Monday, October 1, 2007

9:00 AM - 12:00 PM	**Informal Group Meetings** - Meeting rooms will be available for small groups by reservation only. Times will be reserved in 15 minute blocks of time.
9:00 AM - 2:30 PM	**Poster Set-up**
9:00 AM - 6:30 PM	**Attendee Registration** Fitzgerald Foyer
12:00 PM - 1:30 PM	**Lunch – Attendees will have lunch on their own**
1:30 PM - 2:30 PM	**Networking Session** Fitzgerald C Light refreshments will be available during this time.
2:30 PM - 3:00 PM	**Opening Session** Fitzgerald C **Welcome** *David Lightfoot, Assistant Director, Directorate for Social, Behavioral and Economic Sciences* **Meeting Overview** *Rita Teutonico, Advisor for Integrative Activities, Directorate for Social, Behavioral and Economic Sciences* **Logistics Overview** Guardians of Honor, LLC (GOH)
3:00 PM - 4:00 PM	**Plenary Session** Fitzgerald C **International Censuses and Intergenerational Families** *Steven Ruggles, University of Minnesota*
4:00 PM - 5:30 PM	**Poster Session 1** Fitzgerald and Hemingway Foyers (Second Floor) Light refreshments will be available during this time.
5:30 PM - 7:00 PM	**Dinner** Fitzgerald C

Tuesday, October 2, 2007

7:30 AM - 8:30 AM   **Morning Refreshments**
Fitzgerald C Foyer

7:30 AM - 2:30 PM   **Poster Setup**
Fitzgerald and Hemingway Foyers (Second Floor)

7:30 AM - 4:00 PM   **Attendee Registration**
Fitzgerald Foyer

8:30 AM – 9:30 AM   **General Session**
Fitzgerald C

Goals for General Session and Breakout Sessions
Rita Teutonico, Advisor for Integrative Activities, Directorate for Social, Behavioral and Economic Sciences

HSD Research Presentations: Current status and future projections

- **The Grammars of Human Behavior**
  Yiannis Aloimonis, University of Maryland College Park

- **Coordinated Motion and Facial Expression in Dyadic Conversation**
  Steven Boker, University of Virginia

- **How Asset Markets Assist Complex Problem Solving: Identifying the Cues through Neuro-Correlates**
  Tony Bruguier, California Institute of Technology

- **Integrated Physical and Social Simulations for Hurricane and Tsunami Hazards**
  Harry Yeh, Oregon State University

9:30 AM - 10:30 AM   **Plenary Session 2**
Fitzgerald C

Introduction
David Lightfoot, Assistant Director, Directorate for Social, Behavioral and Economic Sciences

The Honorable Brian Baird, *Chairman*
House Science and Technology Subcommittee on Research and Science Education

10:30 AM - 11:00 AM   **Break**

Tuesday, October 2, 2007 (continued)

11:00 AM - 11:30 AM	**HSD Research Presentations (cont'd)** Fitzgerald C

- o **Anthropological Models of Social Structure, Genes, and Language**
  Joseph Watkins, University of Arizona

- o **Financial Markets as an Empirical Laboratory to Study an Evolving Ecology of Human Decision Making**
  Doyne Farmer, Santa Fe Institute

11:30 AM - 12:30 PM   **Breakout Sessions: Emergent themes and new directions**

Session 1 - Cognition, Language, and Modeling
Tanya Korelsky, NSF Program Director
Terry Langendoen, NSF Program Director

Session 2 - Decision Making, Risk Perception, and Coordination
Bob O'Connor, NSF Program Director

Session 3 - Disasters and Decision Making
Dennis Wenger, NSF Program Director

Session 4 - Environmental Dynamics
Tom Baerwald, NSF Program Director

Session 5 - Societal, Organizational, and Cultural Dynamics
Amber Story, NSF Program Director
Bill Bainbridge, NSF Program Director

Session 6 - Social, Political, and Economic Dynamics
Pat White, NSF Program Director
Deb Winslow, NSF Program Director

12:30 PM – 2:00 PM   **Working Lunch**
Fitzgerald C

Emergent themes and future directions - Reports from Breakout Sessions

2:00 PM - 3:30 PM   **Poster Session 2**
Fitzgerald and Hemingway Foyers (Second Floor)

Light refreshments will be available during this time.

3:30 PM – 4:00 PM   **Closing Session**
Fitzgerald C

NSF Opportunities: Q&A Session
Rita Teutonico, Advisor for Integrative Activities, Directorate for Social, Behavioral and Economic Sciences

Project Title: HSD: Research on Human and Environmental Systems Interactions

                    Proposal #: 0527318
                    HSD Emphasis Area: Agents of Change

Lead PI: Arun Agrawal, University of Michigan, Ann Arbor
Co-PIs: Daniel Brown, Rick Riolo,
Collaborators: Elinor Ostrom, Krister Andersson

Research Goals:

1) Understand how social-ecological and political-economic conditions shape individual belief formation and decision-making related to collective action
2) Understand how importantly and in what ways do network and social-spatial relationships affect individual beliefs and decisions, and
3) Understand the aggregate effects of individual interactions and responses on a) the resources (forests) on which individuals depend and b) on the local socio-political and institutional structures.

Thematic Areas:

1) Common property resource management
2) Belief formation and the role of institutions

Methodologies:

1) Field research
2) Statistical analysis
3) Agent based modeling

Recent Research Findings:

1) One main findings of our project is that better forest conditions are strongly positively associated with better local rule enforcement; lower commercial value of forests; and low levels of user reliance on forests for firewood.
2) A second significant finding is that variations in institutional and biophysical variables explain a greater proportion of variations in forest conditions in comparison to variations in socio-economic and demographic factors.
3) A third finding is that the degree of formality of institutions vs their informality is less important in shaping forest condition than whether effective enforcement is present around institutional rules.

Challenges and Opportunities:

1) Coordination across international boundaries
2)   Data availability problems for the analytical goals we set ourselves.

Project Title: The Grammars of Human Behavior

                  Proposal #: NSF-HSD 0433136
                  HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Yiannis Aloimonos, University of Maryland
Co-PIs: Ken Nakayama, Harvard University

Research Goals: To understand the structure of human activity

Thematic Areas: Computer Science, Cognitive Science, Psychology, Kinesiology

Methodologies and research findings:
In this project we investigated a linguistic approach to model human activity. Our goal has been to discover a language from empirical data, to find out a new language that models human activity. To learn a new language, we need to understand its phonology, morphology, syntax and semantics. The **Human Activity Language (HAL)** that we developed in this project, consists of **kinetology, morphology, and syntax**. Kinetology, the phonology of human movement, finds basic primitives for human motion (segmentation) and associates them with symbols (symbolization). The input is measurements of human movement in 3D (signals), as for example produced by motion capture systems (a temporal evolution of joint angles). This way, kinetology provides a non-arbitrary grounded symbolic representation for human movement that allows synthesis, analysis, and symbolic manipulation. The morphology of a human action is related to the inference of essential parts of the movement (**morpho-kinetology**) and its structure (**morpho-syntax**). In order to learn the morphemes and their structure, we present a grammatical inference methodology and introduce a parallel learning algorithm to induce a grammar system representing a single action. In practice, morphology is concerned with the construction of a vocabulary of actions or a **praxicon.** The syntax of human activities involves the construction of sentences using action morphemes. A sentence may range from a single action morpheme (nuclear syntax) to a sequence of sets of morphemes. A single morpheme is decomposed into analogs of lexical categories: nouns, adjectives, verbs, and adverbs. The sets of morphemes represent simultaneous actions (parallel syntax) and a sequence of movements is related to the concatenation of activities (sequential syntax). Nuclear syntax, especially adverbs, is related to the motion interpolation problem (or the style problem), parallel syntax addresses the slicing problem, and sequential syntax is proposed as an alternative method to the transitioning problem. The framework has consequences to surveillance, automatic video annotation, humanoid robotics and Cognitive Science. The availability of a grammatical structure representing different actions suggests a new implementation of a sensori-motor theory of meaning. At the same time it suggests specific solutions to many problems in human computer interaction and in general in human-centered computing.

Challenges and Opportunities: There is a trade-off between the complexity of the "phonemes" and the complexity of the grammars. The simpler the phonemes, the more complicated the grammars and vice versa. It is a challenge to understand this trade off. At the same time, it has become clear that understanding an action can happen at various levels of detail. For example, one may need to **recognize** an action, which means to remember what he has seen before. Beyond this, one may need to **imitate** an action, or one may need, given an action, to **predict** what will happen next. Last, one may need to utilize action for **grounding spoken language**. Recognition, imitation, prediction and grounding do not necessarily require the same representations. It is a challenge to build different grammatical frameworks for handling the above mentioned four cognitive abilities.

The PI has recently obtained funding from the European Union for research on these questions, particularly on the project POETICON, addressed by a consortium of Universities including the University of Maryland, the Max-Planck Institute for Biological Cybernetics in Germany, the Universities of Genoa and Ferrara in Italy, the University of Slovenia and the Institute for Speech and Language in Athens Greece. The abstract of the POETICON project follows:

POETICON:
Reproducing an act with sensorimotor means and using fine natural language for communicating the intentionality behind the act is what Aristotle called "Poetics". **POETICON** explores the "poetics of everyday life", i.e. **the synthesis of sensorimotor representations and natural language in everyday human interaction**. This is related to an old problem in Artificial Intelligence on *how meaning emerges*, which is approached here in a new way. POETICON follows an empirical approach for discovering the **"languages"** of sensorimotor representations and the correspondences with natural language; guided by experiments in psychology and neuroscience, it employs cutting-edge equipment and established cognitive protocols for collecting face and body movement measurements, visual object information and associated linguistic descriptions from interacting human subjects, with a two-fold objective:
a) The creation of the **PRAXICON**, an extensible computational resource which associates symbolic representations (words/concepts) with corresponding sensorimotor representations and that is enriched with information on patterns among these representations for forming conceptual structures.
b) The exploration of the association of symbolic and sensorimotor representations through cognitive and neurophysiological experiments and experimentation with a humanoid robot as driving forces and implementation tools for the development of the PRAXICON, respectively.

POETICON views a cognitive system as a set of different languages (the spoken, the motor, the vision language and so on) and provides a set of tools for parsing, generating and translating among them. Through inter-disciplinary research, it contributes to the exploration of *what* integration in human cognition is and *how* it can be reproduced by intelligent agents. This is an ambitious first step for revealing and conquering the "poetics of everyday life".

Project Title: Integrated Analysis of Robustness in Dynamic Social Ecological Systems

> **Proposal #:** BCS-0527744
> **HSD Emphasis Area:** Agent of Change

Lead PI: John M. "Marty" Anderies, Arizona State University (ASU)
Co-PIs: Armando Rodriguez, Marco Janssen, Ann Kinzig, and Charles Perrings, Arizona State University
Collaborators: Elinor Ostrom, Indiana University; Eduardo Araral, Lee Kuan Yew School of Public Policy, National University of Singapore

Research Goals:

1. Develop a publicly available, searchable database containing information regarding institutional and biophysical characteristics of more than 200 cases of social ecological systems including fisheries, community forests, and irrigation systems.
2. Develop a body of theory and associated analytical tools based on dynamical systems and robust control techniques to study robustness-vulnerability trade-offs inherent for different institutional and biophysical configurations that appear in the database.
3. Conduct a series of human subject experiments to characterize the effect of uncertainty and environmental variation on the capacity of groups of resource users to solve common-pool resource dilemmas.

Thematic Areas:

1. Cultural, and societal adaptation to environmental change
2. Robust control, management of rapid change, and decision-making in the face of changing risks and uncertainty.
3. Social change as a process mediated by robustness-vulnerability trade-offs.

Methodologies:

This project combines qualitative analysis of case studies of social ecological systems based on the IAD framework, data from human subject experiments to develop stylized models of social-ecological systems. Models are analyzed using techniques from robust control, dynamical systems, and bifurcation theory.

Recent Research Findings:

Based on the analysis of the classical renewable resource model, fundamental sensitivity-performance trade-offs have been established. Specifically, policies which improve the sensitivity-performance properties for one group of parameters (which we refer to as stock and rate of return parameters) necessarily result in worse sensitivity-performance properties for another group (which we refer to as harvest and revenue parameters). Further, we have established explicit relationships between parameter sensitivities – e.g. if a control law reduces sensitivity to price uncertainty by X%, sensitivity to uncertainty about the carrying capacity will increase by Y%.

Challenges and Opportunities:

Our biggest challenge is to attract students who are sufficiently well-trained in mathematics and interested in serious social science to contribute to the project. On the other hand, providing a venue for such young, talented, interdisciplinary scholars to find an intellectual home generates a wonderful opportunity to produce a new generation of scientists equipped to cope with the challenging problems facing human societies that span disciplines and knowledge domains.

Project Title: Language and Location: A Map Annotation Project (LL-MAP)

                    Proposal #: 0527512
                    HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Helen Aristar-Dry, Eastern Michigan University
Co-PIs: Anthony Aristar, Eastern Michigan University, Dr. Verónica Grondona, Eastern Michigan University, Dr. Yichun Xie, Eastern Michigan University
Collaborators: PARADISEC, University of Sydney, Max Planck Institute for Evolutionary Anthropology, Leipzig, Alaska Native Language Center, University of Alaska-Fairbanks, Tibetan-Himalayan Digital Library Project, University of Virginia, University of Stockholm, Arienne Dwyer, Randy LaPolla

Research Goals:

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

Thematic Areas:

1. Geospatial linguistics
2. Language and culture
3. Data aggregation via web services

Methodologies:

The primary facility created by the project is an online GIS installation showing the spatial location of languages and digital language resources (e.g., grammars, lexicons, audiotapes). The system will host a comprehensive set of language distribution maps, along with rich language information, as well as physical, cultural and demographic data. It also incorporates a "Scholar's Workbench," an area of the site designed to facilitate additional data collection and data analysis by scholars (see below).

Three methods of data collection are being implemented: a) partnering organizations are providing access to their data; b) public sources are being harvested; and c) important non-digital language maps are being digitized and provided with annotations based on review of relevant scholarly research.

The non-linguistic data made available in the LL-MAP project is aggregated from public sources, which employ OpenGIS protocols. The linguistic data is being gleaned from a number of different projects (e.g., Ethnologue, WALS, LingMap), as well as from individual scholars. Via the "Scholars' Workbench," linguists are invited to input geo-referenced data drawn from their own linguistic research; this data can be combined with data already existing on the LL-MAP site in order to produce new maps, which can then be stored on the LL-MAP site or saved and printed on the scholar's local machine.

Two interfaces are available for viewing the data: an easy-to-use Google Maps interface designed for the

general public and an ESRI interface which supports data querying and analysis.

Recent Research Findings:

LL-MAP is an infrastructure project, without research 'findings' in the usual sense. In addition to developing both a Google and an ESRI interface for displaying language data, in the second year of the project, we have focused on the following tasks:

- **Interface for Harvesting WMS Layers**: This interface allows an LL-MAP user to type in the URI of a WMS GetCapabilities file and choose map layers to be aggregated by the LL-MAP project.
- **KML Upload Facility**: Using the Keyhole Markup Language developed by Google, we have developd a way to display polygons and centroid points on the Google map interface.
- **Development of Core Metadata** : we have determined a core set of descriptive metadata for the LL-MAP project. In addition to this, we have determined how this metadata will be mapped to the elements of the OLAC metadata set
- **Workshop**: we held a successful workshop in which project participants agreed to develop guidelines for the production of high quality maps.

Challenges and Opportunities:

In the second year of the project, the LL-MAP team has encountered the following challenges:

- No good model for a linguistic GIS interface exists: numerous tools and services prototyped by ESRI and Google have thus had to re-engineered and expanded.
- An appropriate interface has been hard to build. The main community of users is not familiar with GIS technology, and the information they seek is very complex.
- The scope of the project is greater than that of most GIS projects: it covers the whole world and all its languages, not just phenomena within a specific area.
- Language maps that already exist were created with different goals than ours (e.g., census data and fieldwork data). Integration has proven difficult.
- There is no internationally recognized geospatial standard for linguistic data.
- Language data at a sufficient level of granularity is hard to come by. Thus far, we have only been able to harvest some data from the U.S census.

Project Title: Victims' Responses to Transitional Justice: A Comparative Study in West Africa

                    Proposal #: 0624278 (main award) & 0738854 (REU supplement)
                    HSD Emphasis Area: Agents of Change

Lead PI: David Backer, Department of Government, College of William & Mary
Collaborators: Associate Investigator: Anupma Kulkarni - School of Justice and Social Inquiry, Arizona State University; Advisors: Harvey Weinstein - Human Rights Center, University of California – Berkeley; Brandon Hamber - INCORE (Belfast, Northern Ireland); Hugo van der Merwe - Centre for the Study of Violence and Reconciliation (Cape Town, South Africa) and Terry Karl - Stanford University; Country Partners: E. Gyimah-Boadi [Ghana] - Ghana Center for Democratic Development (Accra, Ghana); Ezekiel Pajibo [Liberia] - Center for Democratic Empowerment (Monrovia, Liberia); Sonny Onyegbula [Nigeria] - UN Mission for Ethiopia and Eritrea (Asmara, Eritrea) and Paul James-Allen [Sierra Leone] - International Center for Transitional Justice (Monrovia, Liberia); Organizational Partners: Ghana Center for Democratic Development (Accra, Ghana); Center for Democratic Empowerment (Monrovia, Liberia); Center for Democracy & Development (Abuja and Lagos, Nigeria) and Sierra Leone Court Monitoring Program (Freetown, Sierra Leone); Research Managers: Joseph Asunka [Ghana]; Emmanuel Kailie [Liberia]; Dauda Garuba [Nigeria] and Mohamed Suma [Sierra Leone]; Other Personnel; Approximately 100 moderators, translators, fieldworkers, facilitators and student research assistants.

Research Goals:

This project examines the consequences of the choices societies make about how to address past violations of human rights during the course of transitions from periods of violent conflict (e.g., state repression, war, genocide), which have been a prevalent phenomenon around the world over the last several decades. A key contribution is to assess the efficacy of these decisions about 'transitional justice' from the distinctive vantage point of the victims of abuses, whose perspective is underrepresented in related academic and policy discussions and rarely the subject of intensive primary empirical research. As a result, the latent question of whether or not they accept the measures that are implemented for the purposes of conflict resolution and democratization remains largely unanswered, though members of the project team and others have previously conducted relevant research in South Africa and elsewhere.

Our study extends that prior work and seeks to evaluate a wide range of common theoretical propositions and policy prescriptions by exploring the reciprocal relationships among (1) transitional justice processes, with particular attention paid to recent truth commissions—designed around the South African model—that emphasize participation by victims; (2) the attitudes and behaviors of victims that are central to their agency in the new dispensation; and (3) trajectories of political and social development. The research focuses on four post-conflict societies in West Africa: Ghana, Liberia, Nigeria and Sierra Leone. These cases afford a useful cross-section of historical legacies (military regimes, civil war, ethnic conflict) and transitional justice measures (prosecutions, truth commissions, reparations, institutional reform, amnesty) that are closely linked in practice. The resulting analysis will constitute the first multi-country study in this field to be based principally on primary data collected from victims of human rights violations. In addition, the Liberia component will involve unprecedented longitudinal analysis (to assess changes over time) and research in the diaspora (to gauge variation by context). The study design also permits novel insights

concerning the interactions among local, national, regional and international forms of post-conflict accountability and democracy promotion.

Thematic Areas:

Political Science
Human Rights
Conflict Resolution
African Studies
Law
Sociology
Psychology
Public Health

Methodologies:

Our basic research framework focuses on collecting extensive primary data using multiple complementary techniques. The initial step is to conduct sets of focus groups with key segments of the victim population. (e.g., war wounded, amputees, women, child soldiers). These moderated discussions (tape recorded for later transcription and review) delve into the circumstances of past conflict and exposures to violence, options for transitional justice, and the nature of attitudes about local and national politics. The insights from the discussions (and official documents pertaining to transitional justice institutions) then inform the development of a survey questionnaire, comprised of a large core of items that is common to all four countries in order to facilitate cross-national comparisons, plus select items added and/or tailored to reflect individual country contexts. The next step (following training of fieldworkers, including a pilot test of the questionnaire) is to administer the survey to a broadly representative sample of victims. (The Liberia study differs in that small numbers of respondents were recruited from the general population as well as the diaspora, to provide further bases of intra-case comparison.) The responses are entered (from electronic files generated by scanning the completed questionnaires on site) to allow statistical and content analyses. The final step is to conduct open-ended interviews with a small sub-set of the survey respondents, to investigate issues in greater depth and (together with the material from the focus groups) provide explanations and illustrations that enrich the quantitative results. In addition, a second wave of data collection will be completed in Liberia—using a panel approach—after the truth commission has concluded its activities, projected for late-2008 or early-2009.

Recent Research Findings:

Since the project is in its first year and data collection remains ongoing, no analytical results are available to summarize at this stage. We can, however, report significant progress:

1. *Focus Groups*: four 1-3 hour sessions, consisting of 6-15 participants apiece, conducted in Liberia, Nigeria and Sierra Leone (Ghana was omitted because collaborators had previously engaged in substantial research concerning the National Reconciliation Commission process).

2. *Questionnaire*: large roster of items developed, translated from English into 16 languages (Ghana: Akan, Dagbani, Ewe, Ga, Hausa; Liberia: Pidgin English, Bassa, Kpelle; Nigeria: Hausa, Igbo, Ogoni, Yoruba; Sierra Leone: Krio, Limba, Mende, Temne), back-translated to English as a verification check, and compiled into bilingual (English +) versions.

3. *Survey*
- Liberia: 1072 respondents interviewed during March-April 2007 in six of the 15 counties.
- Liberia Diaspora: 24 respondents interviewed in Ghana during May 2007; planning underway for similar mini-surveys in Sierra Leone and Nigeria, plus mail survey of 200+ respondents in the US.
- Sierra Leone: 500 respondents interviewed in 10 sites across all four provinces.
- Ghana: 506 respondents interviewed during May-June 2007 in nine of the 10 regions.
- Nigeria: planning underway for survey of approximately 500 respondents in 12 of the 36 states plus the Federal Capital Territory of Abuja, to be administered in December 2007 – January 2008.

4. *Data Processing*: double entry nearly completed for Liberia, Sierra Leone and Ghana surveys, to be followed by reconciliation and cleaning; coding of qualitative material currently being arranged.

Challenges and Opportunities:

We have faced several major hurdles in organizing and implementing the project. One is the difficulty of undertaking large-scale fieldwork in multiple countries, where a crucial consideration is the coordination of the substantive research agendas (to permit rigorous and meaningful comparisons) and the schedules of project activities (to use time and resources as efficiently as possible, under constraints of availability, travel parameters, weather, political events, etc.). Finalizing the many translations and compiling contact lists of victims proved to be especially demanding tasks. Another is the complications presented by these particular countries, including poor infrastructure (electricity, technology, communications, roads, etc.), a lack of experience with survey research, and limited availability of necessary information. Access has been a modest (but surmountable) issue in some locations. Local cultural practices have also intervened, with the most notable instance being an incident where three fieldworkers thought they had been attacked by a devil. In addition, the relationships with certain of the country and organizational partners have not always been smooth, resulting in unanticipated delays, occasional distress and financial disputes.
Despite the problems that have arisen, we feel that we managed to accomplish a remarkable amount in a relatively short period, even expanding the volume (increasing the number of respondents) and scope (adding the Liberia diaspora component) of data collection well beyond what we envisioned at the proposal stage, which we expect will enhance the utility of the final products. In the process, we have devised research protocols and instruments, as well as formulated operational strategies, that can be applied in other settings. We have also capitalized upon this project to develop close(r) relationships with many of the collaborators and to invest in meaningful capacity building at an individual, organizational and inter-organizational level that we believe will have long-term value. Interactions among this network and in the course of the fieldwork have highlighted the prospects for broader impacts in areas such as policy design and evaluation, research methodology and ethics, and pedadogy.

Project Title: DHB: Transformed Social Interaction in Virtual Environments

> **Proposal #:** 0527377
> **HSD Emphasis Area:** Dynamics of Human Behavior

Lead PI: Jeremy Bailenson, Stanford University
Co-PIs: Jim Blascovich, Andrew Beall, University of California, Santa Barbara

Research Goals:

1. Understanding digitally mediated social interaction.
2. Measuring the impact of transforming identity.
3. Developing immersive virtual environment technology to answer social science questions.

Thematic Areas:

1. Media and Communication
2. Social Psychology
3. Software/Hardware application development

Methodologies:

Laboratory Experiments, Field Studies in Online Virtual Environments, Prototype Development for Hardware and Software.

Recent Research Findings:

1. Networked Stanford/UCSB virtual classroom. In what we believe to be the first use of networked immersive virtual reality studying virtual classrooms across long distances, we have demonstrated that virtual classrooms offer affordances that face-to-face group instruction settings do not. Our study featured two students from separate universities who saw networked virtual avatars of one another and a recording of a virtual teacher giving a lesson. Via pretesting, we determined a 'good spot' (close to the teacher) and a 'bad spot' (far from the teacher) within the virtual classroom, and demonstrated about a 15 percentage point swing in exam scores based on learning material between the two spots. Our experiment transformed virtual space such that both students experienced the room from the 'good spot' simultaneously while thinking the other student was is in the 'bad spot'. We showed that as a dyad, students liked the teacher more and were more influenced by course materials in this transformed condition than in various controls. Moreover, on the technological side, the accomplishments involved in getting a networked virtual classroom functioning between Stanford and UCSB were substantial.

2. The Proteus Effect. Cyberspace grants us great control over our self-representations. At the click of a button, we can alter our gender, age, attractiveness, and skin tone. But as we choose our avatars online, do our avatars change us in turn? In a series of studies, we've explored how putting people in avatars of different attractiveness or height change how they behave in a virtual environment. We have demonstrated that when subjects look in a virtual mirror and see themselves as attractive, they behave more socially inside VR and then also have more confidence in dating tasks later on outside of VR than various control conditions. Similar effects occur with avatar height and negotiation tasks.

Challenges and Opportunities

One of the biggest challenges is expanding our research from laboratory studies to larger scale opportunities. The past year has demonstrated a huge increase in the amount of time people are spending in social worlds such as Second Life. Extending our work to these online arenas in which people use avatars naturalistically presents an amazing social science research opportunity. Our research demonstrates the implications of using any digital environment—people can transform their own avatars in terms of appearance, behavior, and location. By doing so, they can gain large amounts of social influence and other advantages. Consequently it is crucial to understand how large these effects are, and how often they are occurring in the "natural" world of social networking websites, online dating, networked video games, and virtual worlds.

Project Title: Integrating Socio-ecological Sciences Through a Community Modeling Framework

Proposal #: 0623162
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: C. Michael Barton, Arizona State University
Co-PIs: 1, University of Alaska, Anchorage
Marco Janssen, Arizona State University
Collaborators: Sander van der Leeuw, Arizona State University
Steven Lansing, University of Arizona
Sean Bergin, Arizona State University (Graduate Research Assistant)
Allen Lee, Arizona State University (Technician, programmer)

Research Goals:

Agent based models (ABMs) have recently emerged as a promising category of research tools to study the dynamics of complex human and biological systems, integrating individual perceptions and behaviors in the contexts behavioral ecology, game theory of decision-making, and geospatial representations of the world. While ABMs are much discussed and are rapidly becoming perceived as a requirement for cutting-edge research centering on human- environmental interaction, most social and natural scientists still have a limited awareness of their potential, and the experimental nature of most ABM platforms prevents them from being readily accessible to researchers. Furthermore, a lack of standards has inhibited the exchange of modeling expertise and cumulative model building among different research teams, and there has been little effort at systematically addressing problems of validation and verification in modeling algorithms and results.

Recent Research Activities:

We propose to address these issues and accelerate the regular integration of ABMs for research in social-natural dynamics by initiating a broad, community-wide agenda involving active researchers ranging from content experts in the social sciences, ecology, conservation biology and GIS, to computer scientists and mathematicians. This initiative was launched by a planning workshop in March 2006, that brought together leading practitioners from across the USA. A national consortium was founded (Open Agent Based Modeling Consortium) and a pilot program begun to address these issues. The consortium's resource center and discussion forums can be found at <http://www.openabm.org>

Thematic Areas:

1.   Community Development Project

Project Title: Constructal Theory of Social Dynamics
　　　　　　　　　　Proposal #: 0524539
　　　　　　　　　　HSD Emphasis Area: Agents of Change

Lead PI: Adrian Bejan, Duke University
Co-PIs: G. W. Merkx, E. Tiryakian and K. C. Land
Collaborators: G.W. Merkx, S. Lorente, A.H. Reis, A.F. Miguel, S. Perin

Research Goals:
The main objective of this project was to develop a community of scholars around the new paradigm of social organization provided by constructal theory. According to this theory, societal organization is a conglomerate of architectures for streams of people, goods, information, etc., and these architectures morph in time so that they provide easier access for all the streams

Thematic Areas:
　　1. Constructal Theory
　　2. Social Dynamics

Recent Research Findings:
The community of scholars took shape in the first year, when we attracted an international group of speakers and participants at the first workshop on Constructal Theory of Social Dynamics (CTSD) held at Duke in April 2006. We doubled the participation in the second CTSD workshop, which we ran at Duke on 23-24 April 2007. The major themes of the workshop were organization in nature, animal behavior, and many social patterns of organization such as migration, war, conflict, human-environment equilibria, corporate sustainability, resilience, epidemics, etc.

The main finding is that this paradigm touches a live nerve in the scientific community. The interest is great and growing. Many of the participants in the 2007 CTSD workshop came from the group of presenters gathered at the NSF HSD review meeting held in September 2006 in Washington. It was there that we found that many of the HSD-sponsored projects are united by the search for deterministic explanations and predictions of social design, and that constructal theory offers a common table of discussion.

We, the Duke CTSD team are so encouraged by the growth of the constructal theory community that we plan to continue this activity of expanding the theory in human social dynamics, beyond 2007.

The progress made by our project forms the subject of the new book "Constructal Theory of Social Dynamics", A. Bejan and G.W. Merkx, eds, Springer, New York, 2007.

Project Title: HSD: Collaborative Research: Social Complexity and the Management of the Commons

                               Proposal #: 0624297
                               HSD Emphasis Area: Agents of Change

Lead PI: David Bennett, University of Iowa
PIs and Co-PIs: Catherine Kling (PI ISU), David McGinnis (PI MSU-Billings), Paul
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Research Goals:

The overarching goal of this research project is to understand the management of common pool resources (CPR) in the rapidly changing American West (specifically southwest Montana). We are interested in: 1) the degree to which the region's changing socio-demographic character will lead to changes in what is valued and produced as CPR; 2) how individuals organize to effect change in the policies and regulations that guide CPR production; and 3) the ability of place-based decision-making to match the demand for with the supply of CPR through time. To understand how society manages common pool resources we must understand how:

1. different types of stakeholders value alternative CPR and ecosystem services.
2. land use/land cover policy is formulated and implemented,
3. individuals mange land use/land cover to maximize individual utility given constraints associated with policies and regulations, economics, and socio-demographic context, and
4. individuals organize to effect change in these constraints and, thus, effect change in what and how CPR are produced and sustained.

To help explore the dynamic and complex set of interactions among decision-makers and between decision-makers and the environment we will develop a model of land use policy, land use/land cover change, and the management of common pool resources.

Thematic Areas:
1. Political ecology
2. Environmental economics
3. Organizational theory
4. Geographic information science

Methodologies:

To meet the objective set forth above we will:
1. Conduct interviews with local stakeholders to better understand: a) local political and administrative processes; b) what ecosystem services are important to local inhabitants; c) the affect of socio-demographic factors on decision-making; and d) the role of place, coalition-based decision-making, and social networks in land use/land cover decisions.

2. Conduct surveys to further elucidate what is important to stakeholders and quantify the relative value of ecosystem services. In our proposal we outlined a two phased approach; 1) a scoping survey would be developed to build on knowledge gained from preliminary interviews and; 2), building on the interviews and scoping survey, a choice experiment would be conducted to quantify relative ecosystem value. While a choice experiment remains a viable approach, knowledge gained suggests that hedonic modeling might produce data that is more applicable to our study. A final decision on methodology will be made this fall.

3. Open-ended interviews and Q-methodology will be used to evaluate whether and to what degree interest groups, decision-makers, and policy implementers cohere and organize around common themes or coalitions as they organize and innovate to control the production and flow of valued ecosystem services.

4. Intensive survey of all subdivision applications for the three study counties over the last 25 years will be conducted and subjected to coding for levels of regulation and forms of mitigation for quantitative analysis of changes in the rate and type of growth controls in the study area.

5. A reconstruction of levels and types of participation in the planning process will be conducted with results subjected to typological coding to assess the changing types of agents active in land use planning in the region and their role in, and effect upon, the regulatory process.

6. An agent-based model will be developed to capture the dynamic nature of land use/land cover decision making and the production of CPR.

Recent Research Findings:

We are in the first year of our study and, thus, have not yet produced conclusive research findings.   We can, however, report significant progress on meeting the goals of this project. Accomplishments to date include the:

1. Completion of interviews with local administrators and politicians designed to: 1) better understand the decision-making processes of public sector decision-makers; 2) identify influential individuals within the communities; 3) get preliminary information on issues of concern to stakeholders (particularly ecosystem services). Note these interviews and others associated with, for example, social networks are an ongoing element of our work.

2. Development of a scoping survey based on interviews and the literature to more formally assess what is important to area inhabitants. We assessed the format and content of this survey through two focus group meetings and adjusted the survey accordingly. This survey has been sent out to 1200 households within the study area.

3. Development and organization of spatial and aspatial databases needed to support research and modeling efforts.

4. Development of the agent-based modeling framework for land use policy, land use/land cover change, and the management of common pool resources. Much of this early work has focused on developing a modeling framework designed to help researchers verify, validate, and explore ABMs of complex adaptive spatial systems (CASS), like the one under investigation. This framework is being implemented using a simplified version of our eventual ABM of CPR management.

5. Results of archival analysis of subdivision records, coupled with oral histories of changes in the planning process reveal: a) that the makeup of stakeholders in this shifting regulatory environment has shifted from interests representing local agricultural financial institutions to those representing out-of-state development interests; and b) that despite momentum towards growth control, existing regulatory frameworks (secured under previous economic regimes) force planning officials and boards towards tacit and indirect growth mitigation efforts, which depend heavily on informal social networks.

Dissemination of research findings

1. Concepts associated with the ABM-CASS framework have been presented in a plenary session at the *Workshop on Agent-based Modeling of Complex Spatial Systems* held in Santa Barbara, CA (Bennett, D.A., 2007. "Representation and Interpretation: Challenges for Agent-based Models of Complex Adaptive Spatial Systems") and in "Mobile Aware Intelligent Agents" (Bennett and Tang forthcoming) in *Understanding Dynamics of Geographic Domains*, edited by M. Yuan and K. Stewart. CRC Press/Taylor & Francis.

2. Results produced from the archival analysis of subdivision records will be reviewed in a research paper under development for the journal *Land Use Policy* with an anticipated completion date of December 2007.

3. A review paper on old west/new west transformation processes is under development for the *Social Science Journal* with an anticipated completion date of December 2007.

4. Over the next six months we also anticipate that journal articles will be developed from the results of our work on verifying, validating and exploring ABM for CASS and the scoping survey.

Challenges and Opportunities:

1. Winning the confidence and cooperation of local decision-makers proved challenging. Focus group discussions, in particular, brought to light concerns that some stakeholders had about our intentions and objectives. Once identified, this provided an opportunity for open and honest debate that allowed us to identify particular terms and phrases used in the draft survey that provoked concern. We believe that this process resulted in an improved final survey and help to build a stronger working relation with local stakeholders.

2. From discussions with international researchers conducting similar work, it is apparent that the processes that drive change in our study area are similar to those in high amenity regions worldwide. We see opportunities for cross-cultural comparative studies on the management of common pool resources.

Project Title: Creating Dynamic Social Network Models from Sensor Data

                      Proposal #: 0433637
                      HSD Emphasis Area: Dynamics of Human Behavior (DHB)

Lead PI: Jeff Bilmes, University of Washington
Co-PIs: Tanzeem Choudhury, Intel Research; James Kitts, Columbia University; Dieter
                 Fox, University of Washington; Henry Kautz, University of Rochester

Research Goals:

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 social networks are important for conveying information and changes in behavior, we know relatively little about the way social networks themselves evolve over time.

The goals of this project are to:

1. Develop tools for making direct automated measurements of face-to-face interaction network over time. Capture the structures of social interaction over time using wearable sensors that collect streaming data on research participants' physical location, speech, and motion.
2. Developing computational models to infer structures of social interaction from these data.
3. Validate our methods and communicate to the social science research community by employing conventional survey and observation designs in tandem with sensor-based tools.

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.

Methodologies:

Development of Instruments
In the first phase of this project, we developed a new wearable sensing platform for collecting multi-modal data from interactions, activities and location. The hardware included a small sensor board and an iPAQ pocket PC and is accompanied by software that we developed for synchronizing and processing the various data streams (audio, acceleration, light, temperature, signal strength from WiFi access points, etc.). This year we revised our hardware data collection platform to support more extensive embedded processing of sensor streams which allows us to process sensory streams in real-time and perform simple inference tasks (e.g. detect when someone is speaking, walking etc.). The new sensor platform is self-contained and more compact than the previous version and does not require an iPAQ for data processing and storage.

Data collection
We have completed the second year (2006-07) of data collection using the new sensor platform. The first year of data collection was done during the 2005-6 academic year. In order to model the formation and evolution of a social network from a natural initial state, we focused on capturing the interactions between the students in a moderately-sized graduate program. We recruited 17 incoming students in a graduate program in the applied sciences at the University of Washington. Data collection began with a 'pre-survey' administered by e-mail in late summer, before students arrived at the school. Sensor data collection began
during the first week of class, in late September. We have now completed 10 consecutive months of data collection. In each month, we collected one week of time-stamped wearable sensor data and also administered a survey with standard sociometric measures.

Probabilistic Models of Interactions and Activities

An important focus of the research is to develop algorithms that can capture various properties of face-to-face interactions and build computational models of social dynamics using sensors and probabilistic learning techniques. The first step in modeling face-to-face communication is to detect the individual interactions between our research subjects. This year we developed a new probabilistic technique for detecting conversations involving more than two individuals which performs significantly better than our previously developed model. The new model can handle the presence of other individuals who are not wearing sensors (e.g. people who are not subjects in our study) but who participate in conversations with our subjects. We have also developed probabilistic models for inferring location from wearable sensor data. We are currently developing algorithms for inferring social network graphs based on the detected conversations and with the aim of optimizing the network structure for a given temporal granularity. We will also extract additional conversational properties (e.g. duration, turn-taking etc.) and investigate approaches to cluster the interactions into groups that correspond to social roles.

Recent Research Findings:

We have developed highly accurate privacy-sensitive methods for (1) automatically finding multi-person conversations in spontaneous, situated speech data and (2) segmenting those conversations into speaker turns. The methods protect privacy through a feature set that is rich enough to capture conversational styles and dynamics, but not sufficient for reconstructing intelligible speech. The conversation finding method outperforms earlier approaches and the speaker segmentation method is a significant improvement over the only other known privacy-sensitive method for speaker segmentation.

The conversation segmentation algorithm is then applied to the aligned streams to automatically segment conversations and speakers from the data streams collected throughout multiple days and weeks. Based on the results, maps of social networks patterns are created (we currently build a static network graph for a week given the conversation data – this will be replaced by the probabilistic method we are developing to infer network structure which will be dynamic and able to handle different temporal resolutions).

We have processed several weeks of survey responses and computed graph agreement metrics between the survey and conversation data. Our agreements are significantly better than the agreement between the survey graph and random graphs with expected densities equal to the observed graphs. However, the survey and sensor-based network are not identical but the difference we see is consistent with earlier results. We will try other similarity metrics used in social network analysis next ---starting with the degree distributions and clustering coefficients.
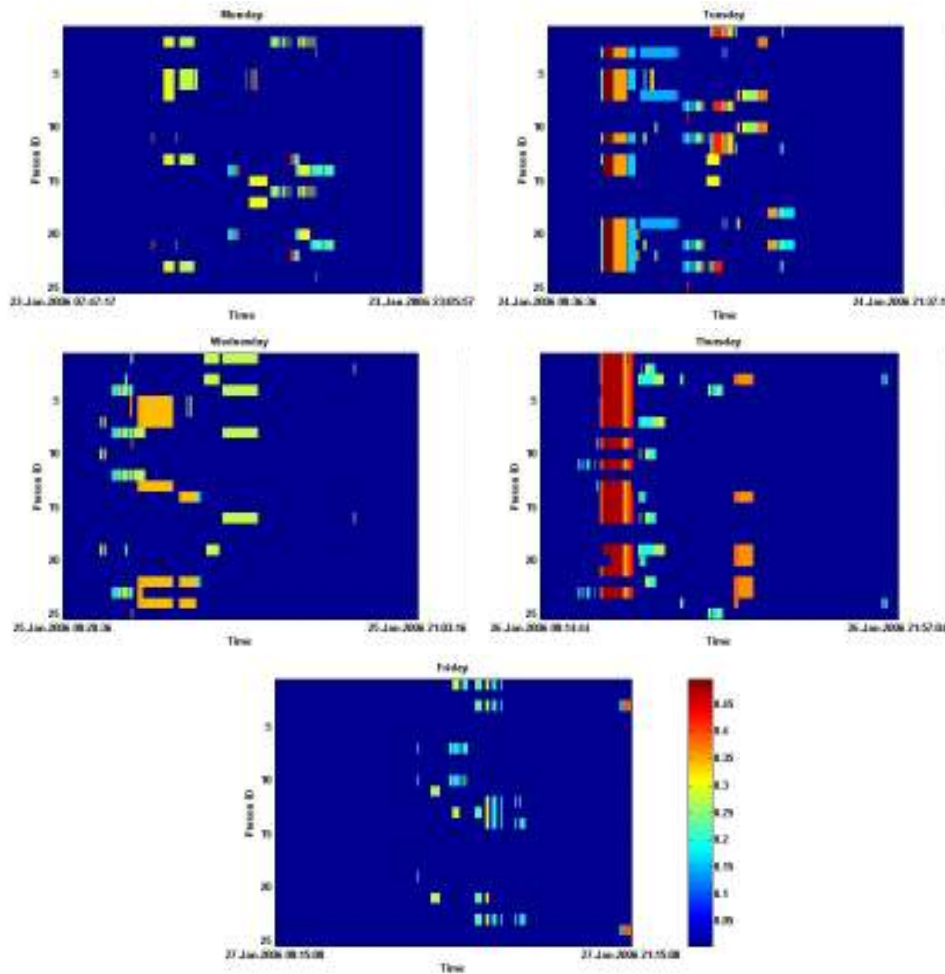
Figure 1: Time evolution of conversations over one week. Each subplot depicts one day's conversation pattern, where x-axis is time and y-axis is the subject IDs. The color-coding in the plots groups multiple individuals participating in a given conversation (e.g. on Tuesday and Thursday multiple people are grouped together when they attend a class in the morning). Speaker segmentation (not shown here) isolates time chunks within a conversation when a given user speaks.

Challenges and Opportunities:

We encountered several problems during the data pre-processing stage which delayed the analysis of the data. The survey responses had error that had need careful inspection before filtering out or correcting a response (e.g. an incorrect class entry was checked against published class schedule and response to other survey questions). Furthermore, some subjects failed to synchronize their devices with the central time server, which resulted in time misaligned streams where the offset was not known. We evaluated different techniques to align our data (e.g. multiple sequence alignment, normalized cross-correlation technique) – the normalized cross-correlation technique provided the best performance in a development dataset and was used to align the larger dataset.

We have collected several thousand hours of data about individual's conversations, locations, and activities – the largest data set of its kind, which will allow us to models network dynamics at various temporal resolutions that wouldn't be possible otherwise. This rich dataset provides a unique opportunity to understand and investigate how social networks form and evolve over time – we are excited to continue our current work on developing richer models of dynamic social networks in the coming year.

Project Title: Designing for Forgetting and Exclusion

                    Proposal #: 0622957
                    HSD Emphasis Area: Agents of Change

Lead PI: Jean-François Blanchette, Department of Information Studies, UCLA
Co-PIs: Michael R Curry, Department of Geography, UCLA; Leah Lievrouw, Department of Information Studies, UCLA
Collaborators: *Anita Allen*, University of Pennsylvania Law School; *Rebecca Baron*, CalArts; *Liam Bannon*, Interaction Design Centre, University of Limerick; *Ian Brown*, Department of Computer Science, University College London; *Ron Day*, School of Library and Information Science, Indiana University; *Martin Dodge*, Department of Geography, University of Manchester; *Mark Hansen*, Department of Statistics, UCLA; *Peter Lunenfeld*, Media Design Program, Art Center College of Design; *Thomas Mullaney*, Department of History, Stanford University; *Karen Till*, Department of Geography, University of Minnesota

Research Goals:

1. Establish an intellectual agenda
2. dentify a community of researchers
3. Develop a research program on the design of socio-technical infrastructures enabling forgetting and exclusion
4. Establish groundwork for submission of a full research proposal to the Human and Social Dynamics program in 2007.
5. Hosting of an invitational interdisciplinary two-day workshop where researchers discuss and delineate the contours of future research, theoretical, methodological, and empirical, in this area.

Thematic Areas:

1. Current climates and forgetting: Why now?
2. Case studies and examples of forgetting
3. Embedding forgetting and exclusion within the design process

Methodologies:

Our approach consists of synthesizing and integrating approaches to forgetting among the various disciplines represented among the participants in our April workshop, including: law, security policy, history, sociology, communications, statistics, cultural geography, computer science, information systems design, archives and electronic records, social technology studies, film and video, art criticism and theory, information science, anthropology, and organizational studies. From this diverse range of disciplines, we have developed a two by two matrix to formulate various approaches to forgetting. Along one axis, we have distinguished between descriptive and normative approaches, while along the other axis we have distinguished between conceptual and empirical oriented research.

Examples of 2 conceptual work include: considerations for active forgetting, developing a descriptive typology of forgetting that examines the current range of forgetting practices, or formulating an information policy platform that establishes the norms for forgetting. Examples of empirical work include an impact assessment of participatory systems on expectations of privacy and forgetting among diverse user populations, an exploratory look at the ways in which individuals are subverting ubiquitous data capture and the motivations to do so, a historical approach of forgetting that looks at policies of data retention among a varied states and organizations. The full development of this matrix is still in progress and will be finalized to help inform a future full research proposal to the Human and Social Dynamics program in 2007.

Recent Research Findings:

Our objective for the workshop was to articulate and prioritize a set of compelling ideas related to social and cultural aspects of forgetting, and to develop and sharpen an agenda for subsequent research, scholarship, design, and creative work in this emerging area of inquiry.

Our workshop produced a number of descriptive and normative investigations into practices, technologies and behaviors that might influence social forgetting. While we are still in the process of fully articulating our findings, proposals for theoretical, methodological and empirical approaches to forgetting and exclusion will be developed for proposals to be potentially submitted to NSF programs such as the Science and Society (S&S), Cyber Trust solicitation, and Information and Intelligent Systems solicitations.

Challenges and Opportunities:

Our current work provides for ample opportunities to begin considering empirical cases. More specifically, the overall consensus from our workshop participants was the need to look in-depth at various modes of forgetting in the current data landscape. In addition, our current work has established the initial foundations for the development of a network of scholars that can explicitly shape the current discourse on ubiquitous computing along several dimension including ethics, policy, design.

Conversely, as storage technologies have gained in practicality and dropped in price, the shift to an electronic medium has changed the default position from one of forgetfulness to one of remembering. This larger cultural shift imposes great challenges to our research as it becomes increasingly difficult to create demands and incentives for forgetting and privacy. As such, challenges to our project consist of identifying sites and cases that explicitly consider forgetting, rather than its counterpoint, remembering. Further challenges include the development of system of evaluation and metrics to evaluate forgetting, which by definition does not leave tangible traces. Additionally, given the interdisciplinary nature of this project, further challenges also include identifying a common framework that fully represents the range of perspectives on this topic.

Project Title: Coordinated Motion and Facial Expression in Dyadic Conversation

   Proposal #: BCS-0527485.
   HSD Area: Dynamics of Human Behavior

Lead PI: Steven Boker, University of Virginia
Co-PIs: Jeffrey Cohn, Simon Lucey
Collaborators: Iain Matthews, Barry Theobald, Jeffrey Spies, Michael Mangini, Timothy Brick, Lala Ambadar, Michael Villano, Kathleen Ashenfelter, Simon Baker

Research Goals:

1. Evaluate the contributions of timing and amplitude modulation of nonverbal cues on the dyadic conversation by independently modulating the timing and extent of head movements, facial expressions, and vocal pitch.
2. Evaluate effects of gender on conversational coordination by replacing the image used to reconstruct an avatar with the image of a person of opposite gender and by modifying vocal formants to be those of a person of opposite gender.
3. Build a combined differential equations and computational model for coordinated head motion and evaluate this model from ratings of ``naturalness'' and by testing the extent to which computer animated motions generated by the model in real time produce appropriate feedback response in the human conversants.

Thematic Areas:

1. Coordination dynamics, social cues, and expression of affect during conversation.
2. Automated tracking and real-time video synthesis of facial expressions.

Methodologies:

Two participants speak with one another over closed circuit video. The video is back-projected and a miniature video camera is arranged so that conversants see each other life size approximately 1.5m from each other and eye gaze is correct within 5 degrees of visual angle. One conversant is a confederate and motion tracked and the face that the other (naive) conversant sees has been manipulated and resynthesized and the voice that they hear has been processed. Manipulations include timing delays, reduced affect (both in facial expression and in vocal inflection), and person/gender substitution. In the reduced affect and person substitution conditions, new algorithms were developed as part of the project. Person substitution tracks the facial expressions and head motions of the confederate and applies these to Active Appearance Models (AAMs) constructed from previously recorded video of another person. When there is a change in gender of the apparent conversant, the vocal characteristics are processed using formant algorithms to pitch shift the voice to an appropriate register.

This novel methodology is, to our knowledge, unique and is transformative in that it allows a broad range of psychological questions to be addressed that previously were not practicable.

Recent Research Findings:

We found evidence of compensatory mechanisms in amplitude and velocity of head movements during conversation such that when amplitude of head movements, facial movements, or vocal inflections were reduced in the avatar or when the avatar was delayed, naive conversants produced more animated head movements. Confederates were blind to when these manipulations were present or not present. The compensatory increase in animation may be linked to a perception by the naive conversant of depressed affect in the confederate. Mild depression is often associated with reduced and/or delayed facial affect and vocal inflection and can elicit compensatory responses in conversational partners.

In the person substitution experiment each of two confederates ``wore the face'' of three different persons, him or her self, someone of the same sex and someone of the opposite sex. Vocal processing was always in effect and vocal register was shifted to be gender appropriate. Confederates were blind as to which person they appeared to be. Preliminary analyses suggest that male-male, male-female, and female-female dyads followed previously observed patterns when gender had not been substituted and followed the dynamics of the confederates movements and not the appearance of the face when gender had been substituted.

Challenges and Opportunities:

This methodology opens up broad new areas of inquiry in which physical appearance can be dissociated from a person in an apparently face-to-face conversation. The next challenge will be to produce a predictive cognitive model of head and facial movements that can be substituted in a believable way for the actual movements and expressions of the confederate. This model will take us a large step closer to understanding the dynamics of nonverbal expression.

Project Title: A Longitudinal Analysis of the Social Dynamics of Environmental Equity in Baltimore

Proposal #: 0624159
HSD Emphasis Area: Agents of Change

Lead PI: Christopher G. Boone, Arizona State University
Co-PIs: Geoffrey Buckley, J. Morgan Grove, Charles Lord, Austin Troy

Research Goals:

1. Analyze how the spatial patterns of environmental equity—defined by access to environmental amenities and disamenities—have changed over time and whether or not such patterns spatially correlate more with race/ethnicity or socioeconomic status.
2. Identify the social and institutional processes that drive patterns of amenities and disamenities.
3. Determine if the patterns of population characteristics shift at certain *threshold densities* of amenities and disamenities and if population characteristics respond to rapid *rates of change* in amenity and disamenity densities.

Thematic Areas:

1. Environmental justice
2. Social and institutional dynamics
3. Land use dynamics and decision-making

Methodologies:

The project melds GIS, spatial statistics, historical, and legal inquiry to examine the dynamics of environmental justice patterns and processes in Baltimore over the long term, from 1880 to the present. For pattern analysis of environmental disamenities, we use data from the EPA Toxic Releases Inventory for the period 1990 to 2000. For the period from 1960 to 1980, we use the Dun & Bradstreet (D&B) Regional Directories to extract location data for heavy manufacturing (SIC divisions 20-29), electric utilities (SIC 4911, 4931, 4939), chemical wholesalers (SIC 5169), and petroleum terminals (SIC 5171), which match the SIC categories for TRI sites. This dataset is supplemented with Baltimore City Directories, Commercial Directories, and Hopkins and Sanborn atlases to determine the location of manufacturing establishments, power generating stations, chemicals wholesalers, and petroleum terminals for the period 1880 to 1950. For social data, we use the census, including a historical GIS of census data already generated by the group. Manuscript census data is being sampled by enumeration district for the pre-1940 period in order to improve spatial resolution of the data. Where residential land classes are available, we reapportion census data using daysmetric techniques. For the analysis of the patterns over time, we use the Cumulative Hazardous Density Index developed by Bolin et al. (2002) to measure the concentration of polluting or likely polluting industry, and also employ Geographically Weighted Regression, to assess the spatial nonstationarity of the relationships between polluting industry and social characteristics of neighborhoods (Mennis and Jordan 2005). For process analysis, we examine historical decisions in the courts and other institutions that impact the distribution of social groups and industry. A group of legal students, for instance, is examining the variances permitted to see if any clear spatial patterns emerge and whether they correspond to neighborhoods of the least advantaged populations.

For the analysis of amenities, we chose to examine the distribution of parks and recreation spaces to measure accessibility versus social characteristics. We define accessibility as within walking distance from a park, using the common standard of 400 meters (1/4 mile). Using the dasyemtric layers, we examine the social characteristics of those living within and beyond a 400-meter buffer of the parks. GWR is also used to examine nonstationarity in the relationships. For the process analysis, we examine historical documentation, including park commission reports, to explain decision making regarding the placement of parks. For both the amenity and disamenity analyses, we will analyze the longitudinal data to test for response or lag characteristics between environmental equity patterns and socioeconomic patterns.

Recent Research Findings:

The team recently completed a paper that examines the distribution of parks in the Baltimore Metropolitan Region in relation to the residential patterns of different socioeconomic groups. We find that a higher proportion of African Americans have access to parks within walking distance, defined as 400 meters or less, than whites, but whites have access to more acreage of parks within walking distance than blacks. Similarly, more low income census block groups tend to be closer to parks, but have walking access to fewer acres per capita than high income census block groups. A needs-based assessment shows that areas with the highest need have the best access to parks but also have access to less acreage of parks compared to low-need areas. The greater accessibility to parks for blacks than whites is in spite of a long history of neglecting and ignoring recreational needs of black Baltimoreans. The dynamics of metropolitan growth, fueled in part by racism and fear, led to white flight from the city and black inheritance of much of Baltimore's space, including its parks. We argue that a combination of outcome and process analyses can improve understanding of environmental justice dynamics.

Challenges and Opportunities:

The team has been working on methodologies for data sharing, given the distributed nature of the research team, and the variety of data sources it uses. To address the spatial components of the project and specifically the question of how spatial patterns of environmental equity change over time we have been compiling an extensive collection of historical data in a geodatabase. Much of the effort has been focused on the "geo-enabling" of historical data; that is taking data that is spatial in nature but contains no georeferencing information and associating the data with a location or area on the earth's surface (e.g. scanned maps). Realizing that this information has considerable value to the public that is increasingly aware of geospatial technology due to the prevalence of freely available virtual globe software such as Google Earth we have developed techniques for making this data available in the Keyhole Markup Language (KML). This will provide the public with a mechanism to view the data compiled as part of this project in a format that is interactive and supports the integration of other spatial datasets. The data sharing challenge will likely evolve into an excellent opportunity for the Baltimore Ecosystem Study and its partners, within and beyond the LTER network, to develop new, user-friendly data sharing methods.

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Project Title: The Uninformed Traders' View Of Participation In Financial Markets With Insiders: A Game Against Nature Or Against An Intentional Agent?

                          Proposal #: SES-0527491
                          HSD Emphasis Area: Decision Making, Risk and Uncertainty (DRU)

Lead PI: Peter Bossaerts, California Institute of Technology and Swiss Finance Institute
Co-PIs: Steven Quartz, California Institute of Technology
                 John Ledyard, California Institute of Technology
Other: Antoine Bruguier, California Institute of Technology

Research Goals:

1. Discover how humans make inference about financial markets
2. Locate where this inference takes place in the brain
3. Find what makes a good trader

Thematic Areas:

1. Financial Markets with Insiders
2. Theory of Mind (ToM)
3. Functional magnetic resonance imaging (fMRI)

Methodologies:

How do people understand stock markets? Finance suggests that they use an approach based on statistical modeling. Here, we hypothesize instead that successful traders use Theory of Mind (ToM). In its classical definition, ToM is the ability to attribute to other people beliefs and intentions different from one's own. Humans use ToM to predict other people's behavior and act in accordance with these predictions. Our hypothesis is more general however: we posit that humans use ToM to understand a complex, anonymous social structure. If true, such result would have wide implications, both in theory and in practice.

We devised three experiments. In the first one, we recruited 20 subjects to trade on an electronic laboratory stock exchange. In this carefully controlled setup, we let subjects anonymously trade one stock and one bond. At the end of the experiment, we rewarded the subjects according to performance. During this experiment, we presented two types of trading sessions. In the first type of sessions (test sessions), some of the subjects ("insiders") had superior knowledge of the payout of the stock while others ("outsider") did not. In the second type of session (control session), all the subjects were outsiders. With this laboratory design, we recorded realistic trading data while at the same time controlling for the diffusion of information.

During the second experiment, we used fMRI to collect brain data. We replayed the previously recorded trading in front of new subjects and analyzed their brain activity by contrasting the two types of sessions. Subjects did not make any financial decisions; indeed, we focused exclusively on the perception of a market. This design has the crucial advantage that decision-making processes do not interfere with our data analysis. However, subjects were exposed to risk in the following way. They could place a "blind bet" (i.e.

there was no strategy involved) and were paid according to the original bet. According to our hypothesis, we predict that brain regions known to participate in ToM (and not mathematics) will activate.

We then performed a behavioral experiment that consisted of four tests. The first test measured the ability to predict price changes in a financial market. Two other tests measured ToM abilities on a continuous scale. Finally, we added a test that measured mathematical abilities. We based this test on typical questions asked to job seekers in the finance industry. According to our hypothesis, we predicted that financial abilities would correlate with both ToM tests and not with the mathematical tests. Conversely, if traders do not use ToM, we expect financial skills to correlate only with the mathematical test.

Recent Research Findings:
Previous findings had demonstrated that ToM areas of the brain (Paracingulate cortex, insula, and amygdala) were activated in the case where insiders were present. Our study is the first, however, to find these regions activated when we subjects are confronted with an anonymous social structures. Indeed, every previous study compared the perception of one human against a non-human baseline. In our case, we involve the same amount of human interaction in both treatments; therefore, the activations we see are only due to the market itself.

Behavioral results strongly corroborated fMRI results. We observed positive and significant correlations between the two ToM tests and the financial aptitudes ($p=0.048$ and $p=0.023$). There was no correlation with the mathematical test ($p>0.20$). These results contradict finance theory. Indeed, in the traditional view, finance treats markets as mechanical structures and models them with a probabilistic approach. Here we prove that, on the contrary, they are perceived and better predicted when we take a ToM-based approach. Our results also challenge traditional recruitment techniques; it may be more efficient to select traders by measuring their ToM aptitudes.

Challenges and Opportunities:
An open question comes from the lack of precise definition of "Theory of Mind." One surprising result is that the two ToM tests do not correlate. This suggests that ToM is not a one-dimensional set of abilities, as previously though. These results extend our understanding of ToM but make clear the need for a precise definition. Psychologists will need to define this currently loosely defined term in order to comprehend it fully.

These results open a second avenue of investigation. While the use of ToM may be beneficial for some traders, it remains unclear whether over-use of ToM is responsible for wild stock market fluctuations, such as bubbles and crashes. Our results suggest that financial regulatory bodies should base their rules on a ToM-based approach instead of mathematical models, as it is currently the case. The need for better regulation was made especially evident by the heavy losses quantitative hedge funds recently suffered.

Finally, we would like to investigate in the future the abilities of autistic patients to understand stock markets. People with Asperger's syndrome (AS) or high-functioning autism (HFA) are able to speak and understand the mechanics of a stock market. However, will they perform as well as control subjects? While it is still debated that autism is an impairment of ToM, a carefully controlled experiment should allow us to test whether autism impairs the understanding of a market. Traditional finance theory predicts that it is not the case, but we predict that the abilities of HFA/AS patients will be significantly lower than the one of a population matched on other cognitive measures (such as intelligence or education level).

Project Title: Interoperability Strategies for Scientific Cyberinfrastructure: a Comparative Study

                          Proposal #:0433369
                          HSD Emphasis Area: AOC, Agents of Change

Lead PI: Geoffrey Bowker, Santa Clara University
Co-PIs: Karen Baker, University of California San Diego
Collaborators: Florence Millerand and David Ribes

Research Goals:

1. To provide a situated social and organizational comparison of three scientific projects with distinct approaches to cyberinfrastructures and data interoperability
2. To open up understandings about the ramifications of data sharing
3. To broaden understandings of how to share data across multiple distributed organizational and social contexts

Thematic Areas:
1. Scientific Information Infrastructure
2. Cyberinfrastructure
3. Data Stewardship

Methodologies:
Use of ethnographic, interview, and content data analysis to provide a situated social and organizational comparative study. Development and use of multiple modes of engagement and of articulation as part of an action research approach that prompts and sustains dialogue on the diverse dimensions of information infrastructure and data interoperability.

Recent Research Findings:
We have developed grounded understandings of social and organizational complexity present in producing shared scientific information infrastructure while investigating three interoperability approaches: metadata standards, ontologies, and community-driven approaches. For references see http://interoperability.ucsd.edu. Information infrastructure has been reviewed (Bowker et al, forthcoming); modes of engagement identified (Ribes and Baker, 2007); interoperability strategies described (Ribes and Bowker, forthcoming; Millerand and Bowker, forthcoming) and community interventions elaborated (Baker and Millerand 2005, 2006; Millerand and Baker, forthcoming; Karasti et al, 2006, forthcoming). Our findings foreground the long-term and heterchronic features of collaborative work and information infrastructure design.

Challenges and Opportunities:
One challenge is a chronic lack of readiness and underestimation of time required to elaborate/modify/design/deploy/engage/enact in order to prompt reflection on changing data practices and to provide feed-back on the multiple dimensions of information infrastructure. Our work provides opportunities to bridge social science and environmental science and to contribute to informed approaches to interdisciplinary work as well as to data stewardship and infrastructure building within a long-term community.

Project Title: DHB: Mathematical and Simulation Modeling of Crime Hotspots

> **Proposal #:** BCS-0527388
> **HSD Emphasis Area:** Dynamics Of Human Behavior

Lead PI: P. Jeffrey Brantingham, UCLA Anthropology
Co-PIs: Andrea Bertozzi, UCLA Math; Lincoln Chayes, UCLA Math; George Tita, UCI Crime, Law and Society.
Collaborators: Los Angeles Police Department, Long Beach Police Department

Research Goals:

The primary goals of the project *DHB: Mathematical and Simulation Modeling of Crime* are: (1) develop computational and analytical models of crime pattern formation; (2) assess the degree to which crime patterns are predictable based on these spatial models; and (3) test model crime systems against recent crime data.

Our discrete computational models have focused on so-called agent- or individual-based simulations built at the empirical scale of criminal behavior. Analytical models focus on the continuum limits of the discrete cases, which lead to advection-reaction-diffusion type partial differential equation (PDE) models. Testing of both the discrete and analytical models has concentrated on spatio-temporal patterns of crime in Los Angeles and Long Beach, CA.

Thematic Areas:

1. Crime patterns formation.
2. Agent-based modeling.
3. PDE modeling.

Methodologies:

The core premise underlying the discrete models is that crimes occur when motivated offenders and potential targets/victims convergence in time and space in the absence of any security measures. Using this perspective the routine movement of offenders, victims and security, within variously structured environments, is deemed to be the major cause of emergent crime patterns. Our work to operationalize this view of crime has concentrated on development of both discrete computation models of crime and corresponding PDE models.

Discrete computational models have been developed in two phases. Phase 1 involved development of small-scale "toy models" in one and two dimensions to investigate some of the basic dynamics of crime pattern formation, concentrating on the burglary as simplest crime system involving mobile criminal offenders and stationary targets (i.e., houses). Phase 2 models are scaled-up versions of the toy models. We have also sought to parallelize the discrete computational code to allow very large spatial models to run on Beowulf-type clusters.

Our working discrete models investigate feedback between burglary events and the probability that a given site is re-victimized. Simulated offenders bias their motion within an environment towards locations that have high victimization probabilities. If burglaries do not occur repeatedly at a location then the probability

of burglary decays towards some environmental constant. These models generate rich patterning with significant points of comparison with both null expectations and real crime data from Los Angeles and Long Beach.

Analytical work has concentrated on derivation of continuous partial differential equation models (PDE) based on the assumptions of the discrete models. We have conducted preliminary stability analyses to assess what parameter conditions are sufficient disrupt equilibrium crime distributions and generate stationary non-equilibrium patterns.

Recent Research Findings:

Our most significant finding to-date concerns the temporal distribution of repeat burglaries at individual houses. It is well known that if a house is burglarized that there is a much higher probability that it will be re-victimized and that this repeat event is most likely to occur within a short interval of time. Our initial small-scale models tested the null hypotheses that such repeat victimization patterns could be generated by (1) simple combinatorial constraints of the time samples and (2) the "spatial friction" associated with simple two-dimensional random walks, the connection here is between repeat burglaries and the return times of simple random walks. Comparisons with real data from Long Beach show that there are significant deviations between the real temporal patterns of repeat victimizations and the null models. In particular, there are more repeat burglaries over short time intervals than would be expected on the basis of combinatorial constraints alone and that there are fewer than would be expected simply on the basis of "spatial friction". Our discrete models go on to hypothesize that there were "attractive" and "repulsive" forces that combined to bring burglars back to specific houses for re-victimizations over different time horizons. Our simulations generate deviations that match the empirical evidence.

It was also clear from exploratory simulations of the baseline models that attractive and repulsive forces were sufficient to generate complex, spatially clustered patterns of burglary (in addition to the expected temporal pattern). Our scaled-up discrete and analytical models provide some insights into how spatial crime patterns may emerge out of relatively simply agent dynamics. In particular, our work to-date has shown that the discrete model dynamics can be accurately described as a continuous reaction-advection-diffusion system and that there are with characteristic length scales to this system (Figure 1). Preliminary indications are that this is a linearly stable system.
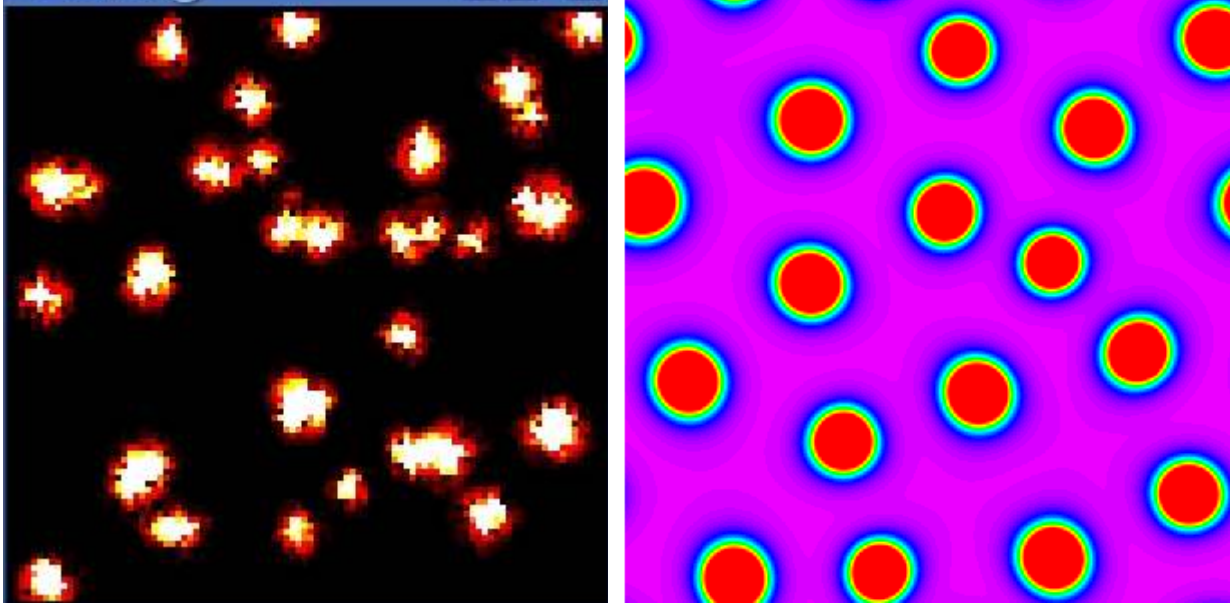
Figure 1. Discrete (left) and continuous (right) models of residential burglary. Both models assume that successful burglaries enhance the probability of that offender will return to a site creating a feedback that is amplified into burglary. Statistical comparison of the models is currently underway.

Challenges and Opportunities:

This project has generated research opportunities at all levels of the UCLA system.

A new postdoc, Martin Short (PhD Arizona), joined the project in 2006. Martin is a specialist in PDE models of reaction-diffusion systems and swarms. His work has been instrumental in pushing forward the analytical components of the project.

A new graduate student Paul Jones (Math, UCLA) has joined the project in 2007 and has started to develop a PhD thesis centered on the impact of different police patrol patterns of crime pattern formation. Paul has a background in probability and computational math.

Eight REU students, funded through the UCLA Math Department, worked on the "crime project" during Summer 2007. One group worked on parallelization of the discrete computational model. Two other groups worked on simulating the time dynamics of residential burglary and the effects of spatial constraints on offender mobility, respectively.

This NSF funded project was also central to a workshop, Crime Hotspots: Behavioral, Computational and Analytical Modeling, held at the Institute of Pure and Applied Mathematics, UCLA, between 29 Jan-2 Feb 2007. The workshop involved 25 invited speakers from local, national and international research institutions. An additional 50 registered participants joined the workshop representing students, researchers and the law enforcement community. This workshop provided an ideal environment to showcase the theoretical and methodological approaches of the current project. More information is available at http://www.ipam.ucla.edu/programs/chs2007/

Project Title: The Dynamics of Probabilistic Grammar

                              Proposal #: IIS-0624345
                              HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Joan Bresnan, Stanford University
Co-PIs: Daniel Jurafsky, Michael Ramscar, Thomas Wasow (Stanford)
Collaborators: Susanne Gahl (Chicago), Consultant on grant, **Post-doctoral collaborators:** Misha Becker (North Carolina), Alan Bell (University of Colorado), Vivienne Fong (Stanford), Marilyn Ford (Griffith, Australia), Jen Hay (Canterbury, New Zealand), Barbara Hemforth (Paris V, France), Florian Jaeger (Rochester), **Student collaborators** (at Stanford, except where mentioned): Inbal Arnon, Scott Grimm, Susannah Kirby (North Carolina), Anubha Kothari, Sander Lestrade (Radboud, the Netherlands), Marie-Catherine de Marneffe, Gorkem Ozbek, , Uriel Cohen Priva, Gabriel Recchia, Nick Romero, Tyler Schnoebelen, Neal Snider, Kirsten Thorpe, Harry Tily, Daniel Yarlett

Research Goals:

1. Study probabilistic change in higher-level linguistic choices across time and space
2. Study interactions of low-level pronunciation choices and high-level grammatical choices
3. Study language learning across the human life cycle, modeling different behavior of children and adults

Thematic Areas:

1. Human sentence production
2. Human word production
3. Human language acquisition

Methodologies:

Rich transcription and labeling of conversational corpora
Multiple regression on phonetically transcribed corpora
Judgment studies of sentence acceptability
Artificial language learning studies
Eye-tracking in visual world paradigm (still in planning stage)

Recent Research Findings:

Toward goal 1, we have the following results:
       • Speaker judgments of acceptability match closely the predictions of a corpus-based model of construction preference in the dative alternation (Bresnan, in press)
       • Bresnan's model of the dative alternation generalizes to New Zealand English, except for a subtle difference in the role of animacy (Bresnan & Hay, in press)
       • Omission of *that* in subject relative clauses in dialects that permit such omission is influenced by predictability in the same way as omission of *that* in non-subject relative clauses in standard English (Jaeger & Wasow, to appear)

Toward goal 2, we have the following results:

    • Content and function word durations are affected differently by their frequency and predictability, supporting the view that content and function words are accessed by different production mechanisms. (Bell, et al, 2007)

    • The duration of function words introducing object phrases after dative alternation verbs is longer if the construction used is not the more predictable one (Tily, et al, 2007)

    • Changes in the pronunciation of vowels in New Zealand English are sensitive to subtle aspects of the meanings of the words in which they appear (Hay & Bresnan, 2006)

    • With some interesting differences, Gahl & Garnsey's work on read speech generalizes to spontaneous speech: pronunciation reflects predictability based on syntactic probabilities (Gahl & Jaeger, in prep).

Toward goal 3, we have the following results:

    • Children show increasing mastery of irregular plural forms simply by producing erroneous over-regularized versions of them (Ramscar & Yarlett, in press)

    • By manipulating the timing and sequencing of color adjectives (pronominal vs. postnominal) we have shown how their probabilistic patterns of acquisition in English can be explained and predicted by basic learning mechanisms (Ramscar, Thorpe & Denny, 2007; Ramscar & Yarlett, in submission), and how the different constraints affecting child and adult learners are affected by prefrontal development (Ramscar & Gitcho, 2007).

    • The dative alternation in child language is exhibits similarities to as well as interesting differences from its pattern in adult language (de Marneffe, et al, 2007)

Challenges and Opportunities:

Our grant did not begin until the middle of the past academic year. A few months into it, Stanford hosted the Linguistic Society of America's Institute. Bresnan, Gahl, Jurafsky, and Wasow all taught courses in the Institute, and were heavily engaged with other Institute activities. In particular, Jurafsky was on the Institute organizing committee, and Bresnan delivered one of the major invited addresses. Many of the graduate students involved in the project were serving as teaching assistants in the Institute, and took courses as well. As a result, very little research on this project took place during the month of July, normally one of the most productive times of year for academic researchers. We hasten to add that the challenge presented by the competing time demands of the Institute was compensated for by the opportunity for stimulating interactions with linguists from around the world who came to Stanford for that month.

Given the late start and the interruption during July, much has already been accomplished. Moreover, numerous studies are in progress, including investigations into the role of priming in construction choice and an extension of our work on prediction and sequencing in color adjectives to number set terms. We are also beginning to use head-mounted eye-trackers in our work. A planned study will see whether verb biases will induce anticipatory eye movements to pictures of what is the more likely next noun.

Project Title: Collaborative Research: DRU Consumer Choice and Organizational Decision-Making

Proposal #: SBE-0624269
HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Marco Castillo, Georgia Institute of Technology
Co-PIs: Laurie Garrow, Pinar Keskinocak & Julie Swann – GA Tech
Collaborators: Wedad Elmaghraby – University of Maryland

Research Goals:

1. Validate theories of human behavior by developing real-world experiments and by examining naturally occurring experiments in three industries.
2. Incorporate individuals' strategic behavior into firm decision-making and understand the interactions and linkages between the strategic behavior of individuals and firms.
3. Extend flexible discrete choice models to incorporate individuals' strategic behavior without imposing strong identification assumptions.

Thematic Areas:

1. Decision making, risk, and uncertainty
2. Integration of individuals' strategic behavior into firm decision-making

Methodologies:

A wide range of methodologies are being used and explored for this study including game theory, dynamic programming, dynamic discrete choice models, behavioral and experimental economics. The methodologies incorporate ideas developed in fields spanning groundwater flow, transportation, marketing science, and behavioral economics.

Recent Research Findings:

During the first six months of the project, we developed a model of search and purchasing behavior that is flexible enough to incorporate heterogeneous tastes over alternatives together with when and how intensely to search for alternatives. The model is flexible enough to include issues of cognitive difficulties, inconsistency on time preferences, heterogeneous expectations and myopia.

The model development is being supported by several synergetic research activities and data collection efforts with researchers from Europe, the Boeing Company, and Sabre Solutions/Travelocity (independent from this NSF-funded research). The data will be used to develop more realistic baseline assumptions (such as the distribution of prices in the market) and to empirically validate model results. For example, the data shows that in some markets prices rise close to departure date while in other markets prices fall.

Challenges and Opportunities:

This model is important because it extends search models to the case were the distribution of alternatives is not stationary, i.e., airline ticket prices vary with time. The context of non-stationary prices is important because it will provide additional sources of identification of behavioral rules that have not been explored in other contexts, such as job search models.

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

            Proposal #: NSF-HSD SES-057720
            HSD Emphasis Area: Agents of Change

Lead PI: Christopher Chase-Dunn, Institute for Research on World-Systems, University of California-Riverside;
Co-PIs: Peter Turchin, University of Connecticut and E.N. Anderson, University of Caliifornia-Riverside

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 4000 years.

The main purpose of this project is to explain growth of cities and states since the Bronze Age. 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. Our first task is to develop an inventory of "upward sweeps" in which the quantitative scale of the largest cities and empires in regions doubled. These are the cases of great expansion that must be explained in order to understand the long-term growth trend. Examples are the rise of the neo-Assyrian empire, and the Persian Achaemenid dynasty. These empires were quantitatively much larger in terms of territorial size that earlier polities had been. The overall picture of upward sweeps in three world regions will be presented at the NSF-HSD PI Meeting in 2007.

Project Title: HSD: Agent-Based Dynamics of Social Complexity: Modeling Adaptive Behavior and Long-Term Change in Inner Asia

Proposal #: 0527471
HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: Claudio Cioffi-Revilla, George Mason University, Fairfax, VA, USA
Co-PIs: Sean Luke, Dawn C. Parker, George Mason University; and J. Daniel Rogers, William W. Fitzhugh, William Honeychurch, Bruno Frohlich, Paula DePriest, The Smithsonian Institution National Museum of Natural History, Washington, DC
Collaborators: Chunag Amartuvshin, Mongolian Academy of Sciences, Ulanbataar

Research Goals:
(1) To develop, test and disseminate a new interdisciplinary theory of long-term societal change and adaptation to complex and evolving social and physical environments, a "generative" theory formalized by a spatial multi-agent computational model; (2) to contribute to the shared understanding of social complexity across the social sciences by integrating concepts and principles within the proposed theoretical framework and research methodology; and (3) to produce and disseminate new interdisciplinary data resources created by this project, such as a new long-term dataset and diachronic atlas of Inner Asian polities.

Thematic Areas:
Origins of social complexity, emergence of governance and inequaltiy, evolution of socionatural systems, long-term adaptation, cross-cultural interaction dynamics, sustainability, societal adaptation to natural change, Xiong-nu, Mongol empire

Methodologies:
Social computational simulation, agent-based modeling, geographic information systems (GIS)

Recent Research Findings:
Since our last report in December, 2007, we have marked progress by developing a new chronology for Inner Asia (systematic periodization did not exist prior to this project), an original data set of polities for the region of interest, and several (uncalibrated) agent-based models that form the basis for further development and cross-level integration as we complete the project to meet the stated goals. Dissemination has taken place through several publications and conference papers. These are other items will be detailed in our poster for the October conference, in preparation.

Challenges and Opportunities:
Our team has grown to approximately twenty members (not counting collaborators in Mongolia), because of interest and excitement with the project and access to new facilities (in fall 2006 we obtained new space for the Center for Social Complexity, GMU/Fairfax). Coordinating this large group in the most productive way remains challenging but experience is accumulating and we hope to overcome existing challenges. Some additional funding for Dr. Maksim Tsvetovat (GMU), who has been contributing gratis, as well as some restored funding for the Smithsonian team would help a great deal since most of SI co-PIs are unfunded but participate actively.

Project Title: Societal Implications of Individual Differences in Response to Turbulence: The Case of Terrorism

Proposal #: CMS-0624165
HSD Emphasis Area: AGENTS OF CHANGE

Lead PI: Roxane Cohen Silver, Department of Psychology and Social Behavior
University of California, Irvine
Co-PIs: George Shambaugh, Department of Government, Georgetown University
Richard Matthew, Dept. of Planning, Policy & Design, Univ. of California, Irvine
Collaborators: Michael Poulin, University of Michigan, Scott Blum, University of California, Irvine
Bryan McDonald, University of California, Irvine

Research Goals:

1. To link psychological research on individual and group responses to traumatic life events to social science work being conducted on the security implications of global change and its effects on democracy. We believe it is important to weave these two strands of research together to investigate the extent to which individual responses to traumatic events and perceptions of global threats may evoke different political responses that in aggregate can influence democratic values, institutions and practices.
2. To evaluate the political impact of the ongoing psychological response to terrorism. What is the impact of ongoing fears of terrorism on the public's willingness to support vs. resist anti-terrorism measures?
3. To explore the relationships among (a) aging and age cohorts; (b) individual interpretations of and responses to security-relevant forms of global turbulence and transformation; and (c) social and political outcomes such as changes in support for or protest against the use of force abroad, attitudes towards surveillance at home, and one's level of trust in government.

Thematic Areas:

1. Transnational threats in general and global terrorism in particular
2. Individual responses to traumatic experiences in general and responses to a collective trauma such as a terrorist attack in particular
3. Collective public policy impact of individual responses to terrorism (e.g., support for the use of force, conscription, and other security-related issues)

Methodologies:

Using an anonymous Web-based survey methodology, we have collected data on a nationally representative sample of US adults (N=1613, 73.5% response rate) during a 3-week period (December 28, 2006 - January 18, 2007). The study sample were adult members of a nationally representative, Web-enabled research panel established by Knowledge Networks, Inc. (KN) who were randomly selected from those individuals who had been on the panel for under six months and invited to participate in our research. The KN panel is developed using traditional probability methods for creating national

Project Title: The Recovery Divide: Sociospatial Disparities in Disaster Recovery from Hurricane Katrina along Mississippi's Gulf Coast

Proposal #: CMS0623991
HSD Emphasis Area: Decision Making Under Uncertainty

Lead PI: Susan Cutter, University of South Carolina
Co-PIs: Jerry Mitchell (University of South Carolina), Walt Piegorsch (Arizona), Mark Smith (University of South Carolina), Lynn Weber (University of South Carolina)

Research Goals:

Recovery from disaster is a social and physical process involving the restoration of communities and the natural environment. The differential impact of a hazard event coupled with the underlying social vulnerabilities of communities work in tandem to influence the rate and extent of disaster recovery. This project uses Hurricane Katrina and its impact on Mississippi's Gulf Coast to understand those factors that influence the rate of recovery in the region, but more importantly, the potential inequalities in the process. Two primary areas of focus include:

1. Does the social transformation of the landscape (post-disaster) follow the same socioeconomic trajectory (pre-disaster) or is the trend offset by the extreme event and a new trajectory is charted? What factors of place-based vulnerability hinder or help recovery from disasters?
2. How will Hurricane Katrina change the demographic face of the Mississippi Gulf Coast? Will previous socio-geographic patterns be maintained or will the large-scale evacuation and rebuilding efforts lead to a new demographic profile and spatial footprint with subsequent changes in diversity and equality?

Thematic Areas:

disasters research, human-environment interactions

Methodologies:

This project employs a multi-method approach, described below.

1. Establish Pre-Katrina Baseline on Social, Built Environment and Hazard Vulnerability
   Using statistical data from the 2000 Census and any updates, a baseline year for social, built environment and natural hazard vulnerability (pre-Katrina) is underway. The social vulnerability index has been computed for each of the three counties. Following similar procedures, a built environment index has also been constructed. Utilizing data derived from SLOSH modeling, mapping of damages by FEMA, and in situ observations, we have developed a fairly accurate representation of the natural system vulnerability immediately prior to and after the storm.
2. Develop Historical Narrative on Antecedent Conditions and Punctuated Trajectories
   A historical narrative is being produced that examines the transformation of the Mississippi coast from a rather pristine natural barrier island habitat to the modern tourist and gambling center that dominated the region in 2005. The principal methodology employed for the historical component of this project is empirical documentary research. An extensive secondary literature search concerning the history of hurricanes specifically and natural disasters generally for southern Mississippi was conducted. Ongoing work seeks to a) identify the principal disasters and hurricanes that impacted the region; b) identify

primary sources pertaining to each event; and c) construct micro-histories of the impact of each event. Newspaper accounts, diaries, letters, and personal reminiscences have yielded some information; official reports by governmental agencies as well as congressional reports yielded a great deal of relevant information, especially for Hurricane Camille.

3. Determine Social Trajectory and Changes using Benchmark Analyses
   A benchmark approach will be used to assess historical rates of disaster recovery and to forecast the ability of a locality or the region to recover from an adverse event such as this. A hindcast risk model will be built using annual population data, building permits, and historical data. These data establish a benchmark risk profile of the region prior to 2005 and are used to estimate how long it may take to repopulate or economically rebuild the region to pre-Hurricane Katrina levels.

4. Forecast Spatial and Temporal Change
   Repeat site visits to monitor recovery progress will be made at 6-month intervals for the duration of the project. Satellite imagery and ancillary data will be used to monitor built environment changes on the landscape. This will be supplemented with an in situ photographic record of change that began in the initial post-impact period. Acquisition of demographic data through local municipalities (if available) or through surrogate indicators, or in situ observations will be used to gauge changes in the demographic composition of the case study communities during the study period.

5. Decision-making and the Role of Inequalities in Shaping the Recovery Process and Future Trajectory
   The community-based, qualitative research component is in a foundational phase in anticipation of identifying the specific communities to be examined. During this phase we have been developing interview protocols for key leaders and community members, seeking IRB approval, gathering contact information, reading and gathering information on the political, economic, and social structures along the coast.

Recent Research Findings: (by Method #)

1. In progress; we are currently comparing our surge output with that of other teams along the coast.
2. The research indicates that the impact of Hurricane Camille will lend itself most readily to comparison with Katrina. Perhaps the most important finding to date concerns the ways in which federal disaster relief in the wake of Camille for southern Mississippi was braided with important questions concerning civil rights, especially school desegregation. The second main finding concerns the respective roles of private enterprise and the role of the state in sponsoring and facilitating recovery after Camille. State and federal aid outweighed private assistance in the immediate aftermath of Camille but the role of private enterprise in amelioration after Katrina suggests a definite shift in the importance of private companies and industries in disaster mitigation.

3, 4, 5. None to report.

Challenges and Opportunities: (By Method #)

1. 3, 4. None
2. Trying to understand the impact of hurricanes on the region and its populations prior to 1860 has proven challenging simply because the source material is stingy and terse. More recent events are better documented and provide the best historical opportunities for comparison with Katrina.

5. Several opportunities for collaboration with other social science researchers and evacuees have arisen. We have consulted with Shirley Laska and Pam Jenkins (University of New Orleans) on long-term community studies they are conducting in Louisiana. Co-PI Lynn Weber is also a Senior Analyst for the SSRC's Research Network on Persons Displaced by Katrina.

Project Title: Temporal Dynamics of Phonological Expectations in Language Comprehension and Development

Proposal #: 0433567
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Delphine Dahan, Univ. of Pennsylvania
Co-PIs: Daniel Swingley, Univ. of Pennsylvania
Collaborator: Bob McMurray, Univ. of Iowa

Research Goals:

1. To determine how listeners adapt to systematic variation in speech signals by taking advantage of regularities at multiple levels of analysis.
2. To determine how infant language learners use the information available to them at their specific developmental level in order to acquire new knowledge of language sound structure.
3. To determine how information in the speech signal is interpreted over time, as it is heard, by infant and adult listeners.

Thematic Areas:

1. Speech perception and interpretation.
2. Learning and adaptation. How information available to the learner is integrated into existing knowledge.
3. Dynamic cognitive processing. How both infants and adults change in how they interpret information (speech, in our studies) over time, evaluated over several timescales.

Methodologies:

Eye-tracking during language comprehension;
Teaching children and adults new words or sets of words to evaluate how learning proceeds;
Perceptual adaptation to distorted or otherwise modified speech signals.

Recent Research Findings:

A number of new studies conducted with HSD funding have examined listeners' adaptation to speech signals altered in some systematic way. These studies help us to understand not only the adaptation process itself, but also basic processes of language understanding. One set of experiments tested interpretation of accented words, where in a certain phonological environment (before the "g" sound) the vowel was changed (an accent that exists in parts of the northern US). Listeners exposed to this accent rapidly optimized their interpretation of the talker. For example, upon hearing the vowel of "back", listeners rapidly ruled out that the talker might be saying "bag", implicitly (probably unconsciously) realizing that if she had said "bag", the vowel would have been different. These studies show for the first time that interpreting accents is not simply a matter of "correcting" the talker's speech to match our own dialect. Rather, interpreting accents requires a systematic reconfiguration of our expectations about how a word would sound if the talker said it -- possibly using a kind of mental simulation process.

One of the tasks children face in learning language is to grasp the sound structure of language. In some languages, such as Dutch, an acoustic feature that is easy to hear (like very long vowels, or large pitch changes) might specify which word is meant; in other languages, such as English, the same feature might say which word is being emphasized; in still others, it might say whether the whole utterances is a question or statement. How do children learn to assign these features the appropriate linguistic function? We have completed a series of experiments asking this question using vowel duration, which works differently in different languages. We found that Dutch one-year-olds reliably consider vowel duration to signal different words (for a Dutch baby, a tam is not the same thing as a taaam), whereas American-English one-year-olds do not (a tam is a taaam). Similarly, Dutch toddlers find a word like "paard" (horse) hard to understand if we shorten the vowel ("pard"), while English toddlers are indifferent to such changes. These studies are the first to examine the question of how it is that very young children begin to interpret acoustic features that are easy to perceive, but that signal very different kinds of linguistic structure in different languages.

When learners are taught a set of items (words, object categories, arbitrary shapes), learning is usually more difficult when the items are similar to one another, because of interference in memory. We have discovered that in word learning, interference effects depend on the temporal structure of the similarity among items. Thus, for example, learning "baf" and "bav" results in confusion, while learning "vid" and "fid" does not, or much less. This appears to be a consequence of listeners' on-line interpretation of the words: while hearing, for example, "baf", the listener thinks of both "baf" and "bav", resulting in greater confusion in memory. While hearing "vid", the early incompatibility with "fid" precludes competition. We have found related effects in the interpretation of familiar words: after hearing a word like "carriage", listeners still reveal effects of thinking "carrot" -- because of the early temporal overlap of these words. These results show that consideration of the temporally extended nature of speech is important in understanding which words are most easily learned and comprehended. In speech, words are not perceived as static objects, and humans do not recover from early interpretation errors optimally.

Challenges and Opportunities:

Our work has helped set the agenda for future research on perceptual learning and adaptation in speech. Now that we know that adaptation requires more than simple adjustment of a talker's speech, it is important to determine the full scope of listeners' abilities: under what conditions is adaptation possible? How much generalization is possible given a certain set of experiences with an accented or distorted speech sample? In the case of children, how does the language that children hear in infancy provide the "raw materials" for their effective categorization and interpretation of speech? To help answer these questions, we are proceeding on multiple fronts: creating corpora of annotated infant-directed speech for computational modeling; performing additional perceptual experiments with infants and toddlers; and testing adult learning of novel sound-based categories and regularities using both speech and non-speech signals.

Project Title: Understanding Linkages Among Governance Factors of Linked Social and Ecological Systems

Proposal #: 0527304
HSD Emphasis Area: Agents of Change

Lead PI: Tracey Dalton, Marine Affairs, University of Rhode Island
Co-PIs: Graham Forrester, Natural Resources Science, University of Rhode Island
Richard Pollnac, Anthropology and Marine Affairs, University of Rhode Island
Pamela Rubinoff, RI Coastal Resources Center
Bette Erickson, Instructional Development Program, University of Rhode Island

Research Goals:

(1) Understand how governance factors related to complex, dynamic marine ecosystems are linked to effective resource allocation;
(2) Identify natural science and social science factors that influence success of marine reserves;
(3) Explain why some reserves are more successful than others in enhancing environmental quality and institutional sustainability;
(4) Build sustainable working relationships among researchers in traditionally distinct disciplines and enhance interdisciplinary research skills; and
(5) Share key success factors with managers responsible for designing and monitoring marine reserves.

Thematic Areas:

Research that integrates across disciplines is critical to understanding the complex relationships among elements of linked social and ecological systems. Through an interdisciplinary analysis of marine reserves in the Caribbean, our research identifies factors critical to successful governance of coupled social and ecological systems, explores relationships among these factors, and examines how factors that operate at different spatial and temporal scales affect the performance of marine reserves. In this study, an integrated team consisting of a marine policy scientist, an ecologist, and an anthropologist together with several research assistants is conducting a systematic survey of governance factors at marine reserves in the wider Caribbean. We are examining the relationships among formal and informal governing arrangements linking humans and natural resources (i.e. capacity, stakeholder involvement, compliance, adaptive management, participatory monitoring, 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).

Methodologies:

For each marine reserve and its associated communities, we use well-established research techniques developed in the fields of cultural anthropology and marine ecology to conduct a rapid appraisal of the social, institutional, organizational, and biological conditions of the area. To date, we have visited nineteen marine reserves and 33 communities associated with the reserves. We spent about 5-8 days at each marine reserve site. At each site, we collected relevant reports and statistics from regional and local government offices. We examined the legislation or local ordinance establishing the reserve and other relevant legislation and management documents. We conducted over 125 semi-structured interviews with key

informants to elicit their perceptions and insights about the reserve. We also conducted over 1100 structured surveys with local community members who are familiar with the marine reserve.

SCUBA divers measured ecological variables using well-established methods for surveying coral reef habitats. The specific protocols used either follow exactly, or are slight modifications of, protocols used by two major reef monitoring programs in the Caribbean, the Caribbean Coastal Marine Productivity program (CARICOMP) and the Atlantic and Gulf Rapid Reef Assessment program (AGRRA). Use of survey methods similar to those in use by CARICOMP and AGGRA ensures that our data will be comparable to these large, pre-existing, regional databases and pre-existing ecological data from some marine reserves. At each site, we performed surveys at two locations, inside the marine reserve and at a nearby control location outside the marine reserve. To date, we have conducted over 350 benthic and coral transect surveys, over 130 roving fish counts, and over 650 fish transect surveys.

We plan to visit an additional ten marine reserves and their associated communities within the next year.

Recent Research Findings:

Preliminary analyses have focused on one particular governing arrangement, stakeholder participation in reserve planning and management. Using data from over 500 structured interviews with individuals in Belize and Honduras who live in communities associated with marine reserves, we examined how stakeholder participation relates to reserve performance. We found no difference in perceptions of overall reserve success between those who participated and those who did not, but there were differences in perceptions of more specific measures of success. For example, those who participated were more likely to think that the reserve brings financial benefits to the local community. Analyses of responses from only those individuals who had participated in reserve planning and management indicated that specific features of the process were related to different perceptions of performance. For example, participants who thought that it was clear how decisions were made during reserve planning and management were more likely to think that conflict in the community had declined since the reserve was established. Our results highlight the complex nature of stakeholder participation in reserve management.

Challenges and Opportunities:

There are research challenges: (1) Avoiding compartmentalizing the research so that each team member attends only to the components related to his/her specialty; (2) Becoming conversant enough with our colleagues' disciplines to engage in intelligent dialogue; and (3) Coordinating biological and social data collection for each site when some reserve sites are associated with more than one community and some reserve sites are located off-shore.

There are also opportunities: (1) Observing how data is collected in other disciplines; (2) Gaining a better understanding of our colleagues' disciplines; (3) Conducting multivariate statistical analyses that integrate data from all disciplines involved in the research; and (4) Producing future leaders in systematic, interdisciplinary research-based resource management.

Project Title: The Emergence of Social Attention-Sharing in Infancy: Behavioral and Computational Tests of a New Theory

  Project: SES-0527756
  HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Gedeon O. Deák, University of California, San Diego
Co-PIs: Jochen Triesch and Kang Lee
Collaborators: April Benasich, Andrea Chiba, Hector Jasso, Rebecca Gómez

Research Goals:

1. Test theoretical model of how complex social skills (attention-sharing) emerge in human infancy.
2. Investigate cognitive, perceptual, and social-ecological factors in development of attention-sharing skills, in a mixed longitudinal/cross-sectional desing
3. Develop modeling tools (virtual environments; robotic platforms) to test machine learning models of social-attention skill acquisition; develop testing tools to assess infant social perception and social learning.

Thematic Areas:

1. Developmental Psychology
2. Social Cognitive Science
3. Computational Modelling/Machine Learning

Methodologies:

1. Infant psychophysics: Preferential looking
2. Infant learning; Contingency/expectancy learning; habituation; operant conditioning
3. Infant neuroscience: Salivary cortisol; alpha-amylase
4. Infant social behavior: Cognitive ethnography; normed developmental screenings; parent interview measures
5. Computational modeling: Virtual platform (Performer/OpenGL; DI-Guys; OpenCV); Robotics

Recent Research Findings:

1. An ethnographic study of infant-parent interaction at home has been exploring how social interaction, particularly attention-sharing develop in the first year. Attention-sharing is critical for social learning and language development. The resulting data set includes over 16,000 coded events from 35 infant-parent dyads. To explore how dyads shared attention we conducted sequential analysis of dyadic patterns of attention and action preceding episodes of shared attention. The analyses of show that adults usually watched their infant, or their own hands as they manipulated objects. Infants seldom looked at parents' faces, but watched parents' hands as they manipulated objects. This tendency to watch object use has not previously been reported in studies of infant social development. Its discovery required laborious processing and coding of large amounts (> 1.5 Tb) of digital video of naturalistic interaction. This was done with greater temporal and spatial resolution than previous studies. Parents' specific behaviors were also coded and analyzed to determine which actions tended to attract and re-direct infants' attention. This analysis confirmed that infants did not follow parents' gaze, but watched

them manipulate objects. Further analysis showed that infants' interest in caregivers' hands could provide infants with sufficient input to learn to follow parents' gaze even when parents are not using their hands. This can explain why controlled experimental studies of gaze-following show the emergence of gaze-following ability between 9 and 12 months of age. It also provides the first inductive test of a plausible theoretical account of the emergence of complex social routines and skills in the first year of infancy.

2. In a recent cross-sectional study to support a larger ongoing longitudinal study, n = 15 infants were tested at 6 and 7 months of age to examine individual differences in distribution of visual attention during a potentially mildly stressful social interaction. This study, by UCSD graduate student Kaya de Barbaro, found dramatic individual differences in looking-behaviors. These individual differences were predicted by animal models in behavioral neuroscience, but have not been incorporated in theories or studies of infant attention. de Barbaro used an innovative coding scheme predicted to distinguish vigilant from non-vigilant infants. Extensive analysis of infants' behaviors (during an orientation phase of a new operant social looking procedure) confirmed that three out of four behavioral indices predicted from rodent and monkey studies were highly coherent across individual infants. Most infants showed predominantly high- or low-vigilance behavior across these measures; at least one other looking measure was also related in a coherent way to the vigilance measures. Current work is examining how individual differences in visual vigilance relate to other social behaviors and responses.

3. Computational simulations (by former UCSD graduate student Hector Jasso, PhD, and Jochen Triesch) have tested numerous theoretical and empirical predictions of the theory of infant attention-sharing development. Among the behavioral findings that have been confirmed: infants develop late the ability to follow gaze or points to targets behind them, and that infants are sometimes "thrown off" or distracted by more proximal, distracting visual targets. Among the theoretical predictions made, our simulations find populations of units within in "infant" agent's "brain" that learn to respond both to seeing a "caregiver" look towards a particular location, and to the infant-agent itself planning to look at that location. These units therefore have the response properties of so-called "mirror neurons."

Challenges and Opportunities:

1. Opportunity: Received supplemental award recommendation through NSF's SLC program and the Temporal Dynamics Learning Center (August, 2007).
2. Opportunity: Longitudinal cohort is a unique sample that is providing dense and hard-to-obtain data on individual infants and caregivers. The MESA project has already leveraged NSF-supported progress to explore further data collection. For example, we have started collaborating with Andrea Chiba (Dept. of Cognitive Science, UCSD) to collect saliva samples before and after some monthly home visits and lab testing sessions. These samples will permit assays of catecholamine metabolites that have been shown to modulate (in infants and caregivers) with social stress, and to vary across individual infants and children. Other opportunities will be explored in the coming year.
3. Challenge: Financial, personnel, and time demands of innovative equipment and infrastructure development.

Project Title: Rumor Propagation: Modeling & Testing Dynamic Social Influence Mechanisms

                              Proposal #: BCS-0527371
                              HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Nicholas DiFonzo, Rochester Institute of Technology
Co-PIs: Prashant Bordia, University of Southern Australia; Martin J. Bourgeois, University of Wyoming; Bernard P. Brooks, David S. Ross, Christopher Homan, Rochester Institute of Technology; Jerry M. Suls, University of Iowa
Collaborators: Jason Beckstead, University of South Florida

Research Goal:

To model and understand how rumors propagate over time and across social space.

Thematic Areas:

1. Rumor
2. Dynamic Social Impact Theory
3. Math Modeling

Methodologies:

Two main methodologies are being employed: math modeling and computer-assisted social network experiments in the laboratory.

1.   Math Modeling on Social Networks
Dialogue Model. Based on research on rumor transmission and belief, a mathematical model of rumor transmission was developed that emphasized person-to-person dialogue occurring in rumor episodes; we dubbed this the "Dialogue Model" of rumor transmission. We used this model in a preliminary exploration of rumor propagation and belief patterns over time in artificial and actual social networks.

Belief-Repetition Study. Our modeling activities also led us to conduct an experiment to understand the relation between hearing a rumor repeatedly and belief. Seven different rumors were embedded between zero and six times in narratives that 140 participants read. Participants then rated how believable they found each rumor to be.

2. Computer-Assisted Social Network Experiments

Data from 27 16-person groups were collected at Rochester Institute of Technology, University of Wyoming, and the University of South Australia. Each group read several ambiguous scenarios and communicated via a computer terminal with four other individuals. During each scenario, participants were presented with four alternative statements (rumors) that made sense of the scenario and were asked to discuss which alternative made the most sense. Discussion proceeded over four rounds of communication. For example, participants read a scenario in which a professor was found dead from a gunshot wound. Alternative A stated that the professor was killed by an angry student, B that he committed suicide, C that he accidentally shot himself, and D that he was killed in a robbery attempt gone awry. After reading these alternatives, parti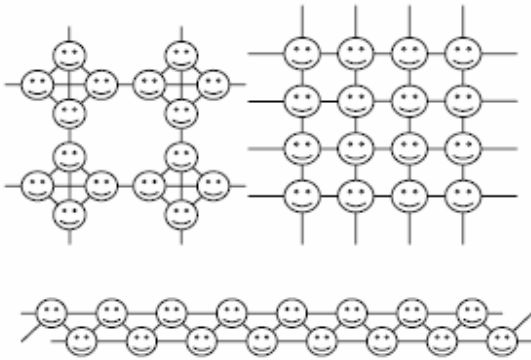cipants indicated privately which of four rumors made the most sense to them and how much confidence they had in that alternative; then they sent and received a message from each of their four neighbors. After each round of messages had been received, they again registered their rumor choice and confidence. Rumor choice and confidence was thus measured four times for each scenario.

Figure 1: Family, Torus, & Ribbon Configurations

The type of social network configuration was varied within-groups. During each scenario the group was configured into torus, "family," "ribbon," or random spatial arrangements. Sixteen-person torus, family, and ribbon networks are diagrammed in Figure 1. Each face here represents an individual and connections are indicated by connecting lines. In the torus network depicted, each individual has four "neighbors"—north, south, east, and west—in a two-dimensionally uniform distribution. The ribbon configuration shows how an individual may be connected to four neighbors aligned as on a street—two across the street and one on either side. The family configuration depicted shows how the majority of one's social interactions may be with one's "family" or local cluster of contacts. Each of the preceding configurations differs in "clumpiness" (segmentation) in that the chances of interacting with some neighbors, as opposed to others, differs dramatically. Families, for example, are the most clumpy. Random configurations, as the name implies, are arranged so that the probability of connections between individuals is random. In addition, in our random configuration, participants were reconnected to four randomly selected persons each round; the effect mimicked what one would experience at a crowded party where the set of people you converse with changes periodically. Random configurations are the least clumpy.

Recent Research Findings:

1. Math Modeling on Social Networks

Dialogue Model. The preliminary exploration offered some support for the validity of our model: rumors that were negative about a rival group spread more quickly and were believed more strongly among one's own group than in a rival group; results dovetailed nicely with empirical research in the area of social identity. This preliminary exploration also highlighted the importance of what we have dubbed the "novelty" factor in rumor propagation: The degree and manner in which the rumor remains "fresh" has a strong impact on the extent and pattern of rumor propagation.

Belief-Repetition Study. Using hierarchical linear modeling techniques, we found that belief in a rumor is logistically related to the number of times the rumor is heard (the rate of belief increase per times heard diminished over times heard). An extension of this study is in preparation that will extend the number of times heard and rule out an alternative relationship.

2. Computer-Assisted Social Network Experiments

We anticipated clumpiness would predict diversity of rumor choice over time. Rumor choice patterns partially accorded with this prediction. The clumpiest configuration, family, did indeed retain diversity over rounds, but all other configurations lost diversity. That is, the family configuration protected against the emergence of rumor majorities and none of the other configurations did so. As a consequence, majorities tended to emerge more when the configuration was not family. The greater segmentation that categorizes the family configuration served to shield participants most from exposure to global majorities.

We anticipated that clumpiness would predict greater confidence in rumor choice. Rumor confidence patterns accorded with this idea. Rumor confidence increased from round 1 to 4 in all groups, but more in torus, ribbon, and family configurations as compared to random. The greater "mixing"—less segmentation—afforded by our random network manipulation appeared to dampen confidence increases.

Rumor clustering is the extent to which homogenous pockets of rumor choice emerge from round 1 to 4; we anticipated that clumpiness would predict rumor clustering. Results accorded with this prediction; clustering occurred for torus, ribbon, and family, but not for random configurations.

These preliminary analyses indicated how different "shared realities" arising from rumors may emerge more among more segmented types of social structures and may remain less susceptible to alteration.

Challenges and Opportunities:

The programming and debugging necessary to produce a useable computer program for the Computer Assisted Social Network Experiment were more difficult than anticipated. This challenge led to composing an even more interdisciplinary team that included computer scientists.

Project Title: Social and Environmental Vulnerability in Disasters: Spatial Analysis and Information Management for Humanitarian Decision Making

        Proposal #: 0624104
        HSD Emphasis Area: Decision Making, Risk, and Uncertainty

Lead PI: Shannon Doocy, Johns Hopkins School of Public Health
Co-PIs: Yuri Gorokovich, Gilbert Burnham, Courtland Robinson
Collaborators: Center for International Earth Science Information Network (CIESIN), Columbia University

Research Goals:

The aims of the research are to improve methods of assessing population risk to natural disasters and to provide information on affected populations to decision makers in the post-disaster relief and rehabilitation context. Specific research goals within these aims include:

1. To establish spatial dependencies and interactions between socio-demographic and environmental variables in order to determine which socio-demographic factors (such as socioeconomic status or patterns of human settlements, etc.) and environmental characteristics (for example distance to coast, slope, aspect, elevation) are related to the degree of and/or types of risk humans face in the context of different types of natural disasters.
2. To determine which socio-demographic and environmental variables show the most significant dependencies and correlations (among those identified in Aim 1) and to assess the relationship between socio-demographic and environmental characteristics in relation to vulnerability in different types of natural disasters.
3. To estimate spatial and analytical uncertainties in an integrated environmental and socio-demographic model and their respective influence on prediction and mapping of vulnerability.
4. To evaluate how models of pre-disaster vulnerability, in particular estimates of populations at risk, can be incorporated into post-disaster assessments in order to derive less biased estimates of disaster impact.

Thematic Areas:

1. Public Heath
2. Physical science and geography
3. Natural disasters and humanitarian response

Methodologies:

The proposed research will be conducted in two phases: 1) an exploratory phase focuses on developing appropriate environmental and spatial risk models and sampling strategies using information from prior disasters, and 2) an implementation phase that would occur during future disasters where models would be refined and applied, and assessments of the disaster-affected populations would be conducted. Currently in the exploratory phase, a literature and historical event review is ongoing, and existing hazard and vulnerability models and techniques from a variety of sources will be explored.

The key element of the proposed research is the integration of physical and GIS based modeling using post-disaster field-based population surveys and pre-disaster spatially distributed demographic data. The innovative element of the proposed research is that it will allow for the evaluation of vulnerability models

based on field survey data from disaster-affected populations. When integrated with modified survey and sample design methodologies, this information can enable post-disaster assessments to be carried out with both pre- and post-disaster population data so that differences in the resulting samples can be compared and overall impact can be characterized with greater accuracy. Survey data that will then be overlaid on physical and GIS based maps and will result in disaster risk models and spatial distributions of the disaster affected populations and select characteristics of vulnerability. These models and findings will provide information to responders that will allow for the identification of groups that need to be targeted in the disaster response by a variety of characteristics such as age, sex, and location. Modeling and post-disaster surveys will be conducted in years two and three (2008 & 2009) of the award.

Recent Research Findings:

We are currently in the exploratory phase of the project which includes a literature review and historical event review of five types of rapid on-set natural disasters including earthquakes, tropical cyclones, floods, tsunamis, and volcanoes. For the historical event review, a summary of the data sources and event criteria is summarized in the table below. Separate data files for each event type are currently being complied and will be analyzed in this phase. Primary outcomes of focus will include spatial and temporal trends, environmental and event characteristics, and predictors of impact in terms of mortality, injury, and displacement.

DISASTER	SOURCE	INCLUSION CRITERIA	# OF EVENTS	# EVENTS ADDED TO DATABASE
EARTHQUAKES (N=1346)	USGS Historic Worldwide Earthquakes	Magnitude 5.5 or greater, 1957 to present	334	334
	EM-DAT: The OFDA/CRED International Disaster Database		695	476
	NOAA-NGDC Significant Earthquake Database		1367	536
TROPICAL CYCLONES (N=942)	EM-DAT: The OFDA/CRED International Disaster Database	Hurricanes, cyclones and typhoons, 1977 to present	942	942
	MMM Tropical Cyclones Database	Tropical cyclones, 1997 to present, category 3 or greater	185	
FLOODS (N=4,864)	EM-DAT: The OFDA/CRED International Disaster Database	1977 to present	2,675	2,675
	Dartmouth Database	1985 to present	3,136	2,189
TSUNAMIS (N= 169*)	EM-DAT: The OFDA/CRED International Disaster Database	1900 to present	59	59
	NOAA-NGDC Tsunami Event Database	Tsunamis from 1900 to present, 2.5 m, definite event with 1+ run-up	128	110
	NOAA-NGDC Tsunami Run-up Database	Tsunami run-ups from 1900 to present, 2.5 m, from definite event with 1+ run-up	2,038	
VOLCANOES (N=322)	EM-DAT: The OFDA/CRED International Disaster Database	1900 to present	198	198
	NOAA-NGDC Significant Volcanic Eruption Database	1900 to 2006	190	124
	Global Volcanism Program	1990 to present	NA	NA

In addition to the historical event review, we are also conducting a structured literature review on natural disaster impact and human vulnerabilities. The literature review focus on immediate effects of rapid onset natural disasters on human populations and will include literature from four databases, gray literature, and reviews of key sources of information within the field such as United Nations documents, ReliefWeb, and literature specific to the humanitarian response community.

	Number of Articles	Number of non-duplicates	Number Screened & Reviewed		
			Title Screening	Abstract Screening	Full Article Review
PubMed	2,747	NA	2,747	1,511	
EM Base	3,763	912	2,851	1,245	
Scopus	5,219	1,957	3,262	1,695	
Web of Science	2,285	1,187	1,098	422	
Total	14,014	4,056	9,958	4,873	

Challenges and Opportunities:

The quality of information available is variable and difficult to verify. In addition, there is limited data on events further back in history which will likely make in-depth assessments of older events more challenging. Conversely, GIS data and land feature data have become available relatively recently as have population density maps; technological developments in these areas will greatly enhance the accuracy and predictive value of models that are developed.

Project Title: Dynamics of Reforestation in Coupled Social-Ecological Systems: Modeling Land-Use Decision Making and Policy Impacts

   Proposal #: 0624178
   HSD Emphasis Area: AGENTS OF CHANGE

Lead PI: Tom Evans, Indiana University
Co-PIs: Kelly Caylor, Burney Fischer, Emilio Moran, Catherine Tucker
Collaborators: Carlos Joly, Ricardo Rodrigues Sergius Gandolfi, Daniel Hogan, Elinor Ostrom, Daniel Hogan, Roberto do Carmo, Mateus Batistella

Research Goals:

1. Identify factors associated with the transition from deforestation to reforestation in Indiana and São Paulo
2. Identify factors that contribute to self-organization and non-government organization (NGO) activities that preserve existing forest cover and facilitate forest restoration
3. Develop and test an agent-based model of land-cover change in specific counties in Indiana and São Paulo with and without regenerating forests

Thematic Areas:

1. Land Cover Change, Land Change Science (LCS)
2. Human-Environment Interactions
3. Landowner decision-making, land management

Methodologies:

GIS, remote sensing, agent-based modeling, forest mensuration, forest ecological modeling, household surveys (land owners), structured and qualitative interviews (land trusts, NGO's)

Recent Research Findings:

The project is in the 9th month of a three year award and does not have major findings to report at this time. We are currently testing survey instruments and will commence social data collection this fall. We have acquired satellite imagery to document changes in land cover and are currently processing those imagery. We expect to have descriptive results and initial modeling results next year.

Challenges and Opportunities:

At this stage of our project, we primarily have basic challenges and opportunities that we anticipate we will encounter as a project proceeds. One basic challenge will be to ***generalizing local level results to larger spatial scales***. Our project includes focused analysis at the county level (unit of analysis parcels/households) as well as general analysis at regional scale (state or aggregations of US counties). We will use the regional scale analysis to put our focus county analyses in a particular context, but we need to develop methods for generalizing local level household dynamics up to regional scales while maintaining the verifiability of our models.

A related challenge is that of ***characterizing agent (landowner) heterogeneity at multiple spatial scales of analysis***. We do not yet know how homogenous our different focus study sites are (we are starting data collection Fall 2007) and the implications of this potential heterogeneity for interactions between decision-makers. We are employing a data collection design that will enable us to assess these interactions, but have not started this datat collection yet. We believe the combination of our empirical data analysis and agent-based modeling will allow us to clearly articulate this dynamic.

From an empirical perspective, we need to ***document historical land cover change at multiple spatial scales*** and because of the timeline focus of our studies we will need to employ multiple satellite products. This is a relativley straightforward challenge, but the solutions are potentially time consuming (labor intensive processing of aerial photography, error assessments of satellite imagery).

Our project includes study sites in Indiana and São Paulo and we will need to compare findings from these two locations to address the theoretical basis for our research (legal contexts that impose constraints on adaptation and innovation related to land management). Our research group (CIPEC – Indiana University) has conducted considerable research along these lines and so we believe we are aware of the pitfalls but expect we will face some unique challenges to clearly relate our empirical findings and modeling work to land-use theory.

Lastly, we hope that we will be able to ***translate the findings from this research into information that will be useful for policy makers***. We are addressing our research from the perspective of complex systems analysis and will be making use of agent-based models. At this time we do not intend to develop graphical user interfaces for our models that would package the model for non-specialist users. However, this may be something we explore in the 3rd year of our project if we have time. However, our project will involve decision-makers at various levels: municipal governments, NGO's, land trusts, households. While participatory approaches were not part of our original study design, we hope to package the results from our research for stakeholders in both Indiana and São Paulo.

Project Title: **Financial Markets as An Empirical Laboratory to Study an Evolving Ecology Of Human Decision Making**

Proposal #: 0624351
HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: J. Doyne Farmer, Santa Fe Institute
Co-PIs: Andrew Lo (MIT), Rosario Mantegna (U. of Palermo), Jon Wilkins (SFI)
Collaborators: David Michayluk (University of Technology, Sydney), Michelle Girvan (U. of Maryland), Fabrizio Lillo (U. of Palermo), John Geanakoplos (Yale), Burton Hollifield (Carnegie-Mellon), Blake LeBaron (Brandeis), Jennifer Dunne (SFI)

Research Goals:
1. Use records of financial trading that contain identity of participants as a laboratory to study social evolution of financial trading strategies.
2. Classify trading strategies and measure their ecological interactions, i.e. classify them as to whether they are competitive, predator-prey, or symbiotic.
3. Track the factors that drive strategy selection through evolutionary time. Does diversity affect properties of price formation, e.g. price volatility?

Thematic Areas:
1. Social evolution.
2. Contextual aspects of decision making.
3. Nonequilibrium models of financial economics.

Methodologies:
This study makes use of a data set in which we have a record of trades that are made as well as who made them. We classify strategies using clustering methods, as well as other statistical and machine learning methods. Ecological interactions are deduced making use of low-level interaction rules (e.g. if a given agent buys a given quantity, how much does this move the price, and how does affect the profits or losses of all the other agents?).

Recent Research Findings:
This project is still in its early stages. We have obtained a data set from the Taiwan Stock Exchange in which we have identities of all trading orders that are placed, with the broker, the account, and the individual making the trade, over a twelve year period. We have done some preliminary analysis and demonstrated that we can classify strategies at statistically significant levels, yielding a taxonomy with hierarchical structure.

Challenges and Opportunities:
This is a highly complex data set, and simply using it is not at all trivial. Our first challenge is to piece the entire data set together and make it usable. Our next challenge is to classify the strategies and understand what the resulting classification means. The goal is to see how the population of strategies evolