problems used by stakeholders and scientists are shaped by their values and concerns.
- Environmental problems are best seen as "wicked problems:" their problem formulation is contested and different interest groups see problems differently (including "bounding").
- Individuals and whole regions can "shift" their mental models to a larger scale called. Macroscoping:
- Can be defined as shifting to a more appropriate scale to model a public problem, therefore partially "taming" a wicked problem by gains in communication, and
- is illustrated in our retroactive case study of the way changes in "mapping" the Chesapeake followed changes in scientific models of pollution.

- We can thus explore two broad sources of evidence:
- Aggregated data on individual decisions:
  - Hedonics (how home prices change across geographic space)
  - Questionnaire data (respondents rate their level of fear of various facilities viewed as unwanted or desired).

Aggregated data provides relatively objective evidence of a widely shared process by which people's concern for hazards and amenities declines across space away from their homes.

- Individual data on spatially sensitive behaviors:
  - Individual interviews and questionnaires to determine respondents' mental and cultural models of their "place" and the space around their place.
  - Discourse analysis in search of macroscoping in scientific journals and newspapers.

Individual data will be used to examine SOP as both a dependent variable (how do people form their SOP?) and as an independent variable (how does SOP affect problem formulation and reaction to environmental problems?).

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### **Infrastructure Change, Human Agency, and Resilience in Social-Ecological Systems**

0527511

Stephen G. Perz, Grenville Barnes, Graeme Cumming, and Jane Southworth

New roads bring complex changes to regions, including ecological degradation, social conflict, and economic development. Needed in such circumstances is attention human agency with a focus on livelihood decisions and resource use. These not only respond to new infrastructure, but also lead to ecological and institutional changes that in turn generate feedback effects that affect human well-being. We use a complex systems framework to focus on social-ecological systems as integrated wholes via the interface of infrastructure and land tenure institutions. We draw on the concept of resilience, a property of complex systems, and reformulate it in terms of system components, relationships, innovations and continuity, which afford a means of observing system properties relevant to the retention or loss of system identity. We also expand on the concept of connectivity to consider its importance not only as infrastructure linkages that bring external shocks from outside regions, but also as networks of connections among local actors and processes. These ideas motivate specific expectations about connectivity and resilience, both at the scale of a social-ecological system and for specific components within a system.

This project will examine the impacts of road connectivity changes on social-ecological resilience in a global biodiversity hotspot, the tri-national "MAP" region of the southwestern Amazon where Brazil, Bolivia and Peru meet. The proposed project will draw on considerable data already in hand for the study site, while adding new data to capture changes underway due to new infrastructure upgrades. We will spatially integrate state data and cartographic products, cadastral maps, satellite imagery, social surveys, and vegetation transects using GPS and GIS. This will allow identification of social actors, institutions, and habitat patches as system components in geographic space. Further, we will specify the relationships among those components via their local connections, which allow monitoring of changes in those networks over time. We anticipate that this research will improve the design of integrated databases for interdisciplinary environmental research, facilitate empirical evaluation of complex systems theory, and result in more robust frameworks for understanding human agency and environmental change.

In 2006 the PI and co-PIs have begun organizing this project, which will be complex due to its concern with transboundary processes across national borders as well as integration of data normally associated with disparate disciplines. In March, two co-PIs (Southworth, Perz) coordinated five (5) special sessions on "Linking Social and Ecological Systems" at the AAAG meetings, which is generating an edited volume. The project team has been organized into three groups by project component: remote sensing, botanical sampling, and land tenure/socioeconomic research on livelihoods. We identified three GRAs, one with matching funds from UF, two of whom have begun work on the remote sensing component. We have acquired memory to store geographic data and have begun acquisition of a 10-step time series of 8 Landsat images each to document land cover changes in MAP since the 1980s. Two of the co-PIs (Perz, Barnes) met with colleagues at regional universities on all three sides of the MAP frontier, and are organizing a tri-national research network there with this project as a point of departure for longer-term monitoring of complex changes due to infrastructure upgrades. We have a matrix with approximately 80 faculty and students at several universities who are interested in consulting on site selection and methodological protocol for fieldwork in 2007 and perhaps 2008. As initial remote sensing analysis of the region proceeds, we are beginning logistical planning for botanical and tenure/socioeconomic fieldwork.

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### **The Living Environment and Human Health over the Millennia**

0527658, 0527494

Richard H. Steckel, Ebba During, Clark Spencer Larsen, Carolyn Merry, Paul Sciulli, Lonnie Thompson and Phillip L. Walker

Observers have long noted a connection between geography and social performance, especially the persistence of poor health and poverty in the tropics. Although the relationship is well-established, the underlying mechanism is controversial. Some emphasize the constraints imposed by ecology, which affect the disease environment, food production, and a country's potential for economic development. An alternative mechanism emphasizes culture and institutions, whereby human creations enable people to adapt and to shape their environment for their benefit. The future health and quality of life of hundreds of millions of citizens in developing countries depends upon knowledge of these mechanisms. The distant and near past provide an excellent laboratory for investigating these issues. Specifically, human health and welfare have varied enormously over the past 10,000 years, with transitions from foraging to farming, from rural to urban settlements, from relative isolation to global exploration and colonization, and ultimately from the artesian shop to industrialization.

The researchers undertaking this interdisciplinary research project will use skeletons to assess health over this enormous span of time and they will employ a variety of sources to prepare measures of the environment or the context in which people lived. With a focus on Europe and the Mediterranean, they will develop models that explain variations in health as a function of two broad categories of variables: ecological and socio-economic. The ecological variables include climate; topography; soils; vegetation; access to water; and the nature of the terrain, while the latter category includes settlement size; patterns of subsistence; technology in use; form of government; the degree of stratification and inequality that existed in the society; the nature of housing; and the presence or absence of monumental architecture. Project researchers will develop regression models to test the null hypothesis that ecological factors had no influence on health.

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### **AOC-Ecosystem Services from Low-input Cropping Systems: Incentives to Produce Them and Value of Consuming Them Year 1: Establishing the Framework**

0527587

Scott M. Swinton, Frank Lupi and G. Philip Robertson

Scientists at the Long-term Ecological Research project in agricultural ecology (KBS-LTER) have identified a low-input rotation of corn, soybean and wheat that offers not only good crop yields, but also environmental benefits including improvements in water quality, soil quality, climate stability and beneficial insect populations. However, this low-input crop rotation is not widely adopted by farmers. In order to find out why, researchers on this NSF-HSD project will explore 4 null hypotheses (methods in parentheses): 1) that the benefits do not scale up from experimental plots to farm fields (scale-up onto farm-scale fields planned at Kellogg Biological Station in Michigan), 2) that farmers are unaware of the benefits of the low-input rotation (focus group interviews), 3) that farmers are aware but prefer not to adopt it (focus group interviews), and 4) that farmers would be willing to adopt if offered a financial incentive (experimental auctions and mail survey of farmer willingness-to-accept). In addition, the project plans a mail survey of taxpayer willingness-to-pay for the ecosystem services that would be provided by the low-input rotation system.

In Year 1, the project focused on research planning and concept development. Scale-up of the conventional, low-input and organic treatments of the KBS-LTER project began in summer 2006 on 27 fields. The design permits 3 replications of 3 treatments with the crop rotation beginning with each of the 3 crops (corn, soybean and wheat).

In order to advance concept development, the PI's organized both a national workshop and a symposium. The national workshop on "Valuation of Ecosystems Services in Agriculture" was held at KBS in Oct. 2005. It led to a forthcoming special issue of Ecological Economics on "Agriculture and Ecosystem Services." The PI's also organized symposia on "Harvesting Ecosystem Services from Agriculture" at the annual meeting of the American Association for the Advancement of Science (Feb. 2006) and at the annual meeting of the American Agricultural Economics Association (July 2006).

Most empirical research activities will begin in Year 2, with newly recruited graduate students, whose training will be a major output of the project. The project has attracted companion funding from within Michigan State University.

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### **Exploratory Research and HSD Research Community Development**

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#### **Constructal Theory of Social Dynamics**

024539

A. Bejan, G. Merx, K. Land and E. Tiryakian

Constructal Theory is the view that the generation of flow configuration is a universal (physics) phenomenon. This "design in nature" phenomenon is covered by the constructal law: "For a finite size flow system to persist in time (to survive) it must evolve in such a way that it provides easier and easier access to the currents that flow through it." This project and workshop (4-5 April 2006 at Duke University) put social scientists in the same room with physicists and engineers, and generated a wealth of ideas of how to grow the field and develop a community of scholars around constructal theory. Major topics of research at the workshop were: The organized multi-scale distribution of living settlements, The occurrence of multi-scale structure inside a settlement. Development, and the connection between 'flowing' societies, advancement

and prosperity, Migration patterns on the globe, in space and in time, Globalization, and the problematic aspects of over-coming obstacles to efficient flows, e.g. investment funds from the public and private sectors. We plan to pursue these ideas and their creators during the second year, for which we plan a second international workshop at Duke in April 2007.

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### **Social Effects in Open Source Projects**

0525263

Premkumar Devanbu

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### **Social Dynamics of Engineering Instructional and Curricular Change: Creating an Interdisciplinary Research Agenda**

0523255

Roberta Spalter-Roth and Norman L. Fortenberry

Undergraduate engineering has high attrition rates and difficulties in attracting U.S. citizens, especially women and minorities. Many resources have been devoted to developing new pedagogies in engineering that will increase recruitment and retention, but little has changed in the content and conduct of undergraduate engineering education. The underlying research question of this project is: “Why do engineering faculty fail to use demonstrably effective teaching methods and other data-based information about teaching, and how can the situation be changed?” In order to understand the social and human dynamics that facilitate the diffusion and acceptance of new engineering curriculum and pedagogy, the Center for the Advancement of Scholarship on Engineering Education (CASEE) of the National Academy of Engineering (NAE) in collaboration with the American Sociological Association (ASA) convened a two-day workshop in April 2006 that brought together 10 sociologists and 9 engineering educators. The purpose of the workshop was to develop study designs that examined the relationships among the acceptance of education innovation and Organizational Context and Faculty Behavior; Faculty Rewards; and Diffusing Innovations.

The premise of this unique gathering of sociologists and engineering educators was that each group could bring complementary insights to understanding and addressing the problem of diffusion and change. Over the course of the workshop participants developed hypotheses and study designs to answer questions about the relationships among (1) types of educational institutions, status of innovators, and status of acceptors; (2) the type and distribution of rewards, the values and norms of the engineers, and the acceptance of innovation; and (3) the type of networks, the type of innovation, and the rate of acceptance.

CASEE and ASA are hoping that joint teams of engineers and sociologists will build on these ideas and develop fundable research projects. This activity could benefit sociologists and well as engineering educators. The broader impact could be an increased understanding of ways in which sociological insights can be beneficial for enhancing innovations to improve the quality of the STEM workforce. Stronger evidence might lead to the greater adoption of new engineering curricula and pedagogy that could help to increase the number of U.S. engineering undergraduate majors and improve their problem-solving abilities.

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### **The Global Pattern of Infectious Disease Emergence and Re-emergence in Humans**

0525216

Kate E. Jones, Nikkita Patel, Marc A. Levy, Adam Storeygard, Deborah Balk, John L. Gittleman and Peter Daszak

Human emerging or re-emerging infectious diseases (EIDs) are diseases that have recently increased in incidence, impact or geographic range and include those caused by newly evolved strains of pathogens (e.g., multi drug-resistant tuberculosis) and those that have recently entered the human population for the first time (e.g., human immunodeficiency virus, HIV). These diseases are considered to be an extremely significant burden to human public health and economies. A range of socio-economic and environmental factors (such as greater rates of trade and travel, population growth, agricultural changes, increased antibiotic drug use and climate change) are considered to be among the important drivers of the emergence and re-emergence of these diseases. However, few studies have explicitly analyzed these linkages to build a critical understanding of when, where and what diseases will be emerging next. In this paper, we investigate the temporal and spatial patterns of the initial occurrence of EID events reported in humans between 1842 and 2004 and examine the links with a range of socio-economic, environmental and ecological factors. We find that the majority of EID events involve bacterial pathogens, are originally transmitted to humans from wild animal populations (are zoonotic) and their reported rate of emergence or re-emergence has risen significantly this century and reached a peak in 1980 to 1990's. EID events occur mainly at higher latitudes and are concentrated in a few places such as north-eastern USA, western Europe, Japan and south-eastern Australia. Controlling for the effect of disease reporting bias, we demonstrate significant positive independent correlations with EID events and human population density and growth, latitude, rainfall and host biodiversity. Zoonotic EID events are more affected by host biodiversity, whereas events involving drug-resistant microbes are more affected by human population density and growth. We anticipate that these analyses will form the starting point of predictive modeling to understand and mediate the consequences of future emerging and re-emerging infectious diseases under different scenarios of global change.

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### **Studying Dynamic Patterns of Husband-to-Wife Abuse**

0525026

David Katerndahl, Sandra Burge and Robert Ferrer

To prepare for a large-scale longitudinal study of dynamics of husband-to-wife abuse, this exploratory research study will evaluate the feasibility of innovative methodology designed to distinguish between three theories on the dynamics of husband-to-wife violence. The objectives for this exploratory study are to (1) conduct preliminary testing of cyclic patterns of behavior in abusive relationships and whether the level of daily abuse is associated with predictors reported in the day(s) prior to the abuse, and (2) explore the feasibility of conducting a large-scale longitudinal study of daily husband-to-wife violence and predictors. To achieve these objectives, this study will recruit 20 adult Hispanic and Nonhispanic White women from a primary care clinic during their routine office visits. Women who report having been abused within the past month but do not intend to leave the relationship will be given a cellular phone and asked to confidentially report daily into a telephone recorder on the level of violence, arguments, hassles, distress, marital harmony, life events, and husband's alcohol intake during the previous day for a 2-month period. Weekly telephone discussions with subjects and an end-of-study interview will assess the women's sense of safety during the study. Analysis will assess whether changes in level of violence were cyclic and will identify triggers of violent events from the previous day(s) measures as well as provide preliminary data needed to prepare for a larger, longitudinal study. Key innovative features include the day-to-day assessment of violent events and triggers, the use of cellular phones in data collection, the assessment of day-to-day dynamics of abuse, the application of analyses never used before in violence research, and the application of complexity science to the study of domestic violence.

Several barriers have been encountered, delaying the onset of data collection. First, the Institutional Review Board required extraordinary measures to ensure the safety of subjects. Second, the retirement of the medical anthropologist on the research team necessitated a search for a replacement anthropologist. Third, the hiring of a bilingual female research associate with the necessary skills in our highly competitive research environment posed a problem. Finally, although originally assured that our institution could provide the necessary data collection technology, it was discovered that an Interactive Verbal Response (IVR) would be needed, necessitating involvement of an external agency. Lessons learned include 1) working closely with the Institutional Review Board before and during the review process, 2) for key functions, develop a list of researchers who could potentially cover these functions if primary personnel cannot, 3) seek first research associates with key skill sets among personnel already working for you and remain open to novel ways of covering ongoing responsibilities, and 4) when using novel technologies, face-to-face detailed description of tasks during planning may prevent miscommunication and ensure the availability of needed services.

This exploratory work will prepare for a larger study that will advance our knowledge and understanding about the dynamics of husband-to-wife abuse by identifying detailed patterns of dynamics and testing them against the proposed theories. In addition, this study will explore the application of innovative methods to study new concepts about violence dynamics. Designed with the challenges of daily data collection and subject safety in mind, this exploratory study will provide preliminary results needed for a future full investigation of these dynamics. The multidisciplinary team has access to sufficient number of subjects as well as the experience and expertise to conduct this study.

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### **Name One Thing That Enables Many Systems to Survive a Bad Surprise**

0525157

P. H. Longstaff

Five disciplines that investigate the resilience of natural, human, and built environments have come together to begin the process of building bridges between their disciplines and finding common themes/processes that might be explored in other disciplines. The identified common themes included:

1. The importance of scale in the analysis of resilient systems, e.g., temporal and level of process scales that interact and cause turbulence or cause the “rules” of the system to change.
2. The effect of increased or decreased variety on a system. An increase is often seen to increase resilience of the whole system over time but a surge in variety can cause the system to flip into an alternate trajectory.
3. Resilience from what to what?
4. Resilience is not always a desirable property and will be judged using human values.
5. Is resilience (or lack there of) reversible?

The participants believe this work can be used by human organizations such as governments, NGO’s business organizations, and others that must respond to “surprises” such as natural disasters, terrorism, or any unexpected reduction in resources. After two meetings the 10 participants have put together research that will be published in a special issue of the Journal of Ecology and Society. They propose that the next step is the development of a “Rosetta Stone” that will help translate resilience concepts among disciplines and enable better interdisciplinary teaching. The disciplines represented in the grant were Computer Science, Ecology, Immunology, Child Development, and Communications.

### **Risk Communication in Road Design: Resolving Controversies in Traffic Safety**

0525065

Ross Gittell, Eric Grinberg, Ernst Linder, Belinda Nguyenm Paul J. Ossenbruggen and Jason Rudokas

The Problem: Over 40,000 people are killed annually on U.S. roadways - a condition that has existed for over forty years and due to a lack of progress, traffic safety remains a critical national public health problem. When it comes to roadway planning and design, there are few standards, codes or widely accepted procedures that can confidently predict safety performance. As a result, decisions associated with traffic safety and design are often controversial and perceived as unfair and arbitrary.

Controversies: Typical roadway designs and traffic safety studies do not use risk analysis methods. Controversies arise from the lack of empirical evidence used to address issues at the local level - the small area problem. Decision-makers in current practice must rely on ill-equipped guidelines - derived largely from "expert opinion" and anecdotal evidence - and consequently, too often render approvals and denials that are unpopular, divisive, and inappropriate political decisions.

Resolving Controversies with Performance-Based Objective Analyses: Our goals are to:

1. Base decisions derived from empirical evidence - use data mining, mapping and database linkage to present complex issues in easily understandable form - maps, graphs, charts, tables and spreadsheets.
2. Improve risk communication - use comparative risk analysis with language and measures of safety performance that are readily understood.
3. Develop tools that benefit decision-makers at the local level and in national jurisdictions - use Bayesian decision analysis - spatial hierarchical models - to solve the small area estimation problems.
4. Engage decision-makers in all of the above.

Progress to Date: Our team has held meetings with the New Hampshire Department of Transportation to identify highway corridors suspected of being hazardous. These corridors are being critically analyzed using our procedures. Algorithms have been written to:

1. Combine large databases - crash, traffic exposure, and roadway/roadside design - suitable for data mining.
2. Deal with missing and critical unobserved factors.
3. Identify "cause-effect" relationships.

Graphical displays are used to show the effectiveness of our approaches in solving small area estimation problems and in improving risk communication.

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### **DHB-CPR: Implementing Community-Based Participatory Research to Reduce Health and Technology Disparities among Low Income African American Women**

0525052

Sadanand Srivastava, Eleanor Walker, Diane Krichmar and David Anyiwo

The variables that contribute to health behavior change remain elusive, particularly among African Americans from low income and underserved communities. This lack of knowledge has resulted in

disparate health outcomes, increased morbidity and mortality, increased health care costs and decreased quality of life for this population. Identification of the variables that influence decision making for health behavior change may contribute to the development of interventions that lead to a reduction in health disparities and health care costs, and an enhanced quality of life among this vulnerable population. This exploratory research study incorporated concepts from empowerment evaluation and technology within the context of community and was designed to identify interventions for decreasing health disparities by increasing the use of health promoting lifestyles among low-income African Americans using 1) online health information and 2) group support.

The objectives of this community-based participatory research project were to 1) identify barriers to health behavior change, 2) identify factors involved in decision making regarding health behavior change, 3) identify variables that support individuals in their decision to change their health behavior, and 4) develop an online support mechanism for sharing information and encouraging ongoing health behavior change. Building on a previously funded project by HUD and using community-based participatory design strategies, 12 participants were recruited for this exploratory study to evaluate the effectiveness of exposure to culturally relevant online health information and involvement in social support activities for health behavior change. Baseline data included completion of a modified version of Bunz's Computer-Email-Web Fluency Scale. Participants ranged in age from 25 to 56, with the majority between the ages of 36 and 56. All except three of the participants had access to a computer and the majority (n=7) indicated they had been using the computer for one or more years. Four persons did not use the computer at all. The most frequent reason for using the computer was to play games, send and receive email, and for word processing. Participants were most likely to obtain health related information, participants indicated family friends, magazines, newsletters, and talking with a doctor, nurse or pharmacist. The Internet was last.

Web sites evaluated included the American Heart Association's Delicious Decisions, the American Diabetes Association, the AARP health Web site, and healthfinder.gov. The American Diabetes Association Web site was rated highest in terms of being easy to navigate and understand the content, learning new information, and the likelihood of returning to the site for information in the future. After three sessions on campus, participants continued their search of Web sites at home. Access to the internet was provided through local Internet providers and by loaning lap tops to participants who otherwise would not have access. Participants were surprised to see the amount of health related information available on the Internet. In the group discussions, several commented that being able to take their time to review information and to obtain additional information (through links to other sites) was very valuable. They commented that doctors don't have enough time to discuss issues in depth. They agreed that access to the information was most important for them.

Health behavior changes that they attributed to information acquired from the Web sites included eating less fried food, walking a longer distance to work, walking in the neighborhood, reading labels and making healthier choices when grocery shopping. The support component of the project involved interactions within the group for health behavior change and the development of a Web site designed by the participants. The Web site is currently under construction. It will include information about the project and the participants, links to sites the participants found useful, participants' evaluations of the sites, and a chat room. Computer literacy and knowledge about healthy lifestyles was increased among participants. Barriers to health behavior change included lack of knowledge, perceived lack of time, and environmental barriers (space, safety). Factors involved in decision making for behavior change included ability to implement daily activities and health related diagnoses/challenges of self, family members and friends. Variables that were found to support health behavior change were support of family and friends, online information, and access to space for exercise.

### **Comprehensive Assessment of Online Course Delivery Systems**

0525087

Mohammad H. N. Tabrizi, Karl L. Wuensch, Erol Ozan, Shahnaz Aziz and Masao Kishore

This study was the first step in a longer program of research that will ultimately yield enhanced systems for delivery of online courses. This was an exploratory study geared toward the development of hypotheses about the influence of technology on online education for producing an effective learning environment. We investigated perceptions of online education and explored how users view its effectiveness as a function of the types of technologies used. We also looked at the utilization of technology in online education and will propose a number of research methods and techniques that would influence the development of effective online course delivery systems. The research survey was designed to gather information from both technology and non-technology-oriented students and instructors, and compared online education with face-to-face teaching methods on the different course elements.

Students reported that online classes are more convenient and less difficult than face-to-face classes but that face-to-face classes better enable communication with instructor and other students, the learning of complex material, and the evaluation of their learning.

The technology most highly associated with student ratings of the quality of online courses was email communication with the instructor. Several other technical characteristics were also found to be associated with rated quality of course.

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### **Community-Based Building of Integrated, Dynamic, Complex Systems Models for Sustainable Fuel Pathways**

Susan Zielinski

Modern transportation systems provide unparalleled convenience and accessibility to markets, employment, health care, education, recreation, and social interactions. Yet mobility brings unintended consequences, both environmental and socio-economic.

By 2030 over 60% of the world's population and 80% of North America's population will live in cities (UN 1996). Particularly in urban regions, the sustainable mobility / accessibility challenge goes beyond the technical fix to include and integrate land use, city design, urban ecology, information technology, human factors, integrated economic and market development, and more. As such, understanding and affecting the future of urban transportation and accessibility requires sophisticated, multi-factor analysis and integrated, multi-faceted solutions. This project, led by SMART (Sustainable Mobility & Accessibility Research & Transformation) builds, uses, and applies complex systems models of mobility and accessibility in urban regions to:

- catalyse systemic and fundamental transformations of mobility / accessibility systems consistent with a sustainable human future
- harness emerging science of complex adaptive systems to address the challenges of meeting future mobility and accessibility needs in an ecologically and socially sustainable manner
- uncover a set of “tipping points” that guide the evolution of such systems

SMART's work is multi-disciplinary, multi-pronged, multi-modal, and collaborative. It transcends the purely technical and engineering approach to include behavioral, policy, and human factors including population dynamics. It takes a complex systems approach, moving beyond the short-term, linear fix to embrace long run, integrated solutions. It is global in scope, exploring urban regions of both the developed and developing worlds. Anticipated final results include enhancing foresight capacity and expanding policy analysis and intervention under a range of urban scenarios. Key activities include:

- developing a set of multi-agent and system dynamics-based models moving iteratively from problem articulation to policy interpretation and evaluation. Current prototype cities for this work are Detroit, Michigan and Bangalore, India. Additional potential prototypes include four cities in South Africa. Related modeling work (both completed and pending proposal approval) focuses on bio-fuel production, the hydrogen fuel service infrastructure, the spread of innovation, and development of New Mobility markets and new business models. Much of this has evolved in partnership with Ford Motor Company. Related intervention and policy work includes proposals to develop a comparative accessibility index for city regions.
- establishing a Sustainable Mobility and Accessibility Learning Community, working collaboratively in support of rigorous understanding of the complex system dynamics of transitions towards sustainable mobility and accessibility. Having engaged a new managing director for SMART, significant momentum has been generated for both the modeling and the learning community through foundational monthly half-day SMART retreats, and conference presentations by SMART members as well as local invited expert lectures and meetings. Learning community activities slated for the upcoming year include a series of conferences and distinguished expert presentations as well as the development of a book entitled the "New Mobility Primer".

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### **Hazard and Risk Management**

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#### **Reasons and Recommendations: An Analysis of School Bullying**

0433152

Julie S. Downs

In three distinct domains, we have pulled together relevant science from diverse disciplines to create integrated assessments of risks facing citizens today. These models include one on the attendant risks of a radiological dispersion device, one on the aftermath of a bioterror attack, and one on the power differentials and social utility that underlie bullying in schools. Here we describe work in progress relating the processes believed to be relevant to school bullying with the empirical research supporting them. Due to the complex social processes involved, it is not possible to conduct controlled experiments testing all aspects of the phenomenon. Rather, cross-sectional and longitudinal studies explore correlates of bullying, and controlled studies explore short-term causal associations between variables that are believed to motivate and control relevant psychological processes. By integrating the strengths, limitations and scope of findings from multiple disciplines, we can identify bounds on the appropriateness of conclusions being drawn about bullying and recommendations being made to schools, teachers, parents and students to prevent it, as well as identify avenues of future research that are likely to be the most productive and informative.

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#### **Tsunami Preparedness and Effectiveness of Warnings in the USA**

0527387

B.F. Houghton, C.E. Gregg, D.A. Gill, D. Paton, L.A. Ritchie and D.M. Johnston

Plans for expansion of the U.S. Pacific tsunami warning system to the Atlantic and Caribbean underscore the level of tsunami risk in much of the U.S. A model that can predict the factors that influence preparedness for tsunamis and identify key performance indicators to design and guide outreach education is an essential tool for helping to ensure that communities meet the demands required for effective response.

Our HSD-funded study refines an empirical model developed for a wide range of natural hazards such as earthquakes, volcanic hazards and wildfires and tests its capability to predict preparedness, including response to warnings, for tsunamis in U.S. coastal communities in Alaska, Hawaii, Washington, Oregon, North Carolina, and Puerto Rico. Data are being obtained in longitudinal studies, that began in August 3006, using questionnaires administered to adults in two phases separated by 6 months.

The study seeks to 1) further refine the model predicting responsiveness to warnings and other personal preparedness, 2) describe the structure of the cognitions that underlie motivation to prepare and the personal and normative decision processes that determine response to warnings, 3) develop cognitive maps of the preparedness and warning processes for education, and 4) develop measures that can be used to develop cost-effective interventions and that represent key performance indicators.

This research aims to provide the capability to predict the factors that facilitate and hinder tsunami preparedness as a supplement to the USA's expanding Tsunami Early Warning System.

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### **Community Risk Management of Hurricane and Tsunami Surge Hazards**

0527699

Michael K. Lindell and Carla S. Prater

This project is developing tools for assessing coastal communities' best options to protect themselves from hurricane and tsunami surge hazards. The investigators are developing comprehensive and integrated models of surge impacts, warning transmission, and evacuation behavior. These models will help emergency managers decide which neighborhoods can safely evacuate from the risk area, which must seek shelter in safe havens, and when these actions must be initiated. The Texas A&M investigators are currently performing three tasks, the first of which is to refine their current evacuation model (EMBLEM2) and analyze data from previous surveys to provide additional input data for those models. Data on the evacuations from Hurricanes Katrina and Rita were collected under a previous grant and are being analyzed to provide the data needed by EMBLEM2. The second task is evaluating the usability of their Hurricane Evacuation Management Decision Support System (EMDSS). The investigators are conducting a laboratory experiment in which participants make decisions about when to evacuate a coastal jurisdiction based on graphical displays of a hurricane's a) trailing track only, b) trailing track and forecast track, or c) trailing track, forecast track, and error cone. In addition to presenting hurricane track information, EMDSS also captures information on respondents' situational awareness, mental workload, and risk perception. The third task is a community policy process review that is assessing changes in communities' tsunami hazard awareness and emergency preparedness and examines the processes influencing community management of hurricane and tsunami surge hazards. The investigators conducted interviews with emergency planners in four coastal jurisdictions in Oregon and Washington to identify their hazard assessment data, their planning

methods, and their needs for further information on hazard analysis, hazard mitigation, and emergency preparedness.

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### **Collaborative Research: Development and Evaluation of a Natural Hazard Interactive Laboratory for Improving Decision Making**

0433419

Holly A. Taylor and Carl Renshaw

Given a wealth of data, varying background information and expertise, and social and emotional factors, how can people make the best decisions about natural hazards and related policy? This work examines the impact of a fully developed, interactive, computer-based, role-playing laboratory on scientific decision making. The project aims to examine educational design principles that promote higher-order critical thinking skills.

Eruption is a role-playing simulation of a volcanic hazard. In Eruption, students take on different roles related to a volcanic eruption. Some act as scientists and gather scientific data from volcano monitoring instruments, using the information to predict eruption likelihood. Some act as policy makers deciding when and how much of neighboring villages to evacuate, taking into account monetary and social factors related to evacuation. Our previous work showed the "proof of concept" of Eruption and its impact on decision making (Taylor, Renshaw, & Jensen, 1997). This work used an innovative evaluation strategy that incorporated cognitive science methodologies. The evaluation methodology examines stability in decision making based on available scientific data. In other words, it examines the extent to which such decisions remain stable in the face of other distracting, but irrelevant information. For example, work in Cognitive Science has shown that people make different decisions about the same data depending on whether the information is framed positively (e.g., survival rates) or negatively (e.g., death rates).

Our previous work also allowed us to identify specific design principles that impact higher-order, critical thinking skills and increase the effectiveness of CAI laboratories (Renshaw & Taylor, 2000; Renshaw, Taylor, & Reynolds, 1998; Sinclair, Renshaw, & Taylor, 2004; Taylor, Renshaw, & Choi, 2004; Taylor, Renshaw, & Jensen, 1997). Incorporation of these principles into the fully implemented Eruption will increase its impact on higher-order cognitive skills such as decision making, problem solving, and critical analysis.

From the start of the project, we have had two main thrusts to our work. First, we have been programming Eruption using the Director/Shockwave development environment. Shockwave and Director include standardized technologies for developing interactive content using web-based networking and 3D imaging. Including networking options significantly increases the complexity of both the use and support of CAI software. While we hypothesize that the increased perspectives gained by including networking will increase the program's effectiveness, it remains an empirical question. Even if correct, the educational improvements must outweigh the increased difficulty inherent in adding networking. It may be that the increase in effectiveness is only slight and more than offset by the additional time and support needed to use a networked program. Consequently, evaluation of the effectiveness of the networked version of Eruption in developing higher-order skills relative to the effectiveness of non-networked versions of the program is essential. This question will be one of the foci of work in the coming year. Second, we have gathered additional background data on factors influencing natural hazard and policy decisions. In addition to question framing, which consistently sways decisions, we have examined issues of personal involvement and evaluating mixed information from different sources.

Work in the coming year will largely involve evaluation of Eruption with a feedback loop to redesign. The completed implementation and coincident assessment will further inform the relationship between educational exercises and higher-order critical thinking skills. This work will also allow further refinement of our cognitive science based assessment methodology. By creating an objective measure of educational impact, we can identify specific design principles that increase the potential for reaching student populations with weaker math and science backgrounds and/or those traditionally under-represented in the sciences.

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### **A GIS Study of Hazard Proximity and Risk Perception**

0433410

Craig Trumbo

Substantively, this project examines the effect of proximity to environmental hazards on the perception of cancer risk. It involves the secondary analysis of social survey data collected from communities in which citizens requested cancer cluster investigations. The theoretical goal of the project is to advance understanding of the spatial nature of risk perception. Methodologically, this project demonstrates an approach using Geographic Information Systems (GIS) to facilitate the spatial merger of social survey data, collected from various locations, into a single virtual space for analysis. Attitude data collected through 22 different surveys are first geocoded. Each survey site includes a single hazard location. After geocoding, each site is then georeferenced to the mean latitude and longitude of the point hazards. Various statistical and visual analysis techniques are applied to illustrate the nonlinear function of hazard proximity on risk perception and the geographically weighted bivariate relationship between risk perception and cancer anxiety. This approach offers an interesting tool for the exploration of relationships that may be spatially associated in survey data collected from various places.

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### **Collaborative Research: Integrated Physical and Social Simulations for Hurricane and Tsunami Hazards**

0527520

Harry Yeh, Dylan Keon, and Cherri Pancake

We describe collaborative research that intersects with our companion project (SES-0527699; PIs: Professors Michael Lindell and Carla Prater of Texas A&M University) and that of an international collaborator (Professor Toshitaka Katada of Gunma University, Japan). Our objective is to develop tools that help researchers and managers assess the best options for protecting coastal communities from hurricane and tsunami surge hazards. Specifically, we are developing comprehensive and integrated models of surge impact, warning transmission, and evacuation behavior. The development of these models requires close interdisciplinary collaboration spanning the fields of social and behavioral science, information technology, geospatial information science, and hydrodynamics. The quantitative prediction capabilities provided by the models will assist coastal jurisdictions in their surge hazard mitigation planning and emergency preparedness programs. Cyberinfrastructure support is making it possible for us to integrate the functionality of these models and apply usability engineering to make them suitable for use by emergency managers, land use planners, and transportation planners along the Atlantic, Gulf, and Pacific coasts.

**Katrina Evacuees: The Transformation from Disaster Victims to Welfare Recipients: An Interdisciplinary Approach**

0555113

Ronald J. Angel and Laura Lein

The project, "The Parallel Strengths and Weaknesses of the Civil Society and the State: The Example of Katrina Survivors" is an interdisciplinary effort drawing on the social science disciplines of anthropology and sociology and informed by the practice approach of social work and clinical practice. It involves the joint application of sociological and anthropological theory and techniques to a real world problem of service delivery. The resulting analysis is designed to pass the test not only of rigor according to research standards in both social science disciplines but the illumination of evidence-based practice in social work.

Background: The research represents a theoretical and empirical examination of current theories of civil society that place great confidence in the capacity of local community organizations to respond to both long and short-term social and humanitarian crises. The disaster of Hurricane Katrina made the weaknesses and shortcomings of the combined organization of government and civil society starkly apparent. Even before the recent retrenchments in poverty programs of the 1980s and 1990s, the United States based its primary social support programs, included those for publicly funded health and child care, on means tests providing public support only to those in poverty. With the more recent devolution of many poverty programs to state and local control and the reduction of the federal commitment to social welfare programs, the poor are increasingly dependent on private sector and non-governmental entities (NGOs) to provide services otherwise unaffordable or necessary due to unemployment and other financial loss.

The Research Team and Functions: Drawing on theories of civil society developed in sociology and anthropology, this project uses an ethnographic approach, drawn from anthropology, to study the supports offered to impoverished victims of a disaster. The triangulation called for by rigorous ethnography has been developed through interviews with multiple members of each household, and at multiple times. Furthermore, a comparative set of interview is underway with the service providers, with a particular emphasis on those providing case management services to evacuees. Trained social workers participating in the research project have also volunteered and worked with agencies providing services.

The Research Site: The City of Austin provides an exemplary study site for the research. A medium-sized city, it received a substantial number of refugees, approximately 10,000, providing a large pool for the selection of a research panel of evacuees and putting considerable stress on the service sector. Austin also has a well developed and large population of NGOs active with impoverished residents prior to the hurricane.

Initial Analyses and Interpretations: At this time with data collection underway, a few findings are already clear: Changing federal guidelines (many imposed by FEMA) in interaction with the multitude of NGOs created considerable confusion among both evacuees and service providers. Some evacuees continued to experience shortages in the year following their evacuation. Many service providers expressed discouragement with the complex and changing service environment in which they were operating as case managers.

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**Eight Months after the Storm: The Psycho-Social and Physical Well-being of Evacuated Youth**

0566000

Edith J. Barrett, Maria Martinez-Cosio and Carrie Ausbrooks

The purpose of the larger project is to examine the role of schools in assisting youth recovering from the catastrophic event of Hurricane Katrina. In perhaps the largest single migration since the Civil War, approximately half a million people left sections of Louisiana and Mississippi as a result of the hurricane. More than 3,700 students enrolled in schools in North Texas. While extensive research exists on the adjustment of refugee youth from foreign nations relocated as a result of wars or natural catastrophes, there are few scholarly studies on massive relocation of U.S. born youth and their families. The study explores the ways the interaction of school leadership structure, the types of parental and community support, and individual socioeconomic characteristics impact the response of schools to the needs of displaced students.

School-based data collection began in May 2006, eight months after the youth were relocated to the Dallas-Fort Worth metropolitan area. In this first wave of data collection, 63 Katrina evacuated middle and high school students completed a survey asking about their emotional and physical well-being, their diet, exercise and risk-taking behaviors, as well as their attitudes toward their new school in comparison to the school they attended before being evacuated. Students were also asked what support services they had received through the school and through other agencies and how useful the assistance was for them. A comparison sample of non-Katrina students in the DFW metropolitan area completed a similar survey, although it did not ask them to compare their school or about support services. Findings from this first wave of data suggest that the differences between the two groups were not great. There were a couple notable exceptions, however. Compared to their classmates, the evacuated youth had lower levels of self-esteem and greater emotional discomfort. On the other hand, they also expressed greater problem-solving skills. The paper also explores the relationship between well-being and support seeking behaviors.

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### **Timing, Traffic, and Household Decision Making: Katrina, Ivan, and Andrew**

0555085

Hugh Gladwin

Theories about hurricane evacuation behavior have tended to emphasize either variants of rational choice/risk aversion or demographics as explanatory variables. Decision constraints imposed by situational contingencies like household and family issues, evacuation options, and timing of the approaching hurricane are rarely included in evacuation models. This poster reports on an intensive cycle of research that links an ongoing NSF HSD/SGER funded survey and two other surveys funded by the Corps of Engineers and FEMA. The initial telephone survey done in 2005 on the Hurricane Ivan evacuation was the standard behavioral study done after major hurricanes. The subsequent studies, while both still telephone surveys, have been designed to collect more qualitative data on pre-impact household concerns and decision making. The HSD funded study also incorporates event constraints for respondents on storm timing, traffic, and GIS location of specific storm risks to respondents. Preliminary results indicate that households face very different contingencies as they prepare for major hurricanes though their concerns appear rational given their different situations (family networks, job and school dispersion of household members, availability of evacuation means and destinations, etc). There are also important factors common to all households but unique to each hurricane. These are the content of warning messages (about risk probability) and day/night traffic timing. Highest evacuation rates should occur when there is a clear communication of major risk with time left to evacuate in possible traffic conditions. Lower evacuation rates should occur with either or both of these factors not applying as well as measureable household situations and contingencies limiting evacuation choice.

### **Emotional Response to Hurricane Katrina**

0554924

Benjamin L. Hankin, Kate Flory, Gustavo Turecki, Bret Kloos and Catherine Cheely

The present study examined survivors' levels of positive and negative emotions following Hurricane Katrina. We also examined several psychosocial factors that we expected would be associated with levels of emotion following the Hurricane. Participants were 209 adult survivors of Hurricane Katrina interviewed in Columbia, SC or New Orleans, LA between October 3, 2005 and May 13, 2006. Results revealed that survivors were experiencing higher levels of negative affect and lower positive affect at a much higher rate compared with normal adult controls. Results also suggested that certain psychosocial factors, such as negative events, social support, and hopefulness, may be associated with the changes in positive and negative emotion as a result of the Hurricane.

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### **Characterization of the Supply Chains in the Aftermath of Katrina: Logistical Issues and Lessons from an Integrated Social Sciences-Engineering Perspective**

0554949

José Holguín-Veras, Noel Pérez, Satish Ukkusuri, Tricia Wachtendorf and Bethany Brown

Extreme events pose serious logistical challenges to agencies and aid organizations active in preparation, response and recovery operations, as disturbances have the potential to suddenly turn the normal conditions into chaos. Supplying critical goods - such as food, water and blood- urgently required to reduce the toll on human life often becomes a difficult task to accomplish because of the severe damages to the physical and virtual infrastructures and the very limited or non-existent transport capacity. The situation is aggravated by the lack of: (a) knowledge about the particulars of how formal and informal (emergent) supply chains operate and interact with each other; (b) methods to properly analyze and coordinate the flows of both priority and non-priority goods; and, in general, (c) scientific methods to analyze logistic systems under extreme conditions. This paper attempts to contribute to the study of this important problem by providing a succinct description of the key logistical issues during the response to Hurricane Katrina. The paper is based, to a great extent, on public accounts of the event and the interviews conducted by the authors during a number of field visits to the area more severely impacted by Katrina, as part of a research project funded by the National Science Foundation.

The response to Hurricane Katrina has been widely discussed in different forums. Criticism over the government response is widespread; and even official reports from the White House, and the U.S. House of Representatives recognized that there are many lessons to be learned from the response to this emergency. Although the devastation caused by the storm has raised many public policy questions about emergency management, environmental policy, poverty, and unemployment; the bulk of the most pressing questions focus on the ineffective logistical response.

This project has attempted to put together a comprehensive and unbiased picture of the key issues that led to the logistical debacle during the Katrina emergency. On the basis of public records and interviews with individuals directly involved in the logistical response at all levels (local, state, federal, and volunteer organizations) the authors identified three broad categories of issues: (1) Initial Impact on the System (i.e., Magnitude of the requirements, and Impacts on the Communication System); (2) Institutional (i.e., Understaffing and Lack of Training, and Lack of integration Between Federal and State Logistic Systems);

and (3) Logistical (i.e., Inefficiencies in Pre-positioning Resources, Lack of Planning for the Handling and Distribution of Donations, Procurement, and Limited Asset Visibility).

On the basis of the analyses conducted, the authors suggest a number of recommendations. Among them, it is important to mention: (1) Creation of a Emergency Logistics Training Program; (2) Improve the Robustness and Interoperability of the Federal, State and Local Computer Systems; (3) Development of Regional Blanket Purchasing Agreements (RBPA); (4) Increase Asset Visibility; (5) Development of Regional Compacts for Pre-positioning of Critical Supplies; and (6) Implement Proactive Donation Coordination Plans. The research team is currently complementing the data collection efforts with additional interviews. In addition, the research team is developing integrated modeling approaches to characterize the behavior of multiple supply chains during extreme events. It is expected that these recommendations and modeling techniques taken together may bring about a significant increase in the Nation's capability to respond to similar extreme events.

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### **The Aftermath of Katrina: Differential Responses to Trauma among African and Vietnamese Americans in One New Orleans Community**

555135, 555086

V. M. Keith, C. Airriess, A. C. Chen, W. Li, K. Leong and S. Hussaini

The eastern most New Orleans subdivisions were hard hit by Hurricane Katrina and the subsequent flooding. African Americans and Vietnamese Americans residing in these neighborhoods were especially vulnerable to the devastating effects of Katrina because they were economically disadvantaged, racially marked, spatially segregated, and/or linguistically isolated. Given the unprecedented loss and suffering that accompanied Katrina, it is important that research analyze the spatial, socioeconomic, and psychological consequences of this historical event. To begin that process, an interdisciplinary research team conducted a study of African and Vietnamese American respondents who previously resided in the eastern New Orleans subdivision prior to Hurricane Katrina. The study relied on mixed methods (focus groups, survey, key informant interviews, field observation and geographic information system mapping) to address various study questions. As part of this larger project, we administered questionnaires to 52 African Americans and 93 Vietnamese American to evaluate the effects of resource loss, financial strain, acculturation, and social support on their quality of life and post traumatic stress (PTSD) symptoms. Results indicate that emotional support is critical for maintaining high levels of subjective quality of life. Resource loss and financial strain are associated with higher levels of PTSD, while language acculturation reduces these symptoms. These relationships remain robust when demographic characteristics are controlled. Our findings point to the importance of sustaining family and community networks and the replacement of economic resources in moving these communities toward recovery. Special attention should be given to those who are linguistically isolated.

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### **Decision-Making among Businesses in Post-Catastrophe Uncertainty: How Economic Geographies Re-Form in New Orleans**

0554937

Nina Lam, Kelley Pace and Richard Campanella

The goal of this project is to understand how businesses make spatial decisions on whether to return or relocate after a major catastrophe and how these decisions in turn impact the landscape and its economy. Specifically, the project will collect and analyze time-critical data on what, where, how, why, and when

businesses return to New Orleans following the repopulation of the city after Hurricane Katrina. The project includes two components: street survey and telephone survey. The street surveys include a complete survey of three major commercial corridors in New Orleans every two weeks, tracking where, when, and what businesses return and survive (or fail). The telephone surveys, conducted for 3 rounds, will target businesses throughout the Orleans Parish.

This paper reports the results of the first two telephone surveys, conducted in December 2005 and June 2006. Initial analyses of the first two surveys show that, as expected, business owners in June 2006 are more certain about whether to reopen or disconnect. Only about 40% of the businesses were open. Of the remaining 60%, about 27 percent of businesses in New Orleans have already disconnected their phones; another 31 percent are still deciding whether to reopen. For every specific problem surveyed, the responses tended to the extremes. Almost every business has a major problem, but not necessarily the same one. The survey results will further be analyzed according to their spatial properties (e.g., location--flooded or not) through GIS analysis, and in conjunction with the street surveys. The coupling and tracking of street and telephone surveys over time will provide vital information for research on human-social-economic dynamics over space and time.

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### **Organizing Attention: Federal Preparedness Agendas and Organizational Change**

Samuel Workman, Joshua Sapotichne, Peter May, and Bryan D. Jones

Critics of the creation of the Department of Homeland Security argued that the agency would have difficulty juggling antiterrorism-related activities with the on-going tasks of the organizations that were folded into the Department. We treat this as an empirical issue for which we examine federal disaster and terrorism preparedness priorities prior to and after the creation of the Department of Homeland Security. We find that three related aspects of organizational change—substantive attention shifts in both mission and policy making, changes in the location of policy making authority, and changes in the relative centralization of policy making authority—occur after creation of the Department of Homeland Security. These changes influence organizational attention and potentially undermine the coherence of federal disaster and terrorism preparedness efforts. More generally, these findings address the substantive and structural aspects of organizational change in disaster management.

Our analyses are based on data collected about the rules promulgated by the Federal Emergency Management Agency and grant program guidance issue by the Department of Homeland Security over the period 1983 to 2006. We examine shifts in location and relative centralization of policy making authority with data about the organizational location of the programs that received attention at different points in time. These data show the interrelationship of organizational structure, issue attention, and the coherence of programs.

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### **Katrina and Rita: The Impact of Exogenous Shocks on Risk Assessment**

Carol L Silva, Domonic Bearfield, Kishore Gawande and Gina Yannitel Reinhardt

How do different types of people respond to information gleaned from catastrophic events such as Hurricane Katrina and Hurricane Rita? In the wake of a catastrophic event, an individual's assessment of the risks encountered in his/her daily life is likely to be subject to frequent updating. Over time, one's updated risk assessment may result in a decision to move from a city at risk of hurricane damage to one that is perceived to be safer. With this project, the PIs intend to launch a survey of people that live in hurricane-

threatened regions along the US Southeastern and Gulf Coasts. This survey will include an examination of at least four dimensions of an individual's choice to migrate or remain in a hurricane-threatened region: re-assessments of the probability and consequences of the exogenous event (the hurricane); perceptions and images of "place" associated with a region of residence that differ in the perceptions of individuals in that area; evaluations and beliefs concerning the policy programs put in place to mitigate future disasters, as well as the people responsible for managing them; and responses to the bundle of incentives that are structured to influence the recovery of a region after a major hurricane disaster.

The objective of this project is to explore the economic, cultural, and institutional dimensions of an individual's risk assessment. The specific questions of focus are:

- How do people update their risk assessments after a catastrophic exogenous shock such as Hurricane Katrina or Hurricane Rita?
- What values or characteristics beyond risk assessment influence the formation of preferences?
- How does one's perception of government competence, combined with various types of government incentives, influence decision-making under uncertainty?

This multi-dimensional study of decision-making under uncertainty has profound public policy implications. An efficient incentive system is one in which people who have the appetite for the risk select to stay in hurricane-threatened areas. In part this appetite may be influenced by perceptions of place. What is an efficient policy? Does an "economically efficient" policy have sociological implications? How will such a policy impact the socio-economic, cultural and racial make-up of a community?

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### **Assessing Katrina's Impact: The Role of Social and Kinship Networks in Relief and Recovery on the Mississippi Gulf Coast**

0555136

David Swanson, Richard Forgette and Mark Van Boening

We report on research in-progress from the Gulf Coast Survey, a self-administered questionnaire of 110 items that includes attitudinal, experiential, demographic, socioeconomic, and social measures of personal relief and perceptions of recovery. In January 2006, a multi-disciplinary and multi-institutional team collected 453 completed surveys from 120 census blocks in the southernmost portions of Harrison and Hancock counties in Mississippi, the epicenter of Katrina's landfall. An additional 453 census blocks in the sample area were canvassed with a 'short-form' survey to assess the devastated housing stock relative to the 2000 US Decennial census. Quality assessment of data and preliminary tabulations underway.

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### **Responding to Chaos: Organizational Cultures and the Katrina Response**

0554938

Bryan Jones and Peter May, in collaboration with William A. Wallace, Rachel A. Dowty and Colin E. Beech

Assessments of the federal response to disasters arising from Hurricane Katrina in the New Orleans area generally find the Coast Guard's successful and FEMA's a failure. We examine organizational cultures to understand such differences in organizational performance when responding to the same crisis situations. In considering organizational culture, we apply the grid-group typology, first proposed by social anthropologist Mary Douglas and later developed for application to political cultures by Michael Thompson, Richard Ellis,

and Aaron Wildavsky. An organization's cultural bias characterizes particular ways rules structure internal and external interactions ("grid" dimension) as well as influence internal and external group ties ("group" dimension). Using this approach to organizational cultures enables examination of matters beyond structure and mission to understand (1) consequences, and (2) justifications of organizational responses to emergencies.

Analyses use data gathered from teleconference transcripts among federal, state, and local organizations during the response, Senate hearing testimony transcripts, government response assessment documents, and source-verified newspaper articles. We draw from these documents organizational management strategies for prioritizing communications and actions aimed to resolve crisis tasks. Resolution strategies are classified in terms of four possible cultural biases: hierarchical, individualistic, fatalist, and egalitarian. These data situate management strategies of the Coast Guard, FEMA, the White House, and emergent, on-the-scene groups as respectively providing evidence of each cultural bias' characteristic response to emergency tasks.

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### **Emergency Shelters and Socially Vulnerable Populations**

Brenda Phillips, Stacey Brown, John Gaete, Thomas Wikle and Jon Comer

This project examines the establishment and operation of emergency and temporary shelters for persons displaced by Hurricane Katrina, especially socially vulnerable populations. A geographic information system was used to evaluate spatial relationships and patterns within the data. Pattern analysis and location-allocation models were applied to shelter distributions to evaluate shelter establishment and usage. Semi-structured interviews with shelter residents and managers were used to examine operation challenges in addressing the needs of special populations. The results suggest the existence of "shelter deserts," or large geographic regions containing socially vulnerable populations that were underserved by shelters.

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### **Infrastructure**

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#### **IPUMS-International: Harmonizing the World's Census Data**

0433654  
Matt Sobek

The IPUMS-International project is building the world's largest public-use population database. A huge body of raw census microdata since 1960 exists around the world, but for the most part it has remained inaccessible to researchers. The IPUMS project is making these data not only accessible but usable, by providing comprehensive documentation, coding the variables consistently across time and space, and making the data available through an on-line web extraction system. Researchers select the variables and censuses of interest to them, the web system creates a data extract, and the researcher downloads the dataset for analysis on his or her local computer. The system is available without cost to any qualified researcher or educator at [www.ipums.org/international](http://www.ipums.org/international). Researchers must apply to use the system.

Since the project's inception, we have integrated 47 census samples from 13 countries from 1960 to 2002, and made them available for public use through our web dissemination system. The data series currently contains 144 million person records. By 2009 we plan to include approximately 140 censuses from 40 or

more countries. We already have sufficient agreements with national statistical offices to meet this goal. We continue to seek further agreements, however, to meet another major goal of the project: preservation. Much of the world's microdata are vulnerable to destruction as technologies change, and we seek to protect this statistical heritage even in cases where we may not immediately be able to distribute the data.

The temporal and geographic breadth of the data series provides a unique opportunity to study society and population over a period of unprecedented change. The series is particularly well suited to comparative research. No other population data source is as comprehensive as census data. Censuses typically ask a host of questions related to demographic, economic, and social behaviors, including education, work, fertility, migration, living arrangements, and many others. All IPUMS data are composed of individual person records that record the separate responses of each person to the census questions. Thus they are amenable to custom tabulations or multivariate modeling. Because the individual records are organized into households, a wide variety of questions can be addressed within the context of persons' household situation, such as the presence of children, the occupation of a person's spouse, or the presence of extended family members. The samples typically range in density from 1 to 10 percent of the national populations. In many cases, we have been entrusted with 100% of a country's census data, although our agreements currently limit our distribution rights to samples we draw from them.

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### **Modeling Human and Social Dynamics**

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#### **Modeling Emergent Patterns in Residential Burglary**

0527388

P. Jeffrey Brantingham, Maria-Rita D'Orsogna, Jon Azose, George Tita, Lincoln Chayes and Andrea Bertozzi

Emergent crime patterns are a well-recognized empirical phenomenon, but their causes are poorly constrained. Simulations and formal analytics are used to examine the roles of offender movement routines and simple feedback with environmental conditions on the nucleation of residential burglary hotspots. Residential burglary is targeted for analysis because it represents one of the simplest criminal systems involving mobile criminal offenders interacting with a stationary environment. Preliminary model results are evaluated in light of observed residential burglary patterns from Long Beach, California.

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#### **Empirically-based Mathematical Modeling of Rumor Transmission within Social Networks**

0527371

Bernard P. Brooks, Nicholas DiFonzo, David A. Ross, Jerry M. Suls, Prashant Bordia and Martin Bourgeois  
Traditionally, mathematical models of rumor propagation have used a 'rumor as epidemic' approach that does not take into account social network configuration has not been based upon empirical research in rumor transmission. A dynamical system based upon empirical rumor research is derived to model rumor transmission. Monte Carlo simulations of rumor flow over various social network configurations are presented. Network topologies include torus, ribbon, family and random configurations. The propagation function addresses five factors of rumor transmission identified in the literature; uncertainty, anxiety, belief, novelty and ingroup/outgroup connection status. Comparisons are made between the rumor flows over the network topologies.

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### **Disseminating Computational Modeling in the Social Sciences**

0433086

James A. Kitts, Martina Morris and Michael W. Macy

The social world that we observe reflects a web of interdependent processes, with macro-level structures of organizations, communities, and societies both emerging from and constraining the micro-level interactions of individuals. Most social science research has focused on finding statistical relationships in cross-sectional data – such as correlations of individuals' age with political attitudes, the demographic composition of personnel with organizational performance, or law enforcement policies with municipal crime rates – while assuming that the objects of study are independent. This focus may describe typical patterns, but gives us limited insight into the underlying generative processes or the dynamic consequences of statistical relationships. Furthermore, many social phenomena are inherently time varying and depend on interactions between entities within a social system, such as in the spread of epidemics, the rise of political insurgency, or the dissolution of formal organizations.

Understanding the link between micro-level interactions and macro-level dynamics could have profound impact on the ways we engage basic social science research. Toward this end, an increasing number of scientists are using mathematical and computational models to elucidate theoretical problems in social dynamics, often by applying general theories or methods from the natural sciences. Population ecology models are applied to the evolution of industries, gene sequence analysis is applied to the study of career trajectories; neural networks are used to model the origins of religious beliefs.

Although these links are promising, their impact is limited by conventional disciplinary institutions that fail to promote broad diffusion of ideas and methods. Within the social sciences, the audience for computational modeling remains largely confined to a small community of modelers. Although a handful of interdisciplinary centers advance these tools, only a handful of disciplinary social science programs currently offer training in computational modeling. Most B.A. and Ph.D. students graduate without learning to be critical consumers of research using these innovative tools, let alone use the tools in their own research. Unsurprisingly, most social science journals have poorly-developed standards for evaluating research employing computational models. We aim to make research in social dynamics both more rigorous and more accessible by offering training resources in computational modeling.

#### **Project Progress:**

One focus of this project is curricular reform in social science graduate and undergraduate programs. To address this goal, we first developed training programs at the University of Washington and Cornell University, creating materials that will also be disseminated to other institutions and disciplines. Second, we are running development workshops at professional meetings to promote curricular reform and to foster disciplinary training standards. Third, we are assembling a resource manual that will enrich coursework in computational modeling and also provide hands-on explorations of social dynamics for substantive social science courses. Lastly, we are developing a web portal with a repository of source code, exercises, and demonstration software, including an arena for interactive learning.

An important focus of our efforts in the second year of the project has been the advancement and improvement of computational modeling among established researchers, including faculty development and retraining. The investigators and graduate students trained under this grant are publishing research papers that exemplify some best practices in computational modeling of social dynamics. More directly, the PI is developing a week-long faculty seminar on computational modeling of social dynamics. The online

repository described above will also aid in developing methodological standards and improve the integrity of computational modeling research by making source code and other supplementary materials available to the social science research community. Lastly, the PI is working with computer scientist Tanzeem Choudhury to organize an interdisciplinary meeting on theoretical modeling of social dynamics. This meeting aims to foster intellectual exchange among complementary experts from mathematics, biology, physics, computer science, and engineering, as well as social and behavioral scientists.

### Broader Impacts:

The edited volume on computational modeling, online repository for source code and other materials, and the workshops at professional meetings will assist faculty in designing courses on computational modeling and in integrating dynamic modeling into their existing course offerings. By enhancing teaching and curriculum development, our goal is to improve the integrity of students' applied training in dynamics within traditional social science disciplines. The short-term result should be a faster rate of adoption in disciplinary curricula and improvement in training quality. This will contribute to a longer-term result of increasing the prominence and integrity of explicitly modeling dynamics in the social sciences. Our recent investments in training current faculty and diffusing tools among researchers will hasten progress toward this long term goal.

Project Website: <http://depts.washington.edu/modeling/>

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### Traffic Congestion: Actions and Reactions

0527252

K. Triantis, D. Teodorovic, P. Edara , S. Liu, Y. Zhao and M. Roper, S. Sarangi, P. Billand and L. Razzolini

This project proposes an integrated analytical framework (based on experimental economics, artificial intelligence, system dynamics, and game theory) to evaluate demand management strategies for traffic congestion. The fundamental premise of this research is that the evaluation of demand based strategies and the solution to traffic congestion requires a complete understanding of how individual and collective human behavior emerges dynamically as a result of changes in the structure and the interactions between social and transportation networks. The researchers on this project anticipate new insights will become available because of the interface among different disciplines (economics, systems engineering, and transportation engineering) that bring together different dimensions of the traffic congestion problem, and integrate different methodologies. There are six concurrent research initiatives that are being explored as part of this research initiative. These include: a) Downtown Space Inventory Control System and Downtown Auction-Based Congestion Pricing; b) Intelligent Parking Systems and Their Potential Impact on Urban Congestion; c) Evaluation of the Impacts of a Cordon-Based Dynamic Traffic Congestion Pricing Policy-A System Dynamics Approach; d) Trip Reservations for Highway Travel; e) Traffic Experiments; f) Heterogeneity in Networks.

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### Social, Political, and Economic Dynamics

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### Interoperability Strategies for Scientific Cyberinfrastructure: Research and Engagement

0433369

K.Baker, G.Bowker, F.Millerand and D.Ribes

The Comparative Interoperability Project (2004-2007) initiates a situated social and organizational comparison of three scientific information infrastructures deploying different approaches to data interoperability. The issue of interoperability often remains addressed primarily as a technical one, e.g. in terms of technical standards for data coding (e.g. classifications, metadata, ontology). In contrast, we consider interoperability strategies as interlocking configurations of technical commitment, community involvement, and organizational structure. These strategies are critical factors in infrastructure development. For instance, while deploying a particular interoperability strategy in terms of technical direction, an information infrastructure project also unfolds strategies of community mobilization and creates organizational form. Our research project is composed of an interdisciplinary team including social scientists and participants of the infrastructures we study. Through our research we seek to contribute these information infrastructures by reflecting existing work practices back to practitioners themselves and offering comparative insights across the infrastructures. We operate with a philosophy of ‘collaborative design’: we seek to generate a mutually informative dynamic across social and environmental sciences for the everyday work of building infrastructure. In this presentation we include concrete examples of collaborative work which demonstrate and clarify the intertwining of technical commitment, community involvement and organizational structure.

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### **Global State Formation: Modeling the Rise, Fall and Upward Sweeps of Large Polities in World History and the Global Future**

057720

Christopher Chase-Dunn, Peter Turchin and E. N. Anderson

Patterns of expanding state formation constitute a long-term evolutionary trend that may eventually result in the emergence of a single world state. The very nature of the expansion of political integration has itself evolved because new institutions that facilitate and organize regional integration, cooperation and conflict have emerged. Military conquest and the long-term interaction between sedentary agrarian empires and confederations of pastoral nomads came eventually to be replaced by a process of geopolitical and economic competition among states in a world that has increasingly been integrated by market exchange. In the last 200 years international governmental and transnational non-governmental organizations have emerged that constitute the first beginnings of world state formation, and the national states have been partially reconfigured as instruments of an increasingly integrated global elite. World state formation may be desirable because the problems created by human technological and social change are increasingly global in scope. But a world state will need to be legitimated in the eyes of a majority of the human population of the Earth and this means that democracy must be constructed on a global scale. This proposed project will allow us to examine several probable future trajectories of global political integration based on models of growth, decline and systemic transformation that are developed by studying patterns of political integration in several regions over the past 3000 years.

The main purpose of the project is to study and model the growth of states in selected regions of the world over the past 3000 years. In the nineteenth and twentieth centuries expansion and intensification of intercontinental interactions has been called globalization. But earlier regional systems also exhibited similar waves of “globalization,” albeit on a smaller spatial scale, and these waves of network expansion and contraction, punctuated by occasional huge jumps in the scale of networks, eventually led to the formation of the modern global social system. This project is studying the spatial nature of interaction networks over time and the relationship between these networks and the growth decline/phases of cities and states. The three-year project is developing and testing models of social change using newly upgraded estimates of the sizes of cities and states, climate change, trade routes, and warfare.

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**Remaking the Apartheid City: Housing and Residential Change in Durban after Transition**

0527667

Patrick Heller and Daniel Schensul

Durban, the first of three South African focal cities for this project, has experienced important but relatively limited changes to its residential structure – a concentric pattern of extreme racial exclusion – since the end of Apartheid. Overall residential segregation has declined somewhat for all pairs of race groups, while still remaining extremely high. The aggregate spatial location of race groups has also changed to some extent, with certain central areas becoming more accessible to the black population as whites move towards relatively new and wealthy peri-urban centers. Concurrent with these changes has been large scale municipal investment in public housing programs, nearly exclusively targeting the black population. Housing construction has been located for the most in peripheral townships and semi-peripheral greenfield areas, with the intention of upgrading existing housing stock and providing new housing for the black population in more accessible places. We use census data to identify and map the main residential racial clusters in 1985, 1996, and 2001. We then overlay data provided by the Durban municipality on public housing construction after 1994 to identify links between housing development and city structure. Future analysis and qualitative work will help us to measure local causal effects of housing development and other types of public investment on residential structure and segregation. Next steps in the project include completing data collection in Johannesburg and Cape Town, constructing an accessible database of collected spatial data, continuing mapping and spatial analysis, and disseminating results to guide focus groups and interviews with South African key informants and collaborators.

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**Experimental Analysis of Long-Term Effects on Human Behavior from Changes in Residential Neighborhood Environment**

0527615

Jeffrey Kling

Changes in population migration, housing policy, and other public policies have produced substantial changes in the racial and economic segregation of America's residential neighborhoods. This project addresses the links between mental processes and human behavior as behaviors have changed over time in response to changes in community environment.

Data from a randomized housing voucher experiment known as Moving to Opportunity (MTO) is used to identify the long-term effects of changes in neighborhood environment on the behavior of low-income, mostly minority families who were originally living in high-poverty public housing projects. Random assignment of housing vouchers in MTO generates comparable groups of people living in different types of neighborhoods, which helps identify the causal effects of neighborhood environments on behavior. In 2007, data on long-term outcomes (about 10 years after randomization) will be collected from 6800 youth ages 10 to 20 and from 4600 adults. Outcomes include survey data on measures of clinical and subclinical mental health problems, schooling, employment, risky behaviors; reading and math achievement tests; and administrative data on arrests, employment, welfare and schooling.

The random assignment of housing vouchers in MTO helps solve the fundamental identification problem that plagues almost all previous studies of neighborhood effects. Our previous research collected outcome measures for MTO participants in 2002, from 4-7 years after random assignment, and found that moving to

a less disadvantaged area through MTO produces a variety of beneficial changes for female youth (15-20 when interviewed). For female adults MTO moves produced large mental health benefits but had little effect on other outcomes, and on balance had detrimental effects on the risky and criminal behavior of male youth. These results have been of great interest in many disciplines, including developmental psychology, economics, demography, education, geography, public health, and sociology. Key contributions of the proposed new research are to expand the range of this research to epidemiology and psychiatry by focusing more intensively on the effects of neighborhoods on clinically significant emotional problems, and to examine how effects have changed over time during the ten years of the experiment. More generally, the project aims to better understand the behavioral mechanisms behind neighborhood effects on behavior. The search for such mechanisms focuses on understanding the gender difference in youth responses to neighborhood change that were the most important scientific and policy puzzle found in the previous research, and which echoes the difference in outcomes over time in national data for African-American males and females.

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### **Global Prices and Incomes, 1200-1950**

0433358

Peter Lindert

The project maps the contours of incomes and prices over six continents and more than seven centuries. The data expedition seeks better answers to questions of perennially broad interest: Who was more productive than whom in the past? Who lived better than whom, and why? Was there an early modern "great divergence" between Western Europe and Eastern Asia, or did their differences antedate Columbus or even the Black Death?

A team of 23 scholars from 12-15 countries of residence-or-citizenship has formed the Global Price and Income History Group (or GPIH Group), which advances knowledge on three fronts: (1) Gathering fresh historical data from around the world and across the centuries; (2) providing downloadable historical data for the general public, converted into modern metric units (<http://gpih.ucdavis.edu>); and (3) fresh intellectual interpretations of historic movements in relative incomes around the world.

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### **Ethnic Identity and Civic Engagement in Three Urban Latino Communities**

0433947

Timothy Ready, Damian Fernandez, Daniel Arreola, Christopher Lukinbeal, Patricia Price and Maria de los Angeles Torres

This study examines the nexus of ethnic identity, civic engagement and the spatial dimensions of community in three mostly low income Latino neighborhoods – Pilsen in Chicago, East Little Havana in Miami and Garfield in Phoenix. The great majority of residents in these neighborhoods select as their first choice of group identifier a term describing their Latin American ancestry (e.g., Mexican or Cuban), or the more general terms "Hispanic" or "Latino." More than 80 percent report feeling a sense of solidarity with other Hispanics/Latinos.

Although eight in ten adults in these communities were born outside of the United States, and only about half are citizens, civic engagement by residents is extensive and takes a variety of forms besides electoral politics. These include volunteerism and involvement in school-based communities, churches, faith-based organizations, and in issue-related advocacy organizations. The roles of social, economic and geographic

factors in defining group interests and civic purposes, and the different ways that residents pursue those interests and purposes in the three communities are examined.

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### **Globalization of Innovation, Migration, and Systems of Human Capital Development Implications for Science and Engineering Policy**

0527584

Hal Salzman, Beatriz Clewell, Leonard Lynn, Carlos Acosta, Robert Lerman, B. Lindsay Lowell and Pamela Meil

Multinationals (MNE) are now globalizing innovation and product development work to sites in the emerging economies as a new stage of globalization, what we term “third generation globalization.” The work now located in emerging economies is high-level knowledge work that previously was confined to the Triad nations (North America, Europe, Japan) and appears to be accompanied by changes in global migration of highly-educated students and workers and in company-university collaborations. The proposed research by a multidisciplinary, international research team will examine these changes to identify more precisely industry-specific and country-specific effects in (a) shifts in science and engineering (S&E) work; (b) changes in migration flows and U.S. migration dependency; (c) human capital development, by occupation/discipline in the US, Europe, and emerging economies (EEs), and, (d) implications for U.S. education policies on the S&E workforce. We will develop a framework of, and model to the extent possible, the interactions of this complex system of MNE change, engineering globalization, migration flows, and changes in educational capacity.

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### **Causes and Consequences of Urban Expansion**

0433278

Stephen Sheppard

This poster presents a sampling of early results from NSF project SES-043278, a project designed to improve our understanding of the dramatic expansion in urban land use taking place in cities around the world. Building on land use classification of a sample of 120 cities around the world, the project is deploying field researchers in each of the cities to collect systematic and detailed information on demographics, planning and land use regulation, urban transportation and urban structure, housing conditions, conditions in informal and slum housing, availability of housing finance, and actual land use at a series of randomly chosen locations for use in evaluating the accuracy of remote-sensing based land use classification. The poster presents a series of images that illustrate the range of observed rates of urban expansion around the globe, and illustrates the project analysis of infill, leapfrog, and extensive urban expansion. The also illustrates the techniques being utilized to make project results more widely available using the project web site and GoogleEarth. The poster provides information on the types of data being collected, and presents preliminary results on model estimates designed to test specific hypotheses concerning the relative contribution of social and economic factors in determining rates of urban expansion.

### **Individual Differences in Affective Learning**

0527440

Lisa Feldman Barrett, Eliza Bliss-Moreau, Jon Horvitz, Christopher I. Wright and Peter Balsam

We present five studies that break new ground by exploring the intriguing possibility that there is individual variation in how people learn about pleasant and unpleasant events (called affective learning).

We developed two experimental paradigms, each tapping a different mode of affective learning. Study 1 was designed to assess individual variation in associative affective learning using a classical conditioning paradigm. Studies 2 through 5 demonstrate individual variation in rule-based affective learning with a minimal learning paradigm. In particular, Studies 2 and 3 demonstrate that with a rule-based learning procedure, people can learn about affective value quickly and efficiently; studies 4 and 5 demonstrate that individuals with an enhanced sensitivity to reward learn about positive events more efficiently. Finally, Study 5 also provides evidence that rule-based affective learning is retained over time. Future directions are discussed.

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### **Dynamics of Rules in Commons Dilemmas**

0432894

Marco Janssen, Elinor Ostrom, Filippo Menczer, Robert Goldstone, Juan Camilo Cardenas and Francois Bousquet

This project combined laboratory experiments, field experiments and role games with agent-based models to explore different aspects on how resource users are able to craft rules to govern their shared resources. Initial results of laboratory experiments, where subjects shared a spatial dynamic resource, are presented. Furthermore, the experimental designs of the field experiments to be held in the coming months in villages in Thailand and Colombia are discussed.

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### **Understanding Conceptual and Cultural Change: The Role of Expertise and Flexibility in Folk Medicine**

0527707

Norbert Ross, Tom Palmeri and David Noelle

The project brings together tools, techniques, and insights from anthropology, cognitive psychology, and computer science to investigate the dynamics of human conceptual knowledge and its effect on cultural processes. Long-term ethnographic and experimental studies are conducted in Chiapas and Michoacan, Mexico as well as among Mexican migrants in the Nashville area. Ethnographic research aims at understanding and describing complex processes of individual conceptual change as well as wider cultural change that occurred in the study communities within the domain of folkmedicine. Laboratory experiments and computer modeling extend this research by exploring the specific conditions of conceptual change. Once understood the data will be used to simulate the ethnographically described cultural change based on processes affecting individual minds. Together these data will provide a better understanding of the interplay of conceptual and cultural dynamics. Results will not only inform our normative theories of conceptual and cultural change and our ethnographic understanding of the specific settings, but will furthermore inform the workings of health care systems in multi-cultural settings. *How do concepts differ across cultures and how does new information affect old conceptual structures?* Are some of the questions at the heart of this project, both on an abstract level, but more importantly with respect to specific cultural

settings, such as the Tzotzil Maya community of Chenalho. The research takes place in collaboration with the community as well as NGO and governmental health organization with support from the Vanderbilt medical school.

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### **DHB: Multilevel Autoregressive Moving Average (ARMA) and Dynamic Models for Longitudinal Data and the Study of Human Interactions.**

0527449

Michael J. Rovine, Peter C.M. Molenaar, David Nembhard, Cynthia A. Stifter, Eric Loken, Katerina O. Sinclair, Kelly Yip, Carol Gold and Beau W. Abar

A number of methods are presented that will be used in modeling mother-infant interactions in stressful situations, including the infant having its arms restrained and the infant receiving a scheduled inoculation. The data come from the Infant and Child Temperament Study (Jahromi, Stifter, & Putnam, 2004; Stifter & Braungart, 1995). The methods that are being implemented, expanded, and developed include Hidden Markov Modeling, Association Rule Mining, State-Space Modeling via Extended Kalman Filtering with Iteration and Smoothing, and Multilevel ARMA Modeling. Current projects and future directions are presented.

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### **Culture, Social Support, and Health**

David Sherman and Heejung Kim, University of California, Santa Barbara; Shelley Taylor, University of California, Los Angeles

Are Asians and Asian Americans more or less likely to seek social support for dealing with stress than European Americans? On the one hand, more collectivistic Asian/Asian Americans might prefer the sharing of stressful problems; on the other hand, efforts to maintain group harmony might discourage such efforts. Study 1, a survey study, showed that Asians/Asian Americans reported using social support less for coping with stressful health problems than European Americans and found the social support they received to be less helpful. Study 2 used priming method to show that when primed with in-group goals, Asian Americans are less likely to seek social support and less likely to find social support seeking beneficial than when primed with out-group or self goals, compared to European Americans who were unaffected by priming. Study 3, a lab study looking at Asian American and European American romantic couples' behavior, found that Asian American support seekers are more responsive to the situational constraints of the support providers. Study 4 examined the effectiveness of different forms of social support. Social support without involving disclosure of one's problems is more effective for Asian Americans and social support involving active disclosure and verbal transactions (explicit support) is more effective for European Americans, in terms both of psychological and neuroendocrine responses to a lab stressor. Discussion centers on virtues and liabilities of different forms of social support within particular cultural contexts and implications for health outcomes.

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### **Technology and Human and Social Dynamics**

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#### **Creating Dynamic Social Network Models from Sensor Data**

0433637, 0433376

Henry Kautz, Tanzeem Choudhury, James Kitts, Dieter Fox, and Jim Rehg

Social networks are widely recognized as crucial for understanding social dynamics, including the spread of diseases, the dissemination of beneficial health practices, and the mobilization of terrorist cells. Although we know that face-to-face interaction is important for conveying information and changes in behavior, we know relatively little about how networks of interaction evolve over time.

In this project, we are developing a hybrid method for rigorously observing structures of social interaction over time using sensor data. We use wearable sensing devices to collect streaming data on research participants' physical location, speech, and motion, and we are developing computational models to infer structures of social interaction from these data. This suite of tools thus allows direct automated measurement of networks of face-to-face interaction over time. We are validating this method and communicating it to the social science research community by employing our tools in tandem with conventional survey and observation designs. Our team includes experts from both Computer Science and Sociology, integrates tools from both fields, and addresses questions that would be intractable without this interdisciplinary lens.

To model the formation and evolution of a social network from a natural initial state, we have completed an intensive measurement study on an incoming cohort of students in a moderately-sized graduate program during the 2005-06 academic year. We recruited 24 (89%) of 27 incoming students and completed 10 consecutive months (one academic year) of data collection. Each month, we collected one week of time-stamped wearable sensor data and also administered a survey that measured subjects' self-reports of their interaction. We have had a 100% response rate on surveys and have collected a total of 4,469 hours of sensor data (~186 days).

Our poster will provide an overview of the data collection effort, the sensors and the sociometric measurements, and the computational models we are developing.

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### **IT Enhanced Market Design and Experiments**

0527770, 630805

James C. Cox

The global economy is in the midst of large-scale transformation driven by innovations in information technology (IT) and the explosive growth of the Internet. IT is reshaping markets and consumer and enterprise behavior while business realities are also impacting the nature of viable IT innovations. A central concern is that little is yet known about the economic and social impacts of this transformation. We are conducting new research on various types of IT-enhanced economic environments, including: markets with asynchronous participation; markets with automated agents; new market formats enabled by IT; and new composite information services.

Existing e-commerce sites such as Amazon, eBay, Priceline, etc. are just the first wave of markets enabled by advances in IT. These companies alter existing market formats (e.g., posted prices on Amazon, and one-sided auctions on eBay and Priceline) and create new hybrid formats (e.g. “Buy It Now” on eBay) with unknown impact on market participation, efficiency and income distribution. At the same time, leading IT organizations such as IBM and HP are investing massively in knowledge-intensive business services and creating new composite service products (e.g., “Business on Demand” and “Utility Computing”) that will require new market formats. Automated trading agents are playing an increasing role in the IT-enabled markets, and their interaction with human traders is demanding close scrutiny.

Our research attempts to identify the market formats, agent designs, and composite information service specifications that, in realistic IT environments, best promote economic prosperity. The methods include development of new theoretical models and testing and refinement of the models in controlled experiments with human subjects.

Previous detailed scientific knowledge of trader behavior and market performance was mainly confined to classic market formats. Our research seeks to expand that classical knowledge, test its robustness, and open new lines of inquiry by considering a broader range of market formats (one-sided auctions, two-sided markets and new hybrids), a broader range of goods (including new composite IT service products), and a broader range of behavior (including human interaction with automated agents).

The scientific knowledge generated by our research will be disseminated via EconPort, an active-objects digital library of economics. Both textual material and platforms for running the various market formats and automated agents will be incorporated into EconPort and thereby into the National Science Digital Library.

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### **Accelerating the Diffusion of Innovations: A “Digital Diffusion Dashboard” Methodology for Global Networked Organizations**

0527487

Julia Gluesing, Kenneth Riopelle and James Danowski

This study of the diffusion of innovations is grounded in the theoretical and methodological traditions in communication and social network research as it intersects with our new approaches to diffusion theory in online organizational systems. It is theoretically interesting to examine whether diffusion through new technologies in organizations produces different kinds of diffusion curves than do traditional processes. Also interesting is how social network structures and word networks extracted from email and instant messages may be linked with differences in IT media used and with the resulting diffusion curves. In organizational contexts, a central problem faced by today’s management is how to increase the speed at which innovations can be implemented in global organizations, so the research findings will contribute in this arena as well.

An interdisciplinary team from communication, engineering and anthropology is conducting a three-year study using automated means to collect data that flows through the information technology infrastructure at Ford Motor Company, General Motors Corporation, and DaimlerChrysler Corporation. Based on modeling how different messages delivered through different combinations of IT media may result in diffusion curves that vary in shape and speed of formation, a “digital diffusion dashboard” tool will be created. It will dynamically display diffusion patterns, associated social networks, and word networks and offer managers recommendations for altering communication about the innovation. The IBM Corporation, as a partner in the study, is providing both IT and research expertise.

The research opens new frontiers in our understanding of the relationship between technology and the human and social dynamics of change. The researchers will create a database of a range of innovations (30 – 60) across the three organizations that will become available in the public domain to other researchers. The study will also advance the practice of organizational change and help accelerate the diffusion of innovations by investigating, documenting and validating a new methodology using existing information technology network infrastructure, and by developing techniques to dynamically plan, monitor and manage the diffusion of innovations and organizational change in real time. Simple, clear and reusable indicators for a “digital diffusion dashboard” will open a new frontier for both scholars and practitioners alike.

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**Embodiment Awareness, Mathematics Discourse and the Blind**

0451843

Francis Quek

Humans are embodied beings. When we speak, our embodied behavior of gesture, gaze, posture, and facial expression are brought into the service of the communicative process. The communication of mathematical concepts seems especially to engage such co-expressive behavior. The extent to which one's interlocutor is aware of such embodied behavior and utilizes it to maintain interaction and comprehend the material conveyed is still an open question. Our research is grounded in psycholinguistic theories of multimodal human communication. Our poster overviews our research under six key headings: 1. Embodiment & Language Claims: We outline our claims concerning embodiment and language, and how these reveal the role of analog imagery in language formation. 2. Mathematics & Embodied Discourse Claims: We outline the role of embodied imagery in mathematics discourse. 3. Mathematics & the Blind: We outline the capacity of students who are blind for spatial imagery. 4. Augmentative Technology Claims: We outline our argument that a key impediment to mathematics instruction for students who are blind is the lack of access to the situated instruction linking real-time discourse with graphics being presented. 5. Tactile/Haptic Devices Developed: We outline the five haptic devices (two reverse joysticks, and 3 vibro-tactile devices) that we have developed to date. 6. Initial Experimental Design: We outline a set of three experiments that permit us to answer three key questions before one can apply these devices to mathematics instruction. These are: a. How effective are the devices convey directional information? b. Can one read with one's fingertips while utilizing these devices to guide one to the graphic to be read? c. Can one fuse information received aurally (verbally) while at the same time reading a tactile graphic to which one is guided using the devices?

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**Using Shared Gaze to Coordinate Time-Critical Collaborative Tasks**

0527585

Gregory Zelinsky, Susan Brennan and Dimitris Samaras

We explored the potential for partners to collaborate, using shared gaze and/or speech, during two time-critical target-detection tasks. The first task was a standard O-in-Qs search. Participants performed the task either alone or as pairs, and all wore ELII eyetrackers, which were interconnected via Ethernet. In the paired conditions, two partners (A, B) were located in different rooms but viewed identical search displays. Either partner could make a target present or target absent response, with that response ending the trial for both. There were three collaboration conditions, with collaboration encouraged by instruction and payoff matrix. In the shared-gaze (SG) condition, a yellow ring representing A's eye position was superimposed over B's search display, and vice versa. Each partner therefore knew in near real-time where the other was looking by the position of this gaze cursor on their display. In the shared-voice condition (SV), partners communicated via a bi-directional voice channel, and in the shared-gaze-plus-voice condition (SG+V) partners communicated using both speech and gaze cursors. There was also a nominal group condition, formed by randomly pairing solitary searchers, and a no-communication condition, in which participants performed the task as a pair but without the opportunity for collaboration. Perhaps unsurprisingly, our data indicated a clear advantage for collaborative search over solitary search, with collaborating partners spatially dividing the search display in two. What is more surprising is that this collaborative advantage was largest in the shared-gaze condition: twice as fast and efficient as solitary search and significantly faster than with shared-voice alone (SV). Whereas partners limited to speaking divided the display rather coarsely

along the lines of “you look left, I’ll look right”, shared gaze allowed a finer-grained division of labor that could be dynamically renegotiated moment-by-moment. More striking still was that shared gaze search was faster than SG+V search, suggesting a substantial coordination cost for speaking that did not exist with gaze cursors.

The second task was also target detection, but the target was now a sniper (represented by a red dot) randomly located in a building window in a quasi-realistic city scene. The participants, who were playing the role of police officers responding to the sniper, had to achieve mutual gaze (i.e., consensus) on the target within 30 seconds, after which the sniper would escape and the trial would end. Task success therefore required that the first person to find the target be able to efficiently communicate its location to their partner. The methodology was otherwise identical to the search task, including the use of SG, SV, and SG+V conditions. We found that time to consensus was faster with shared gaze than with speech. Importantly, once A found the target, B needed far fewer fixations to achieve mutual gaze under shared gaze conditions, again suggesting that sharing gaze can be more efficient than speaking when people are collaborating on tasks requiring the rapid communication of spatial information. We conclude that shared gaze is a highly efficient method of mediating collaboration in a time-critical spatial task.

**Cognitive Processes**

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**Language and Location: The LL-MAP Project**

0527512

Helen Aristar-Dry, Anthony Aristar, Michael Appleby, Dan Parker, Susan Smith and Megan Zdrojkowski

Information about language boundaries and language relationships can provide critical insights into the genetics, culture, migrations, and interactions of populations. However, the full potential of language information to foster advances in the social sciences will only be realized when language data can be easily combined with topographic, political, demographic, and historical data. Geographical Information Systems (GIS) can organize a wide range of heterogeneous data in a highly flexible way. Hence, the Language and Location project (LL-MAP) exploits the power of a distributed GIS to dynamically integrate language information with extensive data from the physical and social sciences.

Even with the project still in its developmental stage, significant progress has been made, from refinements to the database design to the creation of a prototype website. This poster discusses progress to date and outlines some of the challenges encountered by the research team during LL-MAP's first year. Also discussed are the next steps in data collection and interface building. Ultimately, LL-MAP will develop:

- a major database of geospatially-referenced information about existing languages, integrated with a database of genetic relationships among languages which is already under construction
- a user-friendly online interface which organizes the linguistic, geographic, and social sciences information into customizable map layers and context-sensitive attribute displays
- flexible tools for querying, annotating, discussing, and collecting this language-related data.

Together, these facilities will constitute a comprehensive and dynamic investigative tool which will enhance the research and educational infrastructure of numerous fields. The integrated data approach embodied in this tool will support new research methods that will inevitably lead to new insights into human and social change.

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**Losses Loom Larger Than Gains in the Brain: Neural Loss Aversion Predicts Behavioral Loss Aversion**

Sabrina M. Tom, Craig R. Fox, Christopher Trepel and Russell A. Poldrack

One of the most robust phenomena to emerge in behavioral studies of decision making is loss aversion, the tendency for people to exhibit greater sensitivity to losses than to equivalent sized gains. Using functional magnetic resonance imaging (fMRI), we examined brain activity while individuals decided whether to accept or reject gambles that each offered a 50% chance to gain between \$10 and \$40 and a 50% chance to lose between \$5 and \$20. None of these gambles were resolved during the task so that we could isolate activity reflecting decisions, without contamination by the anticipation of impending monetary gains or losses or the actual experience of gaining or losing money. A broad neural network (including midbrain dopaminergic regions and their limbic and cortical targets) showed increasing activity as the size of the potential gain increased, and decreasing activity as the size of the potential loss increased. This suggests

that losses do not engage a separate set of emotional brain systems, but are instead represented by a decrease in activity in several areas that also code for gains.

Moreover, these regions exhibited neural loss aversion as shown by their greater sensitivity to losses than to gains. Finally, individual differences in /behavioral/ loss aversion were predicted by a measure of neural loss aversion in several regions including the ventral striatum and prefrontal and parietal cortex. These results provide the first neuroscientific evidence that risk aversion in the context of mixed gain-loss gambles is driven by the brain's greater sensitivity to losses than gains.

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### **The Dynamics of Political Representation and Political Rhetoric**

0527513

Burt L. Monroe, Kevin M. Quinn, Michael Colaresi, Dragomir R. Radev, Steven R. Abney and Michael H. Crespin

#### Overall Project:

The verbatim records of democratic legislatures represent a source of untapped information of unique importance for the study of both democratic societies and language over multiple time scales. For linguists, there is no other place where we have a systematic minute-by-minute record of the spoken word exchanged by a slowly changing and overlapping set of individuals over significant lengths of time. For political scientists, these are also unique sources of deliberations by elected political representatives about the issues of the day. As such, legislative records provide exceptional opportunities for studying the dynamics of language and rhetoric, of democratic politics and representation, and of their interactions, over time scales ranging from minutes to centuries.

The sheer volume of these records – up to thousands of pages per day – renders conventional techniques of content analysis impractical. Increasing availability of these records in electronic form, however, opens possibilities for various forms of computerized analysis. This multidisciplinary project develops and applies recent developments in computer science, information science, and statistics - for natural language processing in particular and statistical learning from massive databases in general - to the analysis of legislative records from democracies worldwide, illuminating important questions of dynamics of political representation and political rhetoric.

#### Extended Example: Topic Modeling and Dynamics of Political Agendas:

We describe a method for statistical learning from speech documents in order to gain new insight into political agenda dynamics. Prior efforts to evaluate political attention across topic areas have largely been expensive manual coding exercises that are circumscribed by limited time periods, high levels of temporal aggregation, and/or coarse topical categories. We describe a method for inferring, through word choices in each speech and the dynamics of word choice patterns across time, (a) what the topics of speeches are, and (b) the probability that attention will be paid to topics over time. We apply this method to new corpora of legislative speech in multiple countries.

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### **Language, Knowledge and Belief in English, Tibetan and Navajo**

0527509

Jill deVilliers, Jay Garfield, Evangeline Parsons-Yazzie, Thomas Roeper and Margaret Speas

By developing a synthesis between linguistic field work and language acquisition studies, we are exploring the relationship between human cognition about knowledge and belief and the grammar that language makes available for communicating about beliefs and mental processes. The field work explores constructions in Navajo and Tibetan which differ radically from English (and each other) in the way they encode the link between mental processes and human behavior. The acquisition studies aim to illuminate the path of development of children's knowledge of language expressing mental processes and their understanding of false beliefs and other minds.

Our central focus is on the grammar and acquisition of "evidential" morphemes, which are morphemes that indicate the speaker's source of information for the proposition being asserted. Tibetan is one of many languages in which one cannot convey information without also explicitly indicating how one came to know the information: through personal experience, inference or hearsay. We are exploring the nature of these evidential categories as well as related categories in adult and child language.

Our poster will present an overview of our initial studies in three areas:

- The acquisition of evidential morphemes by Tibetan-speaking children
  - We give a brief overview of theoretical work on evidentials, focussing on Tibetan. Then we describe our experimental work with Tibetan speakers between 3 and 8. Since evidentials are obligatory morphemes expressing source of belief, it seems inescapable that mastery of the grammar relates to the child's developing Theory of Mind as well as inferential ability.
- The acquisition of deixis and epistemic predicates in English
  - Unlike evidential morphemes, which express a speaker's source of knowledge, epistemic predicates like "think" or "infer" can express someone else's knowledge ("Mary thinks that...") as well as of the speaker ("I think that...") We are using deixis, which encodes speaker perspective, as a probe into the acquisition of perspective and belief. In related experiments, we are investigating children's understanding of the grammar of sentences embedded under "think", as well as their understanding of epistemic judgment in their comprehension of the modals "must" and "might."
- The grammar of deixis and attitude particles in Navajo
  - We are applying the results of field work and our theoretical research to develop pedagogical materials in collaboration with Navajo bilingual teachers. Our first project was to devise a simple and systematic description of Navajo spatial deictic terms and particles expressing speaker attitudes.

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### December 2004 Tsunami

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#### **Natural Warning Signs of Tsunamis: A Case Study in Thailand Following the Indian Ocean Earthquake and Tsunami Events of 2004**

0522301

C.E. Gregg, B.F. Houghton, D. Paton, R. Lachman, Lachman, S. Wongbusarakum and D.M. Johnston

People's knowledge of, and ability to recognize and respond to natural warning signs of tsunamis is important for three main reasons. First, the signs may provide the first alert for communities near the source of tsunamis because a) a tsunami early warning system may not be activated in time, or b) communication links that relay official or public alerts may be affected by earthquake damage. Second, natural signs may

provide a mechanism for people to personalize and confirm official warning messages, significant factors in response to aftershock warnings. Prior to December 26, 2004, no systematic study had examined these issues. The Indian Ocean events on this date offered an unprecedented opportunity to do so.

We collected nearly 7,000 pages of social behavioral data on Thai adult's experiences with the earthquake and tsunami events of December 2004 and March 2005 in all six of the affected Thai-Andaman coast provinces. This study seeks to provide qualitative and quantitative data regarding the conspicuousness of the natural signs of tsunamis and explore the influences on decision-making processes that affected interpretation of, and behavioral response to, them and other official and unofficial warnings.

Clear findings emerged from 663 interviews. The cognition of the natural signs was variable. Some 24% of the sample population felt ground-shaking from the 2004 earthquake, yet all but 6% ignored it or linked it to anthropogenic causes. Over two-thirds (69%) reported they saw something unusual about the ocean behavior, such as a wave trough or unusual wave form and a majority (55%) heard something unusual before tsunami crests arrived onshore. However, the link to danger came too late. Most people saw tens to hundreds of people in and/or moving towards the danger zone when the first wave struck.

We conclude that natural warning signs were widely detected as something unusual, but, not surprisingly, were not linked to tsunamis. Notwithstanding, the salience of natural signs means they can be interpreted accurately and acted on by the public with proper education. Natural signs and informal and formal warning messages each have their limitations, but a model predicting response to tsunamis must consider all sources of warning. The data collected here serves as a new source of behavioral data about natural warnings.

A recent report by the US Office of Accountability (2006) underscored the threat of local tsunamis along US coastlines, making understanding of behavioral response to natural warnings of tsunamis of great importance. In August 2006, USAID has funded a 1-year study to develop educational tools from the HSD data for five Indian Ocean countries.

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### **Decision Making**

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#### **Decision Markets and Uncertainty in Weather Forecasting**

0527332

Gary Bolton, Andrew Kleit, Anthony Kwasnica and Mark Roulston

Weather forecasts are probably the most visible and commonly used type of scientific forecast, influencing decisions small and large on a daily basis. Weather forecasts raise important questions about how uncertain forecast information should be conveyed to decision makers. As with most forecasts of changing circumstances, they exhibit both within and between-forecast uncertainty: Within-forecast uncertainty refers to the uncertainty inherent to an individual forecast. Between-forecast uncertainty refers to the uncertainty created when individual forecasts differ. With regard to within-forecast uncertainty, meteorologists can now provide more exacting information about the uncertainty in their forecast estimates than was previously available, although little of this information presently reaches end users, in large part due to doubts about how to effectively disseminate it. With regard to between-forecast uncertainty, the weather is both a promising application and a rich test bed for decision markets, a technique economists have been studying for weighting and combining diverse judgments about the future into a consensus

forecast. Finding ways to convey weather information to the decision makers that use it can teach us about how to communicate uncertain events to a wide audience.

This project divides into a series of experiments aimed at three broad questions: The first question is, How do people use uncertainty information to make decisions? Studies to address this issue investigate peoples' ability to use probability information about weather forecasts in their decision making, the difference the method of presentation of the information might make, and whether the present method of information presentation might biases decisions in any systematic way. The second question is: How accurate is the information provided by decision markets? Studies investigate how the mix of trader expertise affects the accuracy of market generated information, and how the structure of the assets traded affects the flow of information in the market. Third: How do (should) people use decision market information? We investigate the effectiveness of the market in situations where decisions must be made well prior to the event.

The research will yield methods for improving the communication of weather information to benefit decision makers. These methods are likely to be applicable to other types of forecasts as well. The research will provide a better understanding of how decision markets work, which is an issue of potential importance to forecasting in institutions and organizations throughout society.

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### **Energy, Air Pollution, and Health: Design of a Field Research Study in Accra Ghana**

0527536

Majid Ezzati

Although sub-Saharan Africa is still a predominantly rural region, the region's urban population grew at a rate of 5.8% per year between 1990 and 2000, higher than any other region in the world. A particular feature of urbanization in Africa is that urban population growth primarily occurs in two modes: concentrated in slum areas within the older city limits or distributed around the expanding periphery, creating a peri-urban community. As a result of these two modes of population growth, the contributions of indoor (biomass fuels) and ambient (mobile and industrial) sources to total air pollution exposure are likely to vary by socio-demographic as well as spatial variables. Understanding the levels and sources of air pollution at small spatial scales will help choose interventions for improving the environmental health of the world's most marginalized populations and has implications for environmental (health) justice. At the same time, unlike Asia and Latin America, there has been little attention to air pollution in African cities, and virtually no long-term monitoring. This poster describes the design and pilot phase of a project that aims to measure and characterize on sources, levels, and exposure to air pollution in indoor and ambient environments in Accra, Ghana, and the effects on health inequalities.

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### **Virtual Experiments and Environmental Policy**

0527675

Stephen M. Fiore, Glenn W. Harrison, Charles Hughes and E. Elisabet Rutström

We develop the concept of virtual experiments and their application to environmental policy. A virtual experiment combines insights from virtual reality (VR) in computer science, naturalistic decision-making (NDM) from psychology, and field experiments from economics. The environmental policy applications include traditional valuation tasks and less traditional normative decision-making ("helping people make better decisions"). The objective of virtual experiments is to bridge the gap between the controls of laboratory experiments and the naturalistic domain of field experiments.

We have two methodological goals. First, we will use interactive, immersive VR simulation technologies to recreate, in a controlled environment, the rich array of cues and information relied upon by decision-makers in naturalistic domains. The application we use, forest management policies, is a good example of a decision environment with a rich set of information cues and interactions, and where the experience of experts is expected to matter in significant ways to the decisions made.

Our second methodological goal is to blend the techniques of controlled economics experimentation with those of NDM. The power of experimentation lies in replicability and control, and by extending these capabilities through the power of VR simulations, this research will allow us to explore issues in decision making in ways that have not previously been feasible, so as to expand the boundaries of what we know about human behavior in dynamic environments. We will compare decisions made by participants using standard state-of-the-art questionnaires, where scenarios are described in words and with pictures, to those made using the interactive experience of the VR technology. We hypothesize that the differences in values and decisions between experts and non-experts is smaller with the immersive, interactive VR environment than with the standard word and picture descriptions.

The economic policy context we implement, to illustrate the application of virtual experiments, is the assessment of how ordinary households and trained experts evaluate the risks and consequences of forest fire.

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### **Search, Learning and Choice under Uncertainty: Empirical Evidence from Alaskan Halibut Fishermen**

0527728

Quinn Weninger, Philippe Marcoul, Gary L. Wells and Terrance Quinn II

This goal of this project is to provide new empirical knowledge about how people form expectations about uncertain events that affect their lives, and how people process and learn from new information. We will record individual's beliefs about the uncertainty they face, and resulting choices that are made, in a high-stress and high stakes environment. Test subjects are commercial halibut fishermen who make repeated trips searching for their quarry in the Gulf of Alaska. This natural experiment presents a unique opportunity to study the decision processes of experienced individuals who have selected a profession that rewards ability to locate fish.

The data will be used to test competing theories of decision-making, learning and search under uncertainty, and to identify, and quantify the effects of biased belief formation, if found. The results are expected to make important contributions to the fields of behavioral psychology and behavioral economics. In addition to better understanding how individuals form beliefs, and make repeated choices under uncertainty, the data will be used to determine how prevalent biased judgment is among experienced decision makers. By documenting the dynamic belief formation, learning, and actual choice in the field, this research will provide an empirical foundation to assess traditional and emerging theories of choice under uncertainty.

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### **Environmental Human and Social Dynamics**

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#### **Cross-boundary Comparison of Land-use and Land-cover Change as Indicators of Human Social Dynamics in Thailand and Cambodia**

0433787

Michael W. Binford, Alan L. Kolata and Robert M. Townsend

The central question of the HSD program grant project “Economic Growth, Social Inequality, and Environmental Change in Thailand and Cambodia” (NSF BCS-0433787) is that social inequality and cross-household variability of income growth in developing economies is larger than conventional economic factors can explain. Our working hypothesis is that environmental, social, cultural, and historical variation interacts with economic factors and affects households, villages, and regions differentially, explaining inequality and a large amount of the residual variance in income growth. One of the many ways to analyze human-environment interactions is to study changes in land cover and land use as a physical manifestation of the functioning of a social-ecological system.

For this poster we ask the specific question of how environmental, economic, and cultural variability interact to drive landscape dynamics, of which land-cover and land-use changes are the visible manifestation, and show several examples of how land-cover and, by inference, land use, has changed differently in selected areas of Thailand and Cambodia. The two major land-cover phenomena are land-cover trajectories from 1990 to 2000 and then to 2005, and the visible shapes of villages in the two countries. We focus on a ~70-km x ~150-km transect that crosses the Thailand-Cambodia boundary in the provinces of Srisaket (Thailand) and Otdar Meanchey (Cambodia). Although Srisaket is one of the poorest provinces in Thailand, Otdar Meanchey is even more impoverished and was the last stronghold of the Khmer Rouge in the civil war that plagued Cambodia until recently. The 1998 Cambodian census did not collect data in eastern Otdar Meanchey because military operations were still in effect. Pol Pot, the most notorious leader of the Khmer Rouge, died in 1998 in Otdar Meanchey, and the relative political stability of Cambodia is considered by many to have been consolidated with this event.

Our preliminary observations indicate that each country has experienced completely different spatial and temporal patterns of land-cover and land-use change in our cross-boundary study area. The area in Thailand lost about half of its remaining dense forest between 1990 and 2000, which was converted mostly to rice agriculture or fallow land. The “built” areas including cities and irrigation reservoirs increased dramatically in Thailand (from 0.2% of the area in 1990 to 1.55% in 2005 – greater than a seven-fold increase in land area). Across much of the Cambodian section, loss of dense forest has occurred through gradual thinning, leading first to sparse forest (pale greens in the satellite image) and then to scrub. This is evident closer to more settled areas. There is a mosaic of thinning forest, and the emergence of scrubby patches. Deforestation here began earlier, probably because of its proximity to villages. The gradual pace of deforestation was observed during the field to obscure the actual extent of agricultural activities – farmers begin growing crops under fairly closed canopies, and gradually, after years of tillage over and with subsequent waterlogging of root systems, the trees died away. However, around some more recently logged areas (some sectors in our transect were still Khmer strongholds and other areas were only recently cleared of land mines), both the spatial extent and the nature of the class change – dense to scrub (olive and orange) – suggest more abrupt deforestation through clear-cutting. Although these areas are likely to be used for farming, much of the timber is probably shipped to larger towns such as Siem Reap, or even exported.

The second example of differential land-cover/land-use change is that village shapes differ in the two countries. Most rural, agriculturally oriented villages in the study provinces in Thailand are nucleated, i.e. they are sub-circular in shape. Their inhabitants farm multiple plots at various directions and distances from the villages, where people live. Most villages in the Cambodian provinces tend to be aligned along roads or waterways. One possible explanation for this is that the Cambodian villages are very young (formed or

reformed since 1998 as was described by multiple informants in multiple villages) so that people pioneering or repopulating a region build houses along roads to facilitate movement and transport of goods. Another factor may be that major clearing of minefields has proceeded slowly, but the early emphasis was on roadside areas. In contrast, the Thai villages have existed for many generations and have grown as clustered households because the land outside the village is more valuable as paddy fields.

These observations are not yet explained in terms of human social dynamics. To explain these changing landscapes, as well as the dynamics of other aspects of the human social systems, we are continuing ongoing socio-economic and environmental studies in Thailand that were started by RMT in 1997 and began comparable surveys in 2005 in Cambodia. These studies survey several thousand households every other year, and several hundred households monthly to gather data on two different scales of economic activity. The studies also collect soil fertility, precipitation, and soil moisture data from multiple sites in the study areas. Economic models have terms for natural resource availability, access to capital and labor, access to credit, idiosyncratic and aggregate shocks, and other factors that help determine many of the variables that are measured in the surveys. Ethnographic studies that focus on describing social networks are also being conducted in both countries. Finally, studies of longer-term climate variation are underway to determine whether years of extremes in the instrumental record match with the perceptions of villagers as to their economically good and bad years. In summary, both quantitative and qualitative methods are conducted to characterize and to understand the interacting socio-economic and ecological variability in this dynamic system.

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### **Global Markets, Regional Landscapes, and Household Decisions: Modeling the History of Transformation of the Amazon Estuary**

0527578

Miguel Pinedo-Vasquez, Eduardo Brondizio, Peter Deadman, Christine Padoch and Robin Sears

The Amazon estuary is the economic heart of the region; it is a microcosm representative of the Amazon in terms of land use systems, socio-cultural variations, environments, and history of colonization. Dramatic swings in dominant economic activities have characterized economic life in the Amazon estuary since well before World War II. Oscillations between reliance on agriculture, cattle production and extraction of forest and river products, as well as fluctuations in residence between the village, forest, and city, began early and have continued into the present. The objectives of this interdisciplinary and multi-institutional project are to (1) demonstrate the complexity of the social dynamics and environmental change associated with historical economic transformations as they affect and are affected by socio-demographic changes at the levels of regional population, communities and households; (2) reconstruct the history of change in regional landscapes associated with economic and demographic shifts; (3) identify the functions of the local institutions, rules and norms in both rural and urban areas in light of the changing conditions; and (4) develop an agent based model designed to examine how local economic, social, and environmental realities in the estuary have historically intersected with global economic processes to produce distinct social and landscape patterns in the villages and towns in the Amazon estuary. Multiple methods will be used to understand a complex history of gradual and radical shifts, economic swings, and reversals in the urban and rural orientations of estuarine populations, their economic activities, and their resource management patterns. The five-member research team will use ethnographic methods including interviews, economic diaries, and life histories to gather data that will allow them to understand, map, and model the migration and residence patterns, economic activities, land use decisions and actions of estuarine residents over the last three generations. These data will be coupled with historical remote sensing and archival data to reconstruct economic cycles and the biophysical transformation in the regional landscape. The team will use

agent-based modeling (ABM) techniques to understand how decisions and norms at the local level are affected by macro-scale processes and interact with environmental conditions to produce broader patterns of behavior than could not be deduced from local or regional level examination alone. To date, most ABM models of land use and cover change (LUCC) have focused on place-based agents, making decisions and interacting with one site. In this project the team will explore dimensions of ABM simulation based on regular household agent movement (e.g., seasonal rural-urban migration). Further, the addition of a network model of agent communication to existing ABM/LUCC techniques will help to capture household, social, and cultural ties that link specific agents across space. The research team has established research commitment and institutional collaboration in the region and brings long-term ethnographic studies among rural populations. An outstanding feature of the project will be the training of US and Brazilian researchers, students, and technicians in scientifically sound and multidisciplinary approaches to studying the human and social dynamics at the rural/urban interface. Furthermore, this project will be linked to global initiatives on capacity development and poverty alleviation being carried out at our respective institutions.

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### **Agent-Based Modeling and Simulation of Adaptive Behavior and Long-Term Change in Inner Asia**

0527471

C. Cioffi-Revilla, S. Luke, D. C. Parker, M. Tsvetovat, J. D. Rogers, W. W. Fitzhugh, W. Honeychurch, B. Frohlich, P. DePriest, R. Latimer and Chunag Amartuvshin

This project addresses fundamental questions in theory, methodology, and data concerning human and social dynamic responses to social and environmental challenges in Inner Asia and the Eurasian world system over the past 4,500 years. Inner Asia played an essential catalytic role in the history of human and social dynamics in Eurasia. This system produced the largest territorial polity to emerge in the evolution of civilizations Mongol Empire of the 13th and 14th centuries economy interdisciplinary team includes expertise from the social sciences and computational sciences: political science and international relations, archaeology, cultural anthropology, physical anthropology, computer science (CS), economics, applied mathematics. CS expertise includes artificial intelligence, multi-agent systems and evolutionary computation. This project also includes international collaborations with experts on Inner Asian archaeology and ethnography (N. Bazarsad), as well as European experts on computational models of empire dynamics (D. Parisi) and Silk Road network simulations (A. Malkov). The main computational social sciences hub will be based at the new advanced Research-I facility at GMU's Center for Social Complexity, with distributed collaborative sites at the Smithsonian's National Museum of Natural History in Washington DC, the Keldysh Institute in Moscow, and the Institute of Cognitive Sciences and Technologies in Rome.

The new knowledge from this project integrated by an innovative computational theory that builds on earlier theories of social evolution and social dynamics by synergizing disciplines and themes that normally do not interact: anthropological archaeology, political economy, and computer science. The research team is composed of experts with both disciplinary and interdisciplinary collaborative experience, backed by strong and long-term institutional commitments to pursuing fundamental questions in the social and computational sciences. Results from this project will have multiple broader impacts in areas of surviving severe social challenges faced by contemporary human communities, such as global change, terrorist violence, or cultural conflicts. These are domains where collective action responses and intelligent organizational coordination are essential for human and social survival on multiple scales. Teaching impacts include interdisciplinary scientific frameworks that exploit disciplinary excellence and computational models for generating emergent social complexity. Social computer simulations also provide innovative and insightful experimental laboratories of psychology and limited areas of economics. Shared training opportunities for

U.S. and Mongolian students will add a new venue for collaboration, assuming additional funding is found for this purpose. An exhibit at the Smithsonian's National Museum of Natural History will reach millions of visitors on an annual basis, with guided student tours by project leaders.

A web site will be used to present project results and provide an additional public resource. This project will also be used in GMU's mentorship program with The Thomas Jefferson School of School of Science and Technology in Fairfax.

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### **Understanding Linkages among Governance Factors of Linked Social and Ecological Systems: Year One**

0527304

Tracey Dalton and Graham Forrester

Institutional arrangements are increasingly being used to explain the complex relationships governing natural resource use and management. Formal and informal arrangements link individuals, groups, and natural resources within a framework of governance (North 1990). Factors of governance continuously interact in non-linear ways to shape the ways in which humans interact within coupled social and ecological systems. The primary aim of this research is to identify factors critical to successful governance of coupled social and ecological systems and to explore relationships among these factors.

In this study, an integrated team including a marine policy scientist, an ecologist, and an anthropologist together with several research assistants is conducting a systematic evaluation of governance factors associated with marine protected areas (MPAs), a socially constructed mechanism for managing human interactions with a specified area of the marine environment (e.g., Mascia 2004). Our research is focused on one type of MPA, marine reserves. A marine reserve, or no-take area, is a type of MPA that prohibits extractive uses inside the reserve to maintain or enhance natural resources (Palumbi 2003). Marine protected areas, and marine reserves in particular, are increasingly being advocated by practitioners and researchers because traditional marine management measures have often failed to prevent fish stock declines, habitat degradation, and other impacts to natural resources.

Our study sample consists of roughly thirty marine reserves and their associated human communities in the wider Caribbean. At each site, we examine relationships among formal and informal governing arrangements linking humans and natural resources (i.e. stakeholder involvement, compliance, adaptive management, alternative income projects), the social and ecological context within which these arrangements are embedded (i.e. level of tourism in community, habitat quality, others), and the impacts of these arrangements (i.e. marine reserve performance). Here, we present background on the project, discuss preliminary results from the first year of field work, and highlight several lessons learned.

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### **Adaptation and Change in the Context of an Oil and Pipeline Project in Chad**

0527280

Lori Leonard, Siba Grovogui, Daugla Doumagoum Moto and Ray Weil

The development of a 4.1 billion US oil pipeline and extraction project in Chad has been touted as a means of reducing poverty and promoting economic development and 'modernization' in one of the world's poorest countries. Based on lessons gleaned from the cumulative history of extractive and large-scale infrastructure projects, the pipeline project has been accompanied by an unprecedented amount of social engineering. Members of the oil consortium, led by ExxonMobil, the World Bank, and the government of Chad agreed, for example, to a new law directing investment of oil revenues to key social sectors of the

economy; regulations promoting the protection of the environment; and social and economic programs aimed at shielding residents of the oilfield region from inflation (through the creation of jobs), the economic impacts of the loss of land (by providing compensation packages), and health risks including the spread of HIV (by sponsoring educational campaigns including the social marketing of condoms and oral re-hydration salts). Monitoring bodies appointed by the World Bank track and publicly report on the implementation of these agreements. This ‘experiment’ is designed to extend over the 25 to 30-year life of the oilfields.

The overall objective of our research project, which we began in 2001 shortly after construction on the pipeline began, is to examine the ways in which residents of the oilfield region adapt and change in the context of the pipeline project – the largest construction project on the African continent. Using health transition theory as a broad theoretical frame, we are studying the linkages between land tenure systems; agricultural and other economic production practices; patterns of household food consumption and food security; and health and nutritional outcomes. We present results from surveys and in-depth interviews we have conducted with members of 120 households that we are following in Chad, including 40 households in each of three sites. For the purposes of the HSD conference we are presenting data that are specific to the village locality, which is located atop one of three major oilfields and in which 32 of the 40 households we follow have lost agricultural land to the pipeline. Our data suggest that farmers are shifting from a system of rotational, long-fallow farming to more intensive use of their remaining land. As part of this project we intend to track soil quality and agricultural yields over time (beginning in 2007). Some farmers whose economic ‘viability’ is in question subsequent to land expropriation were trained in ‘off-farm’ trades (e.g., as carpenters, mechanics, welders, etc.). Migration to surrounding towns is increasing among these men. Other farmers were selected for participation in programs to improve agricultural production, but our data show that they have not been able to implement many of the techniques that were suggested as a means of improving soil quality and agricultural output. Household food security is tenuous and dietary diversity is low, particularly in relation to the other sites and in the ‘hungry’ season.

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### **Human and Social Dynamics in Mývatnssveit, Northern Iceland, from the Settlement to the Present**

0527732

A.E.J. Ogilvie, T.H. McGovern, I.A. Simpson, Jón Haukur Ingimundarson, Árni Einarsson, Orri Vésteinsson and Jennifer Brown

This interdisciplinary, international project integrates human, social and physical systems in order to examine HSD/AOC and their consequences in Mývatnssveit, Iceland. The focus will be both contemporary and historical, from c. AD 871 when the settlement of Iceland began, to the present day. The region has seen near-total deforestation, massive soil erosion and repeated cycles of starvation and abandonment, yet also demonstrates cases of millennium-long sustainable management of land and natural resources by the local population. The region has undergone three major economic and ecological transitions: one c. 1150-1200, a second in the 1880s, and a third from 1990 which is ongoing. Each transition involved both local and global climatic and economic factors and each produced successive cascades of change in vegetation, soil, landholding and settlement locations. Drawing on information from the social and natural sciences, as well as the humanities, the research will benefit from the expertise of local informants in the community, as well as on a wealth of highly detailed documentary records of social and economic change, both historical and contemporary, and an extensive archaeological record. Several different data sets, including environmental and climate data, soils- and sediment-based cultural records, and present-day agronomic, socio-economic, and population records, will be compiled and analyzed. A modeling component will provide an innovative approach for integrating archaeological, historical and environmental strands of evidence. This synergistic research approach will result in a detailed analysis of how the economic growth and social development of a

society, in this case in northern Iceland, is influenced by its eco-systemic links and socio-economic institutions. The research undertaken will further understanding of the complex webs of interaction between current and future environmental changes, and the inherited physical and cultural landscape.

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### **An Exploratory Space-Time Data Analysis Toolkit for Spatial Social Science Research**

0433132

Sergio J. Rey

The study of regional economic growth, inequality, divergence and convergence attracts considerable interest across multiple social sciences. By definition, these analyses rely on data that are spatially referenced. Only a few very recent studies, however, have given attention to the role of spatial dependence and spatial heterogeneity in the empirical analysis of regional economic evolutions. Research in the fields of geographical information systems (GIS), spatial statistics, and spatial econometrics has generated new methods designed to treat these spatial effects, but these methods do not address the dynamic dimensions of regional economic change. A truly integrated social science requires a toolkit that integrates both the spatial and temporal dimensions of socioeconomic phenomena. The objectives of this research project are to develop such a toolkit by (1) examining the implications of spatial clustering and spatial heterogeneity for the application of exploratory data analysis (EDA) techniques in a dynamic context; (2) developing new statistical methods for exploratory space-time data analysis (ESTDA); and (3) implementing these methods in an Open Source package for exploratory space-time analysis of social processes. The methods to be used include exploratory spatial data analysis (ESDA), exploratory temporal data analysis (ETDA), Monte Carlo simulation studies of the empirical properties of the new ESTDA methods, object-oriented programming, and dynamic geovisualization.

The toolkit Space-Time Analysis of Regional Systems (STARS) is an open source package designed for the dynamic exploratory analysis of data measured for areal units at multiple points in time. STARS consists of four core analytical modules: [1] ESDA: exploratory spatial data analysis; [2] Inequality measures; [3] Mobility metrics; [4] Spatial Markov. Developed using the Python object oriented scripting language, STARS lends itself to three main modes of use. Within the context of a command line interface (CLI), STARS can be treated as a package which can be called from within customized scripts for batch oriented analyses and simulation. Alternatively, a graphical user interface (GUI) integrates most of the analytical modules with a series of dynamic graphical views containing brushing and linking functionality to support the interactive exploration of the spatial, temporal and distributional dimensions of socioeconomic and physical processes. Finally, the GUI and CLI modes can be combined for use from the Python shell to facilitate interactive programming and access to the many libraries contained within Python.

#### Activities and Accomplishments:

Research on the project has focused on four areas of activities. The first concerns a set of methodological advances developing new statistical methods for exploratory space-time data analysis. These include the development of two new tests for spatial autocorrelation in dynamic series (Rey, Janikas, and Smirnov, 2005 and Rey and Janikas 2006), and a spatially explicit approach to analyzing the evolution of income gaps between economies in a regional system – so called spatial sigma convergence (Rey and Dev, 2006). The second component of the research effort has been to continue to enhance the STARS package in a number of dimensions. First, we have refactored the data import component of STARS by removing a dependence on shapelib (a c-library for reading shapefiles). As a result a single version of STARS runs on all supported platforms (Windows, Mac OS X, Linux). This component has also been redesigned to improve the “user-friendliness” of data import. The user interface has also been enhanced to incorporate

context sensitive help dialogs guiding the user through the options of each analytical method, as well as incorporation of example data sets, graphical tutorials (QuickTime Movies) and a user guide. A new release of STARS incorporating these, and other, enhancements was completed in January of 2006 and is available on the project website.

In addition to the enhancements of the user interface, STARS has also been extended to include the new analytical methods described above. A key component of this effort has been the development of novel methods for geovisualization. An example screenshot is shown in Figure 1. The user has selected the state of Illinois on the map via a mouse click (lower left). This highlights the associated observations in the three remaining views, each giving a different spatial or temporal perspective. In the upper right view the Moran Scatter Plot depicts each state's income against that of its geographical neighbors. Illinois is seen to have above average income, yet its neighboring states have incomes below the national average.

In the lower right panel, a Conditional Scatter Plot shows that the dynamic relationship between incomes in Illinois and its neighboring states (red line) is markedly different from the overall trend (black line). Finally, the TimePath view in the upper left portrays the co-movement of income for Illinois and its regional neighbors. While Illinois initially had an income substantially above the national average in 1929, it has moved towards the national average over the century. The neighboring states, however, have tended to remain in the same relative positions in the income distribution. The TimePath itself was dynamically created by the user issuing a control-click on the Illinois point in the Moran Scatter Plot.

The third area of activity has been the application of the toolkit to substantive research problems in a number of social sciences including regional economics (Bode and Rey, 2006; Yamamoto, 2005; Janikas and Rey, 2005; Rey and Janikas, 2005), and spatial epidemiology (Getis, 2005; Anselin, et al 2005).

The final area of activity has been outreach, first through interaction with ESRI to explore potential transfer of the new methods to commercial GIS software (Rey, 2004, 2006) and second with other open source spatial analysis projects. The latter has resulted in the establishment of a collaborative project (Anselin and Rey, 2005, 2006) to develop common spatial analysis functions in a shared library for use by STARS and other projects (PySpace, GeoVista) as described in (Anselin, et al 2005). As a result of these efforts, STARS is well situated in the rapidly evolving field of exploratory spatial data analysis (Rey and Anselin, 2006).

### Broader Impacts:

This project will make significant contributions to the practice of spatial social science, the modeling of human dynamics, and to basic understanding of the nature of regional growth and inequality. The incorporation of space and time into models of regional inequality and growth will provide more comprehensive and accurate descriptions of human social and economic behavior. The project will develop an exploratory space-time toolkit that will be Open Source and accessible to a broad array of social science researchers to enhance the analysis of human and social dynamics. As such, this research is expected to have implications in areas such as studies of urban segregation patterns, space-time epidemiology and public health, criminology, housing market dynamics, socioeconomic inequalities, among others. From a policy perspective, the development of new spatially explicit measures will provide planners and analysts with capabilities to design policy interventions targeted at key individual geographical areas. By taking spatial spillovers into account, this spatially focused strategy will leverage the impact of such policy programs across the boundaries of a single area, thereby increasing the effectiveness of the policy.

Project Website <http://stars-py.sf.net/>

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**Spatiotemporal Dynamics of Population Change in the Northern Islands of Orkney, Scotland, c. AD 1750-2000**

0527539

J. W. Wood, P. L. Johnson, T. Murtha, S. Matthews and Corey Sparks

The temporal patterns of the modern demographic transition – the changes in fertility and mortality associated (roughly) with the “industrial revolution” and its aftermath – have been fairly well established, at least as far as national populations in Western Europe are concerned. Almost nothing, however, is known about the spatial reconfiguration of rural populations or resulting changes in migration and settlement during the transition (save for some very crude, aggregate-level features of rural-urban migration). The HSD-funded North Orkney Population History (NOPH) project is a unique attempt to understand spatiotemporal aspects of the demographic transition at the level of individuals and households, by combining historical demography, landscape ecology, historical archaeology, and ethnography. Since the late eighteenth century, the northern islands of Orkney have completed a transition from traditional subsistence agriculture to commercial livestock rearing for external markets. Not only have fertility and mortality declined (though the latter surprisingly recently), but the whole spatial logic of farming has been altered, and net out-migration has begun to dominate local population dynamics. This poster provides an update on our initial collection of data related to these issues, focusing on the special problems that arise in linking sources of demographic information (parish and civil registers, censuses) to geo-referenced information on farmsteads, fields, and features of the natural environment at multiple spatial scales.

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**Exploratory Research and HSD Research Community Development**

**DHB Games Theory, Culture and Institutional Path Dependence**

0524919

Jenna Bednar, Yan Chen, and Scott Page

Cultural behavior influences the performance of institutions. Whether looking horizontally across countries or vertically through time, one lesson is clear: the efficacy of markets, democracies, and legal systems hinges upon behavior, particularly on the tendency for people to cooperate with and trust one another. We posit that a key to understanding culture’s effect on institutional performance lies in better understanding behavioral externalities between strategic interactions. To investigate this premise, our project combines basic theoretical research (mathematical and computational modeling) with laboratory experiments. We have now written three theoretical papers, all which underscore the importance of the larger strategic context for an agent’s behavior in a particular game. We show how culture naturally emerges from the interaction of agents in richer strategic contexts. One theoretical finding to highlight is the evolution of an unusual form of cooperation, where agents trade off receiving higher payoffs, a phenomenon we call Alternation. In pilot experimental studies this summer, subjects developed these Alternation strategies. To our understanding, this behavior has not been observed previously. We plan to continue these experiments later this month.

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**A Worldwide Exploratory Inquiry into the Influence of Globalization on Cooperation and Trust**

0525222

PI: Nancy R. Buchan, Marilyn Brewer, Enrique Fatas, Margaret Foddy, Gianluca Grimalda and Rick Wilson

Globalization is a process in which virtually every society is crucially intertwined. Although research has investigated the influence of globalization on societies and economies as a whole, we have little understanding of how this process influences individual decision making and interaction. The goal of our research is to start filling this gap. Specifically, we will assess the effects of globalization on individual level cooperative decision making with an exploratory approach to the mechanisms involved.

Our methodology is experimental. Participants from 6 countries will play a series of modified public goods games involving people from their own local area, from their country, and from other countries. Our objective is to make salient for individuals the tension between cooperating to increase overall local welfare, or cooperating to increase global welfare. We provide for maximum variance in our independent variable, ‘exposure’ to globalization forces, by including countries at substantially different stages of the globalization process, as measured by aggregate indices of globalization. Additionally, the experiment locations selected within each country represent differing degrees of global interconnectedness (in business and migration flows) and exposure. Finally, responses to an individual level questionnaire will be used to control for ‘individual’ levels of globalization and to investigate a number of possible mechanisms behind globalization’s influence, such as the degree to which participants identify with relevant categories of ‘others.’

Completed pilot tests in three countries - China, Spain and the United States, demonstrate that the proposed research design can be implemented and is the appropriate one to address our goals. Furthermore, our international, inter-disciplinary research team, with a diversity of knowledge bases and skill sets, is uniquely qualified to study the topic of globalization and its influence on cooperation.

### Intellectual Merit:

The proposed project is path breaking, and will increase intellectual understanding both of the influence of globalization and of public goods provision. First, our research is truly comprehensive in scope and global in nature, encompassing interaction between and within several environments around the world.

Furthermore, we are the first to quantify the degree to which an individual is “globalized” – and to test whether this individual characteristic influences cooperative behavior. Next, we extend the public goods context – which is virtually always studied at the local level – to the global domain. Finally, we study not the behavior of college educated students but instead involve “real” people, i.e., a sampling of males and females aged 18-75, who represent a broad spectrum of levels of social and economic status, within each country. In these crucial ways, our research will increase understanding of the extent to which current knowledge of cooperation in public goods games is generalizable to different contexts and to different, and more broadly based, populations. Furthermore, our findings regarding globalization will have greater relevance to the populations of the examined societies as a whole, not just to the elite educated few.

### Broader Impacts:

This research will have much broader impact as well by deepening understanding and shedding light on solutions to the urgent and far-reaching problem of global public goods provision. Provision of global public goods, i.e. those public goods that transcend national borders, such as the environment, public health, international justice, and international financial stability, has increasingly been seen as crucial to the growth of local and global prosperity (see the UN’s Millennium Development Goals). Furthermore, the costs of nonprovision of global public goods are immense; the UNDP estimates that the annual cost for the

nonprovision of efforts to reduce the excessive disease burden alone is \$US 1,138 bn. Finally, this problem not only affects policy makers, but also tax payers, and those who are most powerless in our societies but who are most likely pay the human costs if non-provision occurs. Our research represents a crucial first step toward understanding the degree to which people – who demonstrate differing levels of interconnectedness with the world – will cooperate to provide public goods at the local and global levels, and to explore why they do so. With this deepened understanding, we may be able to increase global cooperation and to reduce the monetary and human costs associated with non-provision of global public goods.

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### **Building a Research Community on Genomics and Racial/Ethnic Identity**

0525011

Toby Citrin, Sharon Kardia, Jacquelynne Eccles, Stephen Modell and Rebecca Sestili

Genomic research, or the study of the human genome, and the technologies emerging from that research, constitute “Agents of Change” having the potential for major impact on society. Scholars differ sharply on the likely societal responses to this research, some suggesting it will result in greater societal cohesiveness while others anticipate an increase in stigmatization, discrimination and prejudice. Research on genomic variation, with implications for the understanding of racial and ethnic identity, is paralleled by studies in the social sciences seeking to further the understanding of individual and group identity. A seminar series sponsored by the University of Michigan Life Sciences and Society Program brings together genetic scientists and social scientists with the goals of (1) building a community of scholars furthering transdisciplinary research and teaching on the impact of genomics on perceptions of racial and ethnic identity and (2) strengthening the understanding of the impact of genomic research and its applications on perceptions of racial and ethnic identity and the implications of these changes for social change and the future conduct of genomics research. Now at the mid-point of the year-long seminar series, the project has produced new insights, identified significant societal issues, and described several areas for future research involving collaborative study crossing traditional disciplinary boundaries.

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### **The Dynamics of Aging and Disease Recognition**

0525238

Melissa L. Finucane, Teresa Hillier and Rebecca Cowan

The primary emphasis area of this study is Decision Making, Risk, and Uncertainty. The study aims to stimulate new knowledge about how the accuracy of disease risk recognition is impacted by basic cognitive processes that change with age and with learning opportunities in a probabilistic environment. Building on work in cognitive psychology, neurology, decision science, and endocrinology, the research will test whether older adults (65-100 years), when compared with younger adults (18-40 years), have more difficulty in identifying and using multiple symptoms to recognize the disease of Type 2 Diabetes Mellitus (T2DM). Behavioral measures of disease risk recognition processes are being developed, focusing on comprehension accuracy, consistency in judgment, and insight into the relevance of T2DM symptoms. We are adapting the multiple cue probability learning paradigm and building on work by Finucane on aging and decision competence to identify new indicators that capture the influence of changes in cognitive processes on perceptions of disease risk. How older versus younger adults learn and change their risk evaluations under the impetus of external stimuli (e.g., cues that are inversely vs. directly related to disease status) is being examined.

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### **Measurement of the Standard of Living Based On the Theory of Functionings: Southern California as a Natural Laboratory**

0525251

Gloria Gonzalez-Rivera, Anil Deolalikar, Prasanta Pattanaik and Joseph Norbeck

The concept of the standard of living has received much attention over the last two decades or so. The Human Development Reports published annually by the United Nations is just one example of the growing interest in this subject. Broadly speaking, there are two non-exclusive approaches to the understanding of living standards: the approach based on income or consumption and the approach based on "real indicators" such as nutrition, education, and health, which is also known as the "functioning" approach. Each of these approaches has its use. In particular, the functioning approach, which has been put on a sound conceptual foundation by the works of Nobel laureate A. Sen (1985, 1987) and the world-renowned philosopher M. Nussbaum (1988), can be of considerable help in assessing the different dimensions of the quality of life in developed as well as developing countries.

The proposed project is intended to be the first step in a multi-year research agenda that aims to measure the standard of living based on the theory of functionings, and to provide policy formulations. We aim to deal with the issues of the quality of life that the region of Southern California is facing and will face in the near future. It is expected that in the next twenty-five years, the inland Southern California region will experience a 112% increase in population. This rapid growth will affect the quality of life of its residents because it will impact the supply of quality jobs, educational and health services, the transportation and communication networks, the air and water quality, and the survival of native plant and animal species. While this may be deemed too focused on our local concerns, we would like to stress that the problems that the region is experiencing are universal in nature. Therefore, Southern California emerges as a natural laboratory for the sub-regional analysis we propose.

This exploratory project has three main objectives: (i) the development of further methodological insights to the theory of functionings; (ii) construction of quality of life indexes; and (iii) data collection for the environmental dimension of living standards in Southern California. In future stages, we will implement an innovative concept "Social Value-at-Risk" that is devised as a public policy tool to inform the decision-making process. To achieve our goals, we will draw on the expertise of a multi-disciplinary group of engineers, social, and natural scientists.

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### **Cognition and Social Development in Linguistic Change: A Pilot Study**

0523976

Suzanne Curtin, Lori Holt and Scott Kiesling

When a child acquires a language, they must make sense of the language they hear around them. But this language is not the always same - it varies from speaker to speaker and situation to situation. Different people the child hears speak differently, and his/her mother will also use different kinds of language when playing or disciplining him/her. This project explores how children manage to organize speech sounds in their minds, and why they end up speaking the way they do. How much influence do caregivers have in this process? Researchers know from previous studies that children do not reproduce their parents' accent exactly, but that their parents' accent usually does make a difference in how they talk. It has also been observed that children of parents who have foreign accents are sometimes not aware that their parents speak

differently from native speakers. What aspects of the child's accent are influenced by the caregiver, and what are determined by other forces (especially peers), and at what age? Understanding how individual children develop their own unique speech pattern will provide a greater understanding of the role of the language that children hear in shaping how they acquire language. Most research in this area has compared the speech produced by adults and children who have parents from different language backgrounds. This study explores how children perceive the language they hear around them, how they represent it in their minds, and how that knowledge changes as they mature. Vowels are more likely to be pronounced differently in dialects than other speech sounds, even in the same speaker. For example, the way someone from Chicago says the vowel in "hat" is noticeable to someone from Tennessee, but there are no differences in the consonants between these two cities. Since vowels are more variable in pronunciation, and are also more easily measured with phonetic equipment, we focus on how children perceive vowel differences. First, whether children 6 to 24 months will be tested to see whether they can hear different ways of pronouncing the vowel in the word 'hay,' and in the word 'hoe.' In a second experiment, children are tested to see if they prefer one way of pronouncing the 'hoe' vowel over another instance (we focus on the 'hoe' vowel because it will be more variable). Methods to record children in naturalistic interaction with same-age children will be tested, as will methods to record interactions with a caregiver. These methods will help determine how children sort out all the variable information they receive in the speech around them, and come up with their own way of speaking. These methods will be used in a future study that will follow children from infancy to school-age (and older if possible).

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### **The Sri Lankan Tsunami: Societal Resilience in Two Coastal Regions**

0525260

Dennis McGilvray, Michele Gamburd, Patricia Lawrence, Alan Keenan and Randall Kuhn

Although the tsunami of December 26, 2004 wreaked similar types of physical damage and human injury in all parts of the Indian Ocean, the unique features of local culture and social structure may prove to have an effect on the resilience of the affected communities, shaping and channeling the processes of recovery and reconstruction in specific ways. This project compares two culturally, linguistically, and historically different coastal regions of Sri Lanka that were both very badly damaged by the tsunami: the Sinhala-speaking patrilineal Buddhist and Catholic south coast vs. the Tamil-speaking matrilineal Hindu and Muslim east coast. By looking at sub-regional differences in tsunami recovery efforts within a single nation-state such as Sri Lanka, it may be possible to distinguish the “cultural components” from the larger political, economic, and environmental dimensions of the post-tsunami situation.

The project utilizes intensive, localized anthropological fieldwork to explore how patterns of village life and traditional institutions of social healing have been affected by the tsunami experience. To corroborate and contextualize the ethnographic data, a broader sociological survey of tsunami impacts and social indicators is being conducted in both regions, and a national-level political analysis will provide a broad assessment of Sri Lankan governmental relief efforts, the role played by NGOs, and the impacts of the LTTE insurrection in the northeastern part of the island. Although initial field research in the summer of 2006 has been hindered by the outbreak of renewed civil war in Sri Lanka, we hope to complete the project in the summer of 2007.

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### **Subsistence Choices, Mercury Bioaccumulation and Ecosystem Change: A Long-term View from the Gulf of Alaska**

0525275

Maribeth S. Murray, Lawrence K. Duffy, Amy C. Hirons, Holly McKinney, Cody Strathe and Jeanne Schaaf

This poster presents results of exploratory research on marine fauna from well-dated (7000 B.P. to AD 1916) stratified archaeological deposits in Shelikof Strait, Gulf of Alaska (GOA). We examine the extent to which changes in stable carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) isotope values in marine vertebrates, (*Gadus macrocephalus*, [Pacific Cod], *Enhydra lutris*, [sea otter], and *Phoca vitulina*, [harbor seal]), may reflect changes in the marine food web and in ocean productivity and how these are coupled to changing mercury (Hg) levels. Human decision making as regards subsistence is considered in light of the biochemical evidence for local marine ecosystem changes, and the impact of consumption of naturally occurring Hg on human health is explored.

The research is designed to test existing models of prehistoric resource use in the GOA region and to generate proxy historical data on ocean productivity, human and marine vertebrate paleodiets, and mercury exposures. Long-term goals include: 1) assessing the extent to which historical studies enable us to generate baseline ecosystem data; 2) evaluating the potential for inferring future conditions under which Hg bioaccumulation rates might increase; 3) developing integrated methods for assessing human/environment interaction over the long-term, and; 4) managing for risks and uncertainties associated with marine resource use now and in the future.

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### **How Has Anti-sprawl Activism Changed Patterns of Suburban Expansion?: A GIS-based Exploratory Study in the New Jersey Highlands**

0523309

Thomas K. Rudel, Vanessa Beuschel, Melanie McDermott and Peter Van Cura

After World War II, massive landscape transformations occurred outside of cities where coalitions of farmers, builders, and bankers converted farms and forests into subdivisions of single family homes. Alarmed by the accompanying environmental destruction, other citizens, organized into counter coalitions, began to oppose real estate development. In this study we address two questions about the causes and effects of anti-sprawl activism. (1) What sorts of socio-economic and ecological circumstances give rise to counter coalitions and (2) what effects do their efforts to preserve rural landscapes have on the local quality of life?

We address these questions through an exploratory study of anti-sprawl inspired changes in land use controls in the New Jersey Highlands. Our poster presentation focuses on the measurement issues that we have faced in trying to estimate the extent of anti-sprawl measures (e.g. downzoning and open space conservation) in the 83 community region.

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### **Hazard and Risk Management**

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#### **Place-Based Decision Support for Spatial and Temporal Transference of Risk and Hazards: Charleston, SC Case Study**

0433158

Susan L. Cutter, Madilyn Fletcher, Cary Mock, John Rose, John Shafer, Walter Piegorsch, Roland Deutsch, and Mathew Schmidlein

This research is developing new methods and spatial models for measuring the differential susceptibility and impacts of hazards on people and places and how this changes over time and across space. We have been focused during the past year how spatial bias may amplify or attenuate risks and hazards and at what scale are these most evident? This question recognizes the special characteristic of particular places and the larger number of inter-related factors that influence risk.

Two place-based case studies will serve as test-beds for linking the theory, concepts, methods and models in a decision support system—the greater Los Angeles area and the Charleston, South Carolina metropolitan region. These test-beds were chosen based on the mix of common and unique hazards in each, a range in scale-dependent complexities based on physiography, size, wealth, demographics, the nature of the built environment and the prior experience and local place-based knowledge of team members. The research team is working on developing place-based integrated hazards assessment models, starting initially with two “design events” (seismic in Southern California; hurricane in South Carolina).

The social vulnerability protocol is complete and applied to Charleston for each decade from 1960-2000. A downscaled census tract social vulnerability index also was constructed for Los Angeles for 2000 to replicate the methodology used in Charleston 2000. A paper that evaluates the robustness of the index to changes in construction (statistical methods, component extraction, index creation) and in geographic setting (Los Angeles, Charleston, New Orleans) is nearing completion and will be submitted to Risk Analysis. Hurricane Katrina afforded us the opportunity to test the robustness of the social vulnerability index at a third location (Orleans Parish).

We have completed the historic hurricane damage reports using archival data sources for three “design” storms: Hurricane Able (1952), Hurricane Gracie (1959), and Hurricane Hugo (1989). We are currently running a retrospective model of the storm surge for each of the design storms. The spatial output will be compared against the damage surface to determine its relative accuracy and then we will integrate the modeled storm surge inundation with our social vulnerability index for each decade in order to assess the changing human impact over time and across space.

The remaining year of the project will focus on the built environment and understanding changes in the evolution of building codes and other structural mitigation efforts. We will also test the seismic model, developed by our Southern California partners, in Charleston.

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### **Social and Economic Effects of a Natural Disaster**

0527762

Elizabeth Frankenberg, Jed Friedman, Thomas Gillespie, Nicholas Ingwersen, Bondan Sikoki, Cecep Sumantri, Wayan Suriastini and Duncan Thomas

On December 26, 2004 the Sumatra-Andaman earthquake struck in the Indian Ocean, creating a tsunami that slammed into the nearby island of Sumatra some 45 minutes later, resulting in unparalleled devastation. The tsunami ultimately wreaked havoc on 10 countries and some 4500 kilometers of coastline throughout the region. Estimates suggest that worldwide casualties likely number over a quarter of a million people. The vast majority of deaths occurred in Indonesia, where some communities were almost completely wiped out. Less than a year later, Hurricane Katrina devastated the Gulf Coast of the United States and the city of New Orleans in particular.

The costs of these disasters have been huge and have underscored our limited knowledge of how people cope in the aftermath of such catastrophes. Drawing on the disciplines of demography, economics, geography, public health, and sociology, in this project we provide scientific evidence on the magnitude of the shock associated with the tsunami, on the pace and shape of the recovery process, and the roles that institutions play in helping or hindering that recovery process in both the short and the longer term. Focusing on Indonesia, the country most affected by the tsunami, we are assembling, collecting and analyzing uniquely rich longitudinal survey data and combining it with satellite-based measures of destruction caused by the tsunami. Baseline data are provided by a broad-purpose household survey conducted by Statistics Indonesia in early 2004 in tsunami-affected areas, and in comparable areas that were not directly affected by the tsunami (N=39,000). We have designed and fielded a longitudinal survey, the Study of the Tsumami Aftermath and Recovery survey (STAR) which locates and, if alive, re-interviews the same respondents. The first follow up wave of STAR was conducted in 2005-2006, and the second follow-up wave is currently in the field.

We present preliminary results regarding our approach to using remotely-sensed data to quantify damage within the communities, and on the costs of the tsunami for mortality and mental health. We use images from NASA's MODIS instrument, from before and after the tsunami, to assess the degree of damage to vegetation caused by the tsunami. On the basis of this measure we divide our 587 survey communities into groups experiencing (as a result of the tsunami) almost total destruction, heavy damage, light to moderate damage, and no damage. The proportion of respondents who died between the 2004 survey and the 2005-06 survey is only about 2% in the areas without tsunami damage, but is 45% in the areas of almost total destruction. For the survivors, the mental health costs of the tsunami have been substantial, with most of those in the devastated areas reporting symptoms of post traumatic stress disorder. Nevertheless, the majority of survivors also report a sense of optimism regarding their expectations for the future, suggesting that the resilience in the face of disaster that has been documented for other events is a characteristic of tsunami survivors as well.

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### **Highly Uncertain Risks: Prospects for Improving Assessment and Management**

0527664

David Hassenzahl, Robert Goble, Dale Hattis and Dan Kammen

An assertion that there is no risk from an exposure or process conveys different information from that conveyed by an assertion that the risk is lower than some value, or is negligible or is not a public health concern. Serious obstacles must be overcome to justify a credible finding that there is no risk. The obstacles reflect many of the challenges in performing interdisciplinary work on matters of public concern. They include 1) a perception within many scientific areas that "one cannot prove a negative"; 2) more broadly, multiple scientific disciplines are generally involved and different disciplines differ in how they weigh evidence and in the weight they give to different kinds of evidence; 3) different creators and users may well differ about the purpose of the assessment. In these contexts we believe that there is value in designing assessments so that "no risk" is a feasible outcome. We discuss three types of criteria, impossibility theorems, alternative explanations, and research exhaustion, that could justify such a finding and illustrate their application in the California Department of Health risk evaluation of the hazards, if any, posed by exposure to low frequency electromagnetic fields. A useful heuristic for evaluation is for analysts to prepare arguments for and against a negative finding within each relevant discipline followed by a cross-disciplinary synthesis. An illuminating contrast to the EMF case occurred during the emergence of the AIDS epidemic in assessing risks to the blood supply. In neither example did the evidence justify a

negative finding; however, the implications that could have been drawn for risk management are quite different.

The poster is based on a draft paper by David Hassenzahl, Robert Goble, Dan Kammen, and Dale Hattis. It is part of an HSD exploratory project on improving the assessment and management of highly uncertain risks: the research principals are Robert Goble, Vicki Bier, David Hassenzahl, Roger Kasperson, and Seth Tuler. The broad objective is to explore the idea that taking a perspective in which uncertainty is regarded as a key part of the assessment and management problem to be dealt with directly rather than as an unfortunate aspect of the analysis could improve both assessment and management in situations of high uncertainty. We are considering six cases: unregulated chemicals, extreme sea level rise, health hazards (if any) from electromagnetic fields, terrorist acts, radioactive wastes, and emerging diseases.

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### **Hurricane Katrina**

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#### **Factors Affecting the Post-Katrina Experience of New Orleans Residents**

0555934

David Banks, Maria Sirois, Edd Hauser and John Lefante

This research describes a multimode survey of current and former New Orleans residents to determine what factors (1) influenced their decision about whether to evacuate in advance of Katrina, and (2) shaped their post-Katrina refugee experiences. The results of the survey are still being analyzed, so the poster describes preliminary findings and lays out the research program, which includes fitting social network models to examine how needs changed over the course of time. Additionally, the poster describes the methodological challenges that arise in sampling unsettled populations.

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#### **Mapping and Analysis of Emergent Multiorganizational Networks in the Hurricane Katrina Response**

0555125

Carter Butts

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#### **Communication Networks of Organizational Leaders: Returning and Rebuilding New Orleans' Inter Organizational Infrastructure**

0554959

Marya L. Doerfel, Ivan Marsic and Jack Aiello

Much is understood about social networking and its ancillary benefits, however, the specific case of New Orleans' situation provides a unique opportunity to extend an understanding of the social processes associated with building – and now, in New Orleans case, rebuilding – social capital in a community. Two aspects of rebuilding is knowing the social context of relationships and how that context is created through individual action. Unique to rebuilding is that former trusted partners are not necessarily back, and for those that have returned, social, financial, and informational resources vary greatly. Old networks are reforming, but new networks are emerging, too. The theoretical framework that drives this study is from structural holes theory (Burt, 1992, 1995), resource dependency (Pfeffer, 1991) and strategic networking (Doerfel &

Taylor, 2004). The driving research questions asked in this study are: (a) How do former relationships and the context of current relationships offer support to organizational leaders in facilitating their rebuilding processes? (b) How can information seeking behaviors, support outreach, and other inter organizational processes that happen in the larger social network context be translated and used as the foundation for intelligent agent software that would become a resource for other returning organizations and future possible disasters?

Understanding what factors contribute to both the successes and failures of the rebuilding efforts at the organizational level can help to improve future post-disaster management. The project includes (a) ongoing field research, (b) interviews with organizational decision makers (e.g., owners, CEOs, presidents) that began in December, 2005, in New Orleans, (c) over 2000 archived newspaper articles (and growing) that cover various aspects of rebuilding activities, and (d) development of intelligent agent software that will become an interactive space that continuously improves through added/continued use and interactivity within it. The project is currently in data collection and data coding stages. Preliminary results from over 50 interviews and print-news analyses show networking and leadership activities that differentiate seemingly successful organizational reentrants from those expressing great concern for their organization's future.

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### **Aging Families in the Aftermath of Hurricane Katrina**

0555038

Tammy L. Henderson, Karen A. Roberto and Yoshinori Kamo

Social science literature that addresses catastrophic natural disasters, including hurricanes has focused on disaster planning (Coward, 1994; Ridway & Persily, 1980), disaster relief (Stokesberry, 1993), and the stressors and strains placed on individuals and communities at-large (Kaniasty & Norris, 1995). Little attention has been given to older families, especially African American families with special care needs who typically rely on a combination of a strong kinship care network and formal resources for day-to-day support (Allen, Blieszner, & Roberto, 2000; Hunter & Taylor, 1998). In the case of Hurricane Katrina, evacuees are facing prolonged dislocation compounded by separation from family and property loss. This long-term crisis presents significant challenges not only to older family members who relocated to Baton Rouge but also to the families and communities that opened their doors to evacuees. For example, more than 400,000 residents from New Orleans and other Gulf areas hit by Hurricane Katrina evacuated to the city of Baton Rouge; overnight, size of the city has doubled. Today, around 100,000 displaced individuals reside in Baton Rouge. Yet, little attention is being given to the impact this growth is having on its permanent residents.

We integrate constructs from two theoretical frameworks – the life course perspective (Elder, 1974) and the ecological model of human development (Bronfenbrenner, 1986) – to examine the functioning of aging families in the aftermath of a natural disaster. We anticipate that personal resources (e.g., education, income, health, self perceptions) and ongoing family and other informal relationships coalesce into an explanation of their overall family functioning. In addition, understanding the influence of micro- and mesosystems in the lives of aging families in the aftermath of Hurricane Katrina requires an examination of their personal histories, family relationships, and social and historical contexts.

The study sample will be recruited from two groups of residents currently living in Baton Rouge, LA: aging families who have been displaced as a result of Hurricane Katrina (n = 100) and those who are long-term residents of Baton Rouge coping with the overnight transformation of their community (n = 100). Aging families for the current project are defined as: (a) two or more older adults, 60 years of age or older, (b)

grandparents parenting grandchildren, and (c) elderly persons cared for by their adult child, family member, or another person. Personal interviews with a series of structured and open-ended questions will be used to elicit information in five areas: (a) demographic information; (b) health and psychosocial functioning; (c) community involvement; (d) reliance on family members, friends, and community services, and (e) family functioning.

We also will invite the 100 displaced families to continue participation in the study for one-month beyond the initial interview. Evacuees who agree to participate in the follow-up study will be given a notebook and disposable camera to provide a brief account of their events, experiences, and decisions. Participants will be asked to respond to these questions: (a) How is your family doing today? (b) What types of decisions did you make to take care of your family? (c) How did you go about making decisions for your family? (c) How are you feeling today? They will be provided a self-addressed, stamped envelopes to return the materials to Virginia Tech's Center for Gerontology. We will develop and send the pictures back to the evacuees, followed by a telephone interviews to clarify any of the written information, and obtain the "story" behind selected pictures. The combined forms of data – the written word and photos - will provide further insights about their experiences as they work through changes in their lives.

Study findings will advance theory and understanding of aging families' functional capacities in the aftermath of a major natural disaster and nonnormative events, especially underrepresented groups, such as poor, African American, and Asian citizens. We will present our findings at annual meetings of various professional associations and publish the findings in scholarly journals, write a Research Brief to distribute to community leaders, service provides, and policymakers.

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### **Reactions to Hurricane Katrina: Emotions, Political Polarization, and Racial Stereotypes**

Michaela Huber, Leaf Van Boven, Bernadette Park and William Pizzi

Hurricane Katrina's devastation of New Orleans and its aftermath elicited strong emotions among United States citizens and around the world. How do people's emotional reactions to Hurricane Katrina influence their evaluation of the Bush Administration's response to Hurricane Katrina's devastation of the Gulf Coast? How do emotions influence people's use of racial stereotypes and their perceptions of racial issues regarding Hurricane Katrina? We examined these questions from three perspectives.

First, we found in a nationally representative sample that Democrats evaluated the Bush Administration less favorably than did Republicans. Factors often thought to mitigate political divides including ethnicity, gender, education, income, and state of residence did not moderate this political divide. Preliminary analyses suggest that both Democrats and Republicans tended to be saddened by similar aspects of Hurricane Katrina (e.g., the loss of life and culture), they were angered by very different aspects of Hurricane Katrina. Whereas Democrats tended to report anger at the Bush Administration's perceived failures, Republicans tended to report anger at the state and local governments' ineptness.

Second, in a representative sample in Boulder and Denver, Co., we found that incidental emotional states moderated Democrats' and Republicans' polarized evaluations of the Bush Administration. Because anger inhibits people's tendency to correct initial judgments whereas sadness amplifies such correction, Democrats and Republicans who were incidentally angered exhibited more polarized evaluations of the Bush Administration than those who were incidentally saddened. Political polarization is thus persistent across demographic traits, as indicated by the first study, yet labile across emotional states.

Finally, in an ongoing study with a representative sample in Denver, Co., preliminary results suggest that White participants who were incidentally angered are more likely to judge a person with more Afrocentric features as guilty of looting when found with various packed objects in the aftermath of Hurricane Katrina. White participants also seem to judge police who did not respond to White people's calls for help as more culpable than police who did not respond to African American people's calls for help if the participants were angered. When participants were incidentally saddened, this tendency seems to be reversed.

Together, these studies highlight the political divide in American's perceptions of Hurricane Katrina and its aftermath, the role of racial stereotypes, and the possibility that emotional states can moderate these effects. Such psychological processes played an important role in public discussions that followed Hurricane Katrina about the attribution of responsibility and people's perceptions of behavior that took place during the disaster. Understanding these processes will allow citizens and law makers to have more informed discussions and to craft more deliberate laws and policies about these very important issues.

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### **The "New" New Orleans: Evaluating Preferences For Rebuilding Plans After Hurricane Katrina**

0554987

Okmyung Bin, Craig Landry, Harold Stone, John Whitehead, Ken Wilson and Jamie Brown Kruse

In the wake of near total destruction of infrastructure in some parts of the city of New Orleans after Hurricane Katrina, policy makers are faced with a quandary. New Orleans has considerable economic value, not only as a commercial port, manufacturing hub, and tourist destination, but has a rich and colorful history and thus unique cultural value. However, the present location of New Orleans and the legacy of engineering interventions have created a city so vulnerable that catastrophe was inevitable. It is apparent that any redevelopment of the current location must contend with present and future vulnerabilities. To evaluate possible future planning options for the restoration of New Orleans, it is necessary to consider the contributions of three primary planning disciplines, Environmental Planning, Urban Planning, and Housing Planning. Each of these three components, when bound to the evolved city, is essential in defining the possible options for reconstruction. This project uses survey methods to investigate public attitudes toward different options for the future New Orleans. To assess the social value of different restoration plans for the New Orleans area, data will be gathered from a stratified random sample, composed of (i) residents of the Hurricane Katrina-affected area and (ii) households in other parts of the nation. Conjoint analysis is used to estimate the value attached to different attributes of the city. This study elicits local and national valuation of the historic and cultural attributes that make New Orleans unique. The study also elicits public valuation of mitigation that can harden the city against future hurricanes and tropical storms. This information will help to inform the restoration so that New Orleans' most valuable assets will be preserved in the process.

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### **Disaster, Resilience and the Built Environment on the Gulf Coast**

0555025

John R. Logan

This project studies the resilience of the built environment in coastal communities that are subject to chronic wind and water damage from hurricanes. It is partly a case study of the impacts of the Katrina hurricane on New Orleans and the Mississippi Coast and the national and regional pattern of displacement of residents and their assimilation into other places. It asks whose communities were most affected, which will be rebuilt and how they will be different from before, and which segments of the population will be permanently displaced. This Katrina case study is embedded within a larger project on the relationship

between hurricane damage, natural environment, and the built environment. It assesses the cumulative storm risk on the Gulf Coast during the last fifty years, and asks how the natural environment (forest cover) and the built environment (residential land use) have been affected by these events. Historical data on storms and remote sensing information on forest cover are being analyzed together with fine-grained census data at ten-year intervals for 1950-2000.

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### **Individual Decision Making in the Setting of a Natural Disaster**

0601731

Kavita Patel and Danielle Vogenbeck

#### Background:

Disaster Settings are by definition, unpredictable and chaotic. However, prior research shows that there are some distinct patterns and trends which emerge when trying to understand the behavior individuals express in a disaster setting.

#### Objective:

We proposed a study which would determine the important factors which go into deciding whether or not to evacuate and whether to return to the affected areas.

#### Methods:

In the immediate aftermath of the Katrina, we conducted a longitudinal study of evacuees in major metropolitan areas. We selected the three major geographic areas in the U.S. that individuals were evacuated to (Baton Rouge, Houston, and San Antonio). Within each of these areas, we surveyed a random sample of evacuees regarding their socioeconomic characteristics and factors that impacted on the decisions about when to evacuate.

#### Results:

Preliminary findings show that despite knowledge and awareness around the gravity of the hurricane, people's decision to evacuate was largely influenced by access to transportation and the inability to leave due to a medical condition of a household member. With regard to the decision to return to their original neighborhoods, people largely relied on a series of informal social networks that consisted of faith based organizations and non governmental agencies.

#### Conclusions:

Our initial findings support the notion that in thinking through the necessary response in a disaster, thought should be given to the role of informal social networks and volunteer organizations in the response and recovery process.

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### **Adversity and Resilience: Effects of Hurricane Katrina on Vulnerable Populations**

0555240

Jean Rhodes, Mary Waters and Christina Paxson

The goal of this study is to examine how a group of 200 low-income, minority parents from New Orleans, all of whom registered for community college in 2004, have coped with the effects of Hurricane Katrina. We are studying how the pre-hurricane resources and capacities of individuals-defined to include their mental and physical health, social networks, and economic resources-are affecting their ability to

successfully adjust to a major life trauma. Outcomes include psychological distress, symptoms of depression and post-traumatic stress disorder (PTSD), and substance abuse. We are also examining the determinants of successful social and economic adjustment, including the re-establishment of social networks and resumption of employment and educational activities. Quantitative analyses of the data that are being collected will provide empirical evidence on the effects of the disaster on a vulnerable segment of the population. In-depth qualitative interviews will add richness to the quantitative work, and will provide a record of the experiences of the hurricane for the group we study. The poster will discuss the issues that we have encountered in locating and interviewing the participants as well as preliminary data that have emerged from the study. Our sample of low-income, primarily single, African-American parents (mostly mothers) is an especially relevant group to study and, because there was a great deal of heterogeneity in the resources and capabilities of members of this group prior to the hurricane, we are able to examine how these resources and capabilities relate to participants' experiences of and adjustments after the hurricane.

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### **Planning for Data Collection in the Post-Katrina Environment**

0555148

Kimberley Shoaf

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### **Disaster Vulnerability in Relation to Poverty in the Katrina Event: Reconnaissance Survey and Preliminary Analysis**

0606606

Andrew Smyth, Rebekah Green, Bijan Khazai, Guillermo Franco, George Deodatis, Lynn Seirup and Cathy Taylor

An overview is given of the ongoing research project conducted by an interdisciplinary team composed of engineers, social scientists, and natural hazards scientists from Columbia University and Tulane University with collaboration from local New Orleans community leaders and contractors. The fundamental issue under investigation was the degree to which poverty plays a role in pre-disaster vulnerability as well as post-disaster recovery. Through a particular focus on neighborhood damage survey information collected through field reconnaissance trips, and calibrated with the assistance of local contractors, the team was able to make independent comparative assessment of physical losses depending on neighborhood. This information taken together with social parameters such as income, insurance coverage and race, and physical parameters such as site elevation, age of residence etc., create a vantage-point from which to assess the disaster as a function of several factors. In addition to the physical assessments, a social survey was conducted of the residents of the assessed houses, nearly all of whom have not yet returned to New Orleans. The responses are currently being compiled. Through a comparison with the City-commissioned loss assessments of the City's residences provided to FEMA shortly after the disaster, the Columbia team's assessment indicates that caution should be exercised before using the City's loss estimates at a residence-by-residence scale for decision-making. The large scale loss assessment survey conducted by the City has already been used in the critical rebuilding permitting process, and now is proposed for use for the federally-sponsored Road Home Program which will provide up to \$150,000 per residence depending on a variety of factors including assessed level of damage. In short, in addition to insurance availability, the loss assessments, although not designed for this use, are potentially a major economic driver to the form of the rebuilding of New Orleans.

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### **Government and Voluntary Association Coordination and Evacuees' Experience of Assistance in Colorado**

0555117

Susan Sterett, Jennifer Reich and Martha Wadsworth

This interdisciplinary project examined the response of the Denver metropolitan area to people displaced from the Gulf Coast by Hurricanes Katrina and Rita. Data were collected from service providers and networks, as well as from evacuees themselves. Investigators conducted more than 45 informant interviews with federal, state, and local officials, as well as leaders and service providers in non-profit organizations. In addition, we observed virtually all of the meetings of the local long term recovery committee and of local casework teams (over 140 hours of meetings). We have also conducted in-depth interviews with 104 evacuees from the Gulf Coast.

Regarding service provision, we have found that displacement occurred in a context of generic concern about race and racism, informed by media accounts of problems in New Orleans. As a result, volunteers from Black churches were involved in decision-making about relief in Colorado based on an assumed shared community with evacuees. Second, it is clear that service providers from voluntary and local agencies work within the constraints of federal policy, limiting the type and amount of assistance they can offer evacuees. Providers are constrained by rapidly changing FEMA policy shifting under the threat of class action lawsuits, an emphasis in policy on residual assistance, and the limited availability of low income housing in the Denver-metro area. Third, it has been impossible to replicate some sources of assistance previously provided by informal community networks that are simply not yet evident or available to evacuees in the Denver area.

Adjusting to life in Colorado and to the loss of home and community has been challenging for evacuees. Psychological functioning and perceptions of assistance were assessed via in-depth qualitative interviews and standardized questionnaires assessing stress, coping, and symptoms of psychopathology. One hundred four evacuees (93 adults and 11 teens) were assessed at time 1 (2-6 months post-Hurricane). Thus far, 79 adults and 7 teens have been located for time 2 follow-up (9-12 months post-Hurricane). Evacuees in our sample were a very diverse group of individuals and families, about half of whom self-evacuated and half who were brought to Colorado by government arranged airplanes. Their mean age, excluding the teens, was 43.4, with a range of 20-73. Although predominantly African American (58%), our sample was also 36.5% White and 5.5% Multiracial. Our sample is 56% female.

Evacuees rated community providers overall as being “somewhat helpful” in providing financial assistance and being “a little helpful” in terms of providing emotional and non-financial tangible support. Overall, most evacuees believed that Colorado did a good job welcoming and supporting evacuees in their initial days, weeks, and months in this new state, though there were some striking exceptions. Despite “feeling the love” in Colorado as one evacuee put it, evacuees showed high rates of Post Traumatic Stress Disorder (PTSD) at time 1 (43%), with many others having high levels of PTSD symptoms not reaching diagnostic levels. Evacuees reported high levels of stress and loss, including 84% with significant financial loss, 34% with a family member who died, 20% who were injured in the hurricane, 57% who were separated from immediate family during the storm and evacuation, and 68% who lost contact with immediate family at some point during re-location. Lack of stability in shelter was normative, as many stayed in three or more different locations in the course of evacuation (48%). These experiences were associated with mental health problems. Evacuees qualifying for a diagnosis of PTSD reported lower use of active ( $F = 16.3, p < .0001$ ) and palliative coping ( $F = 36.6, p < .0001$ ), more family deaths ( $F = 4.6, p < .03$ ), more injured loved ones ( $F = 3.4, p < .06$ ), and higher levels of overall stress ( $F = 6.0, p < .01$ ). In addition, evacuees with PTSD reported less family support ( $F = 3.7, p < .05$ ), poorer coping efficacy ( $F = 8.1, p < .006$ ), and more discontented religious coping ( $F = 5.6, p < .02$ ). Collection of data in time 2 is on-going and will allow us to assess the

stability of stress and symptoms, examine predictors of persistent PTSD, and better understand changes in support and resources over the year since the hurricane.

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### **Modeling Human and Social Dynamics**

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#### **DHB: Modeling in Social Dynamics: A Differential Approach**

0527545

D. J. Kaup, Florian G. Jentsch, Linda C. Malone, Thomas L. Clarke, Sivakumar Jaganathan, Alan Jolly, Jessica Larson, Rex Oleson II, Mario Rosa and Kresimir Sivoncik

Recent world events have prompted research into understanding crowd behavior in emergencies such as nightclub fires, stadium accidents, and subway bombings. It has also revealed that little is understood about how to model crowds and collections of individuals. Using available information, Helbing, Molnar, Farkas and Vicsek developed a Social Force Model (HMFV Model) to simulate human behavior in crowded and panicked environments as a “self-driven many-particle systems”. Helbing’s original model consisted of two components: social interaction and physical interaction. This model has been expanded (LKF Model) to include more individual characteristics and more realistic physical parameters. The goal of this research is to expand the Social Force Model to provide more realistic simulations of crowd behavior under both panic and non-panic conditions, by adding individual differences like age, gender, culture and ethnicity. To carry this program out over the three years of the project, there will be several parallel efforts, including developing methods for gleaning information from videos of crowds, determining optimum simulation parameters and validating various models by a continual statistical analysis of simulations and observations of pedestrian motion. The results of this research will have implications beyond emergency situations.

This poster describes the current state of the research effort after the first year of the project as well as future research to be undertaken as part of the project. We have collected real world video footage of crowds in diverse non-emergency situations such as sports, concerts, schools, malls, and church events. Procedures for processing crowd videos to yield a vector field of optical flow had to be developed. The obtained optical flow will be used to provide a measure of physical motion inside a crowd for comparison against simulations of the same. Actual hand-counts will be used as needed for validation. A JAVA based common framework has been implemented which would allow the linking of any crowd model to any environmental situation, with each being independent of the other. This framework includes logging and visualization capabilities and currently implementations include flocking, social potential, and HMFV models. Future activities will include refining the expanded Social Force Model, increasing video processing capabilities, expanding the variety of environmental objects, further quantitative and qualitative comparisons of the models through simulations and by comparisons to data extracted from crowd videos as well as the determination of simulation parameters corresponding to differences in age, gender, culture and ethnicity.

### **Flows of Information and Influence in Social Networks**

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0527249

Eliot R. Smith, Rob Goldstone and Luis Rocha

This project is investigating flows of information and influence in social networks, using multi-agent modeling and studies with human participants. The general goal is to examine outcomes over time when

each individual is both a source and recipient of influence, using up-to-date theoretical models of the details of social influence processes.

In one line of research we are investigating how people's attitudes and opinions (e.g., about consumer products or about political issues) influence each other, when both implicit and explicit attitudes are brought into the picture. Recent evidence suggests that implicit attitudes (relatively spontaneous evaluations, which can be measured by response-time techniques) often differ from the same person's explicit (self-reported) attitudes, particularly in domains that are socially sensitive, such as racial attitudes. Implicit attitudes also have different properties compared to explicit attitudes, such as being shaped by different types of information and being slower to change over time. Our laboratory studies are investigating whether one person's implicit (as well as explicit) attitude can influence another person's attitude, and preliminary results support this idea. We are also examining how people adaptively change the amount of trust or weight they give to others' opinions when they make their own decisions. Two experiments currently underway test the hypothesis that this process can be described using models developed to account for people's adaptive weighting of cues when they make judgments based on nonsocial cues.

In the second line of research we are examining the flow of information about potential dating/mating partners. Existing theory in this area assumes that a person's desirability as a mate can be assessed almost at once (based mostly on immediately visible characteristics), but research on romantic relationships shows that people also care about other, less immediately knowable characteristics of a partner (aspects of personality, for example). That harder-to-acquire information can be transmitted as gossip through social networks, influencing people's choices of dates or mates. We have developed a preliminary multi-agent model of this process, and are preparing to begin an empirical study using data gathered from a social networking website and questionnaire measures, which will allow us to track both the formation of friendship networks and dating patterns in a group of college students over time. Results from this study will feed back to constrain and improve the multi-agent model.

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### **Data Mining Based Adaptive Regression for Equilibrium Static: Traffic Speed-Density Relationships**

0527508

Lu Sun, Jun Yang, Hani Mahmassani and Marc Sebrechts

In this paper we developed a methodological framework to deal with traffic stream modeling based on data mining, steepest-ascend algorithm and genetic algorithm. The new method is adaptive in nature and has a greater flexibility and generality compared with existing methods. It provides an optimum overall fitting of the observed data. Specifically, the advantages of adaptive regression are that (1) knot positions and model parameters are estimated optimally and simultaneously using genetic algorithm, and presetting of knot positions can be performed in terms of either density or speed, (2) the method is automatic and data driven, and will always find out the model of best fitting to site-dependent actual traffic data, and (3) user has a great flexibility to specify the degree model continuity and to define and add new basis functions that are parsimonious and fitting better into the traffic data in some regime of speed-density relation into the basis function set to enlarge the pool of candidate models. The proposed method and developed computer software package MiningFlow will be beneficial to the practice of traffic operations and traffic simulation.

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### **Social, Political, and Economic Dynamics**

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#### **Constructing 'Children and Armed Conflict' in Transnational Civil Society**

0432844

Charli Carpenter

Why do transnational activists mobilize around certain issues or populations of concern but not others? We explored this question by analyzing human rights advocacy discourse around the issue area of "children and armed conflict" (CaAC), particularly the conversational strategies employed to discuss an issue not presently salient within the human rights network: children born as a result of wartime rape and exploitation.

As a result of previously NSF-funded research, the PI has on file 120 pages of transcripts from four focus groups with members of this advocacy community, convened between December 2004 and March 2005. These conversational settings included discussions about the CaAC agenda broadly, the protection needs of children born of rape in conflict zones and the reasons for the relative inattention to this category of child within the child protection community. Supplemental NSF funds enabled a new wave of coding and analysis of this data. In collaboration with professional analysts from University of Pittsburgh's Qualitative Data Analysis Program, the transcripts were coded for passages indicating the presence and absence of factors hypothesized in the literature to explain variation in issue selection within transnational advocacy communities. The results of the analysis provide some support for several of these hypotheses, but also suggest the importance of exploring inter-network relations as a factor in transnational issue emergence.

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### **Harnessing Patent Data for Social Science Research**

0527657

Iain Cockburn

This project is devoted to building a research-oriented database of US patent information. The more than 3 million patents issued by the United States since 1976 are a unique source of data on inventive activity by individuals, corporations and other entities. Each patent can, in principle, be located quite precisely in time, geographic location and technology space, and linked to other patents through citations, co-inventorship, co-location and other metrics, as well as to other economic, social, and physical data. But for researchers to fully exploit this data, some substantial obstacles must be overcome. Names of individuals, organizations and locations are subject to considerable "noise" in the form of data entry errors, permutations of word ordering, varying transliteration from other languages, etc. and to be useful to researchers these must be standardized systematically and accurately. These "names games" are surprisingly challenging problems: for example our best estimate so far is that the 4.2 million distinct inventor names on patents granted between 1976 and 1999 represent no more than 1.6 individuals, but variations on the algorithm used to identify individuals produce estimates ranging from 0.6 million to 2.2 million. Equally, corporations, universities, and other organizations are an important focus of research in many disciplines, but identifying them consistently over time means solving similar "who is who" problems, complicated by frequent mergers, acquisitions, bankruptcies, reorganizations and the like. Finally, locating patents in geographic space requires developing algorithms that can accurately distinguish between e.g. the many cities named Springfield, or the letters CA when used to denote California or Canada.

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### **Dissent and Repression in the Middle East**

0527631

J. Craig Jenkins, Mary Ann Tetreault, Philip Schrodt, Katherine Meyer, Jillian Schwendler and Christian Davenport

Our project examines a paradox in research on the relationship between repression and dissent - the dissent/repression nexus. While dissent is consistently found to give rise to repression, repression has diverse and inconsistent effects on dissent. We argue that this seeming paradox is a product of incomplete definitions of dissent, overaggregation of measures, and failure to examine the perspectives of both dissidents and authorities.

Past research has largely focused on overt forms of dissent and repression; aggregated event and survey measures applied to whole countries and large time units. It has typically neglected social context, cultural perspectives, and variables such as space and time. Drawing on an interdisciplinary team and multiple methods, including event data, surveys, field research and historical sources, we examine dissent and repression in five territories in the Middle East: Egypt, Israel/Palestine, Jordan, Kuwait, and Turkey. The first year of research assembled and coded core data sets and initiated field work bearing on all cases.

Four papers currently under review from this project examine the dissent/repression paradox and the methods we propose for addressing it, outline a method for disaggregating and validating event data, identify and trace hidden forms of repression and dissent, and analyze effects of repression and dissent on women's rights in Kuwait.

In work underway, we examine repression and its effects in all five territories: a democratizing regime (Turkey), a restrictive neo-patrimonial regime confronting an array of dissident challenges (Egypt), two moderate monarchies reacting to dissident movements by experimenting with political and civil reforms (Jordan and Kuwait), and the complex amalgam of democracy, anarchy and military occupation that is Israel/Palestine.

Our research will refine understanding of the dissent/repression nexus by: (1) identifying types and contexts of repression that generate militant and radical dissent as opposed to declining or no dissent; (2) devising more sensitive tests of repression/dissent hypotheses; (3) developing models that incorporate data on time, location, and the perspectives of dissidents and authorities; and (4) increasing our understanding of the social and cultural bases of the political battle over women's status, which itself is a nexus of conflict over political change in the Middle East.

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### **Global Dynamics of Offshore Sourcing of Knowledge Work**

0527180

Kenneth L. Kraemer, Jason Dedrick, Gloria Mark, David Brownstone and Erran Carmel

Problem:

Knowledge work such as R&D and new product development (NPD) is being outsourced and offshored with uncertain consequences. Although it began earlier and continues in manufacturing, outsourcing and offshoring is now also occurring in services. Some occurs through creation of foreign subsidiaries; some through sourcing with foreign firms; and some through a mix of foreign subsidiaries and outsourcing. We lack understanding of the forces and dynamics shaping these trends, and the consequences for firm performance and jobs in the U.S.

Goals:

The goals of this research are to:

- Identify the key factors shaping trends and how they might vary by products vs. services.
- Understand how the dynamics differ by “maturity” and type of product or service.
- Gauge the impact of offshoring and outsourcing on firm performance and jobs.

Research Framework:

Existing research in economics (c.f., Bartlett and Ghoshal, 1989) and social networks (Dyer and Singh, 1998; Castells and Hall, 1994) suggests that the dynamic interaction of economic, relational, and ICT factors influence the sourcing decisions of individuals and firms and, collectively, shape global sourcing patterns. Economic factors loom large in sourcing decisions, but the adoption of ICTs can change the economic costs associated with different knowledge activities (Gurbaxani and Whang, 1991). Interactive ICTs such as collaboration tools may reduce the importance of geographic proximity in supporting social networks (Globerman et al., 2001). Relative costs and the need for closer social interaction may drive development of new software or other technologies to support new ways of organizing knowledge activities (Carmel, 1999).

We seek to discover how firms make choices about sourcing options, and the consequences for firm performance and knowledge jobs in the U.S.

Methodology:

We examine the relative importance of these factors through field work and interviews with sourcing executives in 20 firms, and a phone survey of NPD executives in 400 firms. We split the sample to include high-tech/non-high-tech firms in manufacturing and services to control for firm differences. We use grounded theory (Strauss and Corbin, 1998) and discrete choice models (Train, 2003) to describe, analyze and interpret the data.

Progress:

We have completed a field study of high-tech manufacturing in the personal computing industry. The study of software and IT services fieldwork is in process. Collectively, the fieldwork is being done in the U.S., Japan, Taiwan, China and India. Over 100 interviews in 20 firms have been completed and currently being analyzed. Findings here are from the PC industry study.

Findings from the PC Industry Study:

### *Nature of knowledge activities*

R&D and new product development (NPD) are the key knowledge activities in the PC industry. R&D is done by upstream suppliers such as Intel and Microsoft, whereas the branded PC firms such as Dell and HP do NPD. New product development is an interrelated, three-phase process of design, development and production. The phased and systematic nature of NPD makes it possible to outsource certain activities to other firms, but the importance of tacit knowledge also requires proximity, which has implications for location.

### *Organization of NPD*

NPD activities were originally done in-house by the PC vendors, but have been offshored and outsourced mainly for lower costs. In a few cases, outsourcing offshore has occurred for access to unique capabilities, such as small form factor design in Japan and Taiwan. As this suggests, the pattern of global sourcing differs for notebooks and desktops. The small form factor and greater complexity of notebooks requires

joint development with original design manufacturers (ODMs), whereas the relative simplicity of desktops enables vendor development and handoff to contract manufacturers (CMs). See figure.

### Factors Influencing Offshoring and Outsourcing:

- PC vendors develop subsidiaries offshore or use outsourcing to manufacturers who are offshore.
- Economic factors are the primary force in these decisions.

### Dynamics of Offshoring:

- In NPD, outsourcing/offshoring of production was first, followed by development, then design.
- Once activities are outsourced, relational factors will “pull” other related activities.
  - Detailed product development must be located close to production for manufacturability and for effective resource utilization (avoid duplicate facilities).
  - Some design must be close to development to handle tacit knowledge, solve problems quickly, and keep NPD on time.
- Lower cost capabilities available in offshore location are utilized for additional purposes as experience shows the opportunity. Teams of local software engineers created in offshore “design centers” originally to support NPD take on support of other corporate activities such as software development and IT services.
- These forces are resulting in a new global division of labor in the U.S. and the global PC industry.
  - Whereas NPD was entirely in the U.S. in 1990, by 2000 only design remained. Development and manufacturing had moved to Taiwan.
  - By 2005, manufacturing and some development moved from Taiwan to China.
  - Taiwan is now pulling physical design from the U.S., whereas China is pulling design for manufacturability, and testing, from Taiwan.

### Impacts and Implications:

- U.S. branded PC vendors dominate the industry, but margins are low.
- U.S. knowledge jobs are not growing in spite of rapid industry growth, as NPD activities are offshored or outsourced.
- Knowledge work that remains in the U.S. focuses on design, with physical product and process engineering largely done by ODMs in Taiwan and China.
- Knowledge work that remains requires skills in the intersection of engineering and computer science, and in new specialties, especially small form factor design, communications and networking, software engineering and the interfaces between these.
- Software engineering in particular is playing a larger role in NPD for new products such as smart phones and handheld devices which add functionality through tightly integrated hardware and software.
- Embedded software enables large scale, low cost production of standard physical products that can be provided with different features, tailored to particular markets and continually updated to extend product life, or encourage migration to a newer platform.

### Current research questions on software development:

- How does the development process differ when there is no physical product?
- Does development “pull” design to its location and what relational factors account for it?
- How does development differ for new software products vs. software maintenance?

For more information see: <http://pcic.merage.uci.edu/pubs.asp>

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**The Austronesian Expansion: Social, Linguistic and Genetic Networks**

0432262

J. Stephen Lansing, Michael Hammer, Tatiana Karafet, Joseph Watkins, Sean Downey, Brian Hallmark, John Schoenfelder, Peter Norquest, Murray Cox and Herawati Sudoyo

We are interested in social networks both in terms of their intrinsic structure and dynamics, and as the substrate on which other processes occur. Theoretical explanations for behaviors such as the cooperative management of common-pool resources or the diffusion of innovations or diseases must define a social structure on which interactions take place. In some models, such as evolutionary game theory, social structures evolve over time, but in most cases the structure is understood to be static or at equilibrium.

Typologies of social networks have long fascinated social anthropologists. In 1949, Claude Lévi-Strauss worked with mathematician André Weil to analyze the Elementary Structures of Kinship. More recently, the new field of molecular anthropology has begun to offer fresh perspectives on human prehistory; one of its main foci is to dissect the historical processes that shape broad-scale human genetic patterns. This adds a realistic temporal dimension to our understanding of the social worlds that humans construct for themselves. But this added realism comes at a cost, as we move from simple equilibrium systems to non-equilibrium conditions. We have already outrun the mathematics of classical population genetics, which was developed to analyze equilibrium states. New models designed to make use of the torrent of new molecular data focus on out-of-equilibrium processes, bringing us closer to the finer scales at which most important social and demographic processes actually occur.

In 2003 we began a collaborative study with the Indonesian National language center and the Eijkman Institute for Molecular Biology in Jakarta. We collected data on 415 languages and genetic samples from ~80 communities across the archipelago. Our initial foci were the genetic background for diseases such as malaria and hepatitis, and contact-induced language speciation in eastern Indonesia.

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**The Outcomes of Civil Wars in Bosnia and the North Caucasus of Russia**

0433027

John O'Loughlin, Michael D. Ward, Gerard Toal, Jeremy Mennis and Frank Witmer

The poster reports some of the main findings to date of the project which compares the attitudes and beliefs of populations in two war-zones, Bosnia and the North Caucasus of Russia, as well as documents the changes in population distributions, agricultural land-use and environmental changes over the past decade. Results from two large representative surveys conducted in December 2005 show, inter alia, that a) violence doesn't play the predicted role in expectations of cooperation; b) Typical attitudinal measures are not statistically powerful in explaining expectations of inter-ethnic cooperation; c) respondents from Bosnia are considerably more skeptical about ethnic cooperation than similar respondents in the North Caucasus areas of Russia; d) Bosnian residents are dramatically more in favor of ethnic separation into homogenous ethnic territories; e) ascriptive characteristics are powerful explanations of attitudes and beliefs, especially Age, Gender, and Nationality, and f) there are significant differences between the nationalities in each study area that are not easily explained.

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**Transnational NGOs as Agents of Change: Toward Understanding Their Governance, Leadership, and Effectiveness**

0527679

Derrick Cogburn, Margaret Hermann and Hans Peter Schmitz

Transnational non-governmental organizations (NGOs) play an increasingly visible role in managing refugee flows, fighting world poverty, promoting human rights, and defending the environment. While the number of NGOs and their funding has skyrocketed in past decades, this ‘success story’ for some NGOs is accompanied by the failings of many others as well as questions about their effectiveness and legitimacy. This project investigates 180 transnational NGOs across issue areas with regard to their organizational attributes, communication and networking strategies, leadership, and accountability mechanisms. The NGOs are selected according to their size and effectiveness (measured in the amount of overhead costs and fundraising abilities). Using data collection and interviews, the study will provide the first systematic understanding of the factors that shape the success (and failures) of transnational non-governmental activism.

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### **Society, Organizations, and Culture**

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#### **The Strength of Social Influence as a Determinant of Organizational Change**

0433280

Stephen J. Mezias and Ebony Bridwell-Mitchell

##### Summary

The premise of this investigation is that organizational change is an emergent process that depends on social understandings and the complex interactions of actors within and across organizational boundaries. We conduct a three study investigation of intra-, inter- and extra- organizational dynamics that promote or constrain organizational change. Study I examines organizational members’ adoption practices, given their social networks and opinions of change. Study II examines how organizational leaders use external social relations to solve problems. Study III examines affiliation networks of regulatory requirements and their effects on organizational change

##### Industry Context

The empirical context is a sample of lower-grade public schools in a large urban district in the northeastern United States. Three overlapping regulatory reforms imposed by the local, state and federal governments compel isomorphic change (DiMaggio and Powell 1983). As typically small, decentralized organizations with a professional staff relying on pooled-interdependencies (Thompson 1967) and organic process to produce outcomes, schools provide an instrumental setting (Eisenhardt 1989) for examining the effects of social understandings and interactions.

##### Contributions

Our approach facilitates a much-needed dialogue across scholars and practitioners in diverse fields and in multiple domains, providing insight to those interested in organizational change, complex systems, social networks, sociocognitive processes, professional communities and education/schools.

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#### **Learning Attention-Sharing: Experimental, Observational, and Computational Studies of Infant Social Skills**

0527756

Gedeon O. Deák, Jochen Triesch, Natalie Wong, Anna Krasno and Kang Lee

There is currently much interest in infants' acquisition of complex social skills. However, detailed theories of how infants acquire these skills are lacking, especially theories that are neurologically plausible and consistent with infant perceptual development and social input. The MESA project (Modeling the Emergence of Shared Attention) at UCSD is rigorously testing such a theory. The SECLAP theory suggests that infants learn important gaze-following and point-following skills through basic perceptual and attention skills, learning processes (e.g., habituation), and affective preferences within the context of a structured social environment. We are testing and refining the theory through naturalistic observational studies, computational simulations, a new longitudinal study of infants using observational and experimental methods, and new simulations in a robotic agent that learns by interacting with human trainers. The results so far suggest that general perceptual, learning, and affective traits can, in a structured environment, lead to complex social skills. Special-purpose modules are not necessary to explain infants' attention-sharing abilities.

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### **Exploring the Dynamics of Dyadic Interactions via Hierarchical Segmentation and Small-World Networks**

0527766

Emilio Ferrer

We introduce Hierarchical Segmentation (HS), a nonparametric exploratory technique based on computation modeling, to explore the dynamics of affective processes in non-marital couples. We first rescale the observed time series affect data into a digital string with codes that represent the value of the original data. This digital string is then used to construct a hierarchy of sequence coding representing different segments – and different affective expressions – in the series. We explore the synchrony between the emotional structures of both people in the dyad by embedding one person's sequence code onto the other person's code. We then examine the daily transitions in affective states among the couples and use Small-World Networks to visualize the different patterns in which such transitions are manifested.

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### **Social Isolation in America: Results from the First Phase of the Networks and Niches Project**

0527671

Lynn Smith-Lovin, Miller McPherson, Alex Rosenberg and Stephen Teitsworth

This project gathers data to answer a key question from a general theory of association: How do the network connections between individuals and the affiliations of individuals to voluntary groups co-evolve in a community structure? What types of significant social relationships are formed as a result of initial contact in social groups? What types of memberships in such groups and associations occur by virtue of prior network connection with a significant other? To what extent do voluntary groups and their internal structures serve to integrate or segregate community systems and their social networks? The first phase of the project collected data on networks and voluntary groups from a sample of 1500 respondents in the 2004 General Social Survey, replicating questions that had been last asked in 1985. We found that discussion networks are smaller in 2004 than in 1985. The number of people saying there is no one with whom they discuss important matters nearly tripled. The mean network size decreases by about a third (one confidant), from 2.94 in 1985 to 2.08 in 2004. The modal respondent now reports having no confidant; the modal respondent in 1985 had three confidants. Both kin and non-kin confidants were lost in the past two decades,

but the greater decrease of non-kin ties leads to more confidant networks centered on spouses and parents, with fewer contacts through voluntary associations and neighborhoods. Most people have densely interconnected confidants similar to them. Some changes reflect the changing demographics of the U.S. population. Educational heterogeneity of social ties has decreased, racial heterogeneity has increased. The data may overestimate the number of social isolates, but these shrinking networks reflect an important social change in America

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### **Emotion Regulation as a Complex System**

0527475

Twila Tardif, Rosa Angulo-Barroso, Barbara Felt, Niko Kaciroti, Sheryl Olson, Dawn Tilbury and Li Wang

The goal of this project is to describe and examine the processes involved in emotion regulation as observed in preschool-aged boys and girls in China and the United States. Learning how to regulate emotional states is fundamental to successful functioning in any society. Children who do not learn to regulate their emotional states and behaviors during the preschool period are at high risk of psychopathology and numerous problems later in life.

Emotion regulation involves coordination across behavioral, psychological, and physiological subsystems that develop over time. Research into the development of each of these subsystems has made significant progress in the past decade, but regulation of this system as a whole is not well understood. In this project, both complex systems and statistical modeling techniques will be used to examine how children engage in regulatory processes across 3 key domains: physiological (salivary cortisol and heart rate systems); behavioral (motor activity and facial/body expressions of emotion); and moderating factors (gender, temperament, inhibition and executive functioning abilities; parent emotionality and emotion socialization practices; and culture); and under 2 conditions: at baseline (over a period of 3 days) and in response to a stressful experience. A secondary aim is to examine group differences in temperament, executive functioning, and behavioral and physiological reactivity for our Chinese and U.S. parent and child samples to more fully understand the influence of culture as a “regulatory” variable.

Our data collection phase began in July 2006 and we have already collected data from roughly one-third of our sample (n=20) at each site. Data collection for this project involves sending an extensive packet of questionnaires home to both mothers and fathers of 4-year-old children enrolled at local preschools, a “meet the parents” visit at which we instruct the parents and children in how to obtain home salivary cortisol samples, and 3 successive days (for 2 hours each day) of behavioral testing at the children’s preschools. Our measures include “calming” activities designed to bring children’s cortisol levels down to baseline before an emotion regulation “challenge” task (frustration or disappointment), and a number of control measures examining children’s overall emotional and cognitive functioning as well as their abilities to regulate and control their behavior in a number of “executive functioning” tasks. During all 3 days of our 2-hour testing protocols, we are regularly sampling children’s salivary cortisol and continuously sampling their motor activity levels. We have also begun behavioral testing only at a parallel study site in Japan. Data from all three sites are being entered and preliminary results from some of our parenting questionnaires, as well as child behavioral measures will be presented. Our results at this point will focus primarily on cross-cultural similarities and differences at the behavioral level of emotion regulation. Over the next year, we will continue to collect data and begin to analyze the processes of behavioral and physiological emotion regulation within our regulation challenge tasks as well as by examining motor activity and cortisol levels throughout the three days of our testing protocol.

This project is generating new data on cultural differences and similarities in both physiological and behavioral components of emotion regulation, as well as a new integrative approach for modeling these data. The dynamic and complex systems models that are developed as part of this project will allow for a deeper understanding of the feedback mechanisms and interrelationships inherent across the multiple domains and time scales of emotional reaction and regulation. This, together with our richly sampled data has the potential to initiate a paradigm shift in research on emotion regulation.

Broader impacts of this project include deeper understanding of emotion regulation processes that can be used to inform treatment of emotion regulation problems at an early age. In addition, the interdisciplinary interactions in the project (between psychology, pediatrics, kinesiology, biostatistics and engineering) has allowed us to learn from each other and to work towards generating new knowledge at the intersections and gaps between the disciplines and across cultures.

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### **Technology and Human and Social Dynamics**

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#### **Investigating the Dynamics of Free/Libre Open Source Software Development Teams**

0527457

Kevin Crowston, Robert Heckman and Elizabeth Liddy; James Howison, Kangning Wei, U. Yeliz Eseryel, Qing Li and Keisuke Inoue; Eileen Allen, Sarah Harwell and Steve Rowe

The goal of this project is to study how distributed teams develop shared mental models to guide members' behavior, roles to mediate access to resources, and norms and rules to shape action, as well as the dynamics by which independent, geographically-dispersed individuals are socialized into these teams. Our project is set in the context of distributed self-organizing technology-supported team of software developers contributing to Free/libre Open Source projects. Project funding started in December 2005, so here we report on the first 9 months of the project.

We have undertaken the following activities:

1. a literature review of empirical studies of Open Source Software development
2. dynamic Social Network analysis of bug fixing and interaction data
3. development and pilot testing of a coding scheme for decision making processes in FLOSS software teams and initial development of a coding scheme for group maintenance behaviours
4. addressed issues in preparing ill-structured email discussion archives for automated processing
5. developed a two-order theory of leadership in FLOSS teams as a basis for future work
6. designed a study of shared mental models in FLOSS teams to be carried out this coming academic year
7. developed a system for integrating on a single time line multiple events from a FLOSS project

From this work we have found:

1. dynamic SNA data confirms our earlier findings that FLOSS projects display highly distributed centralizations
2. pilot analysis of decision-making practices in two projects has revealed differences that seem to be related to differences in overall team effectiveness
3. preliminary analysis of the way power is expressed and exercised through language use in FLOSS project teams, we speculate that strong, centralized leadership, the assertive exercise of power, and direct language may contribute to effectiveness in FLOSS teams

### **Children and Technology Project**

0527064

Linda A. Jackson, Yong Zhao, Alexander von Eye, Hiram Fitzgerald, Rena Harold and Anthony Kolenic

The Children and Technology Project examines how children's use of Information Technology (IT) influences their cognitive, social, psychological and moral development. Based on an ecological systems theory perspective (Bronfenbrenner and Morris, 1998), IT use is conceptualized as a reciprocal proximal process that occurs over time and is embedded in a social and cultural context. Thus, to understand the impact of IT use requires a consideration of Person (Child) and Contextual factors as they interact with IT use over Time. A longitudinal design is guiding six waves of data collection from middle-school children, their parents and teachers to assess Person and Contextual factors, IT use (nature and frequency), and a variety of cognitive, social, psychological and moral developmental outcomes. Ethnographic data will complement quantitative and qualitative findings. Of particular interest is whether the developmental impact of IT use is different for children living in disadvantaged environments than for children living in advantaged environments.

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### **Concepts and Percepts Underlying Human-Robot Interaction**

0433653

Daniel T. Levin, Kazuhiko Kawamura, Megan M. Saylor and D. Mitchell Wilkes

As computers become increasingly powerful, they will become progressively more and more integrated into the real world. This phenomenon is especially salient for the kind of humanoid robots that are currently being developed to fill real-world functions ranging from household chores to elder-care. Among the challenges these devices pose, perhaps the most difficult is the need for a two-way understanding between the robots and their human users. Not only do humans need to understand robot capabilities and representational states, but robots require the same understanding of humans. This is particularly true if robots are to have productive and flexible interactions with humans, a process that requires a careful alignment of understanding that is dynamic enough to coordinate a complex flow of changing circumstances, beliefs, desires, and intentions. The research proposed here represents an attempt to understand A) how people will construe the representational states of robots, particularly with respect to vision and B) the cognitive and perceptual basis for and effects of this construal.

An important issue underlying this research is that people have a specific set of expectations about how other people think about, and represent things in the world. These expectations are sometimes referred to as an "Intentional Theory of Mind", and they are applied to a wide range of tasks as people attempt to infer others' beliefs and desires based on the behaviors they produce. Previous research by the PI suggests that this intentional theory is sometimes the most readily available means people have of thinking about representations, so it is sometimes misapplied to representation-making systems (such as computers) for which it is not appropriate, and can even lead to mispredictions about human representations. On the other hand, it may be that people have some understanding of the difference between different kinds of representational systems, and that problems occur only when they fail to apply these understandings. Generally, we have been quite surprised to discover how little is known about people's expectations about the inner workings not only of robots, but of computers more generally, despite the large amount of research exploring human-computer interactions.

Progress and preliminary outcomes:

The activities funded by the grant have been organized into several specific projects. In the first, we have been exploring people's beliefs about the representations inherent to different kinds of living and mechanical systems. We have therefore been asking children and adults questions derived from basic research on concepts that are designed to assess the degree to which the mental functions of computers and humans are presumed to differ. For example, in several experiments we have observed that subjects are willing to generalize novel mental properties from people to computers, but only if they are nonintentional. In addition, we have observed that people make different concrete predictions about the behavior of intentional and nonintentional systems. For example, we have found that subjects predict that intentional behavior is fundamentally object-directed whereas nonintentional behavior is more location-directed. In these experiments, subjects seem comparatively resistant to predicting intentional behavior on the part of robots in the absence of strongly anthropomorphic descriptions of the systems. Interestingly, preliminary findings suggest that this unwillingness to extend intentional reasoning to robots may be less strong in older adults.

To begin understanding the basis for these attributions we have been asking children about the mental, physical and biological properties of humans, computers, and robots. At age three, children successfully differentiate these three systems, and by age 4 they seem to apply subtly different notions of thinking and seeing to the systems. Also interesting is the finding that young children seem comfortable attributing both cognitive and mechanical (but not biological) properties to robots, implying that foundational concepts about living and nonliving things are sufficiently flexible to include anthropomorphic objects such as robots. In addition, we have tested the effects of viewing a brief video in which a robot engages in apparently intelligent behaviors. We found that this experience affected 4 year-olds' judgments, but not 3 year-olds' judgments. In particular, the older children apparently treat the robot more like a camera when they have seen the video. We are presently attempting to determine the cause of this finding.

In a second project we have been exploring the degree to which concepts such as the ones described above affect people's interpretations of actions, their expectations about how different kinds of systems interpret actions, and how people perform actions. In one series of experiments, we have been asking subjects to demonstrate simple procedures (for example tying a shoe, or completing the Towers of Hanoi problem) for either a human or computer audience. We have found that subjects engage in systematically different movements and looking behavior for the two audiences. For example, subjects looked more at a picture illustrating a human audience than at a computer audience as they demonstrate the actions. On the other hand, subjects provided more visual emphasis for the segments of subactions when demonstrating for a computer audience. In addition, we asked subjects to mark action segment start- and end-points as they would be perceived by a computer or a person. Subjects consistently broke actions into smaller and more numerous segments for computers. Most interesting, this effect was strongest in subjects who responded that computers are poor at understanding human goals and intentions (as indicated in a post-experiment survey). Combined, these experiments show that people have specific expectations about how intentional and nonintentional systems perceive action, and our next experiments will begin to explore how the kinds of anthropomorphism inherent to robots affects these expectations. Finally, we are piloting experiments testing the effects of being observed while completing simple actions. These experiments will explore how being watched by a person, by a computer, or by a robot will affect hand movements as subjects touch covers that they have hidden an object under. This experiment will make use of a remote-control robot head adapted for this project. We hope to test the effects of different realistic (and nonrealistic) robotic eye movements on observed actions.

In a third project, we have been exploring how people move when they demonstrate these actions. Initial work has focused on tracking hand and head movements while people demonstrate actions using both video

analyses, and magnetic tracking of hand movements through 3-D space. We have successfully developed a color- and texture-based video tracking system that processes action demonstration videos to locate the actor's hands, their head direction, and the objects they are handling. We have been using these analyses as predictors for action breakpoints, and as a means of objectively distinguishing action demonstrations for different audiences, and purposes. In the most basic of these analyses, we have extracted basic kinematic information from the demonstration videos, and found that this information predicts a small, but highly reliable proportion of variance in breakpoint placements. We are currently analyzing a new set of videos, based on an expanded set of actions, to test the degree to which these predictions can be enhanced not only by kinematic analysis but also by ratings of object-to-hand contact, looking, and other "core" event features.

**Broader Impact.** This research will not only enrich the existing collaborations between the cognitive science and engineering communities at Vanderbilt, but it will also have a broader educational impact. Testing these ideas in the context of a humanoid robot will also provide a compelling context for both graduate and undergraduate students to consider basic questions of representation and mind, and Vanderbilt undergraduates have been playing an important role in this research. In addition, the project will be featured in a video created by the Learning Sciences Institute here at Vanderbilt. This video covers a range of projects in the learning sciences, and based on the filming we have already done for our short segment, we plan to create a longer video on this project, intended for a broader nonacademic audience.

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### **Technology to Support the Elderly: A Social Science Methodology**

0527648

Edward Riseman, Allen Hanson, Phebe Sessions, Julie Abramson, Rodeerick Grupen, David Burton, Mary Olson, Candace Sidner, Adam Williams, Sichao Ou, Dan Xie, Lynn Mazur, Jessica Krause, Joseph Gallo, Caitlin Bailey, Jennifer Crouser and Allison Pietras

The growing numbers of elderly individuals in need of supports to live in the community will severely test the current social services infrastructure. Part of the answer is to develop technological innovations that allow a sensitive and intelligent augmentation to empower an elder population to successfully “age in place.” However, it is essential to understand the needs of the target community before encouraging large investments in research leading to exotic, new technologies. We believe that this issue can best be addressed by integrating the knowledge and perspectives of social science, computer science, and in partnership with potential elderly recipients of the technology. The data being collected from focus groups of the elderly populace, their caregivers, and families are being analyzed using an ecosystemic perspective to study the effective utility of computer-based technology for enhancing capacity in the elderly to “age in place” and generally live independently. Based on these findings, appropriately designed technological applications will be developed, deployed, and subsequently analyzed for the ‘degree of fit’ to the focus group findings.

Our primary goal is to create a practical, unobtrusive, cost effective system that specifically addresses the special needs of the elderly. Initially, a novel suite of these applications include an easy to use videophone, a fall detector that automatically places a call, an object finder (e.g. keys, coffee cup), and a calendar/appointment system that also functions as the central database for the integrated applications. This project brings together social scientists and geriatric social work practitioners from Smith College and computer scientists who have expertise in computer vision, robotics, and human-computer interaction from the University of Massachusetts and Mitsubishi Electrical Research Laboratory (MERL).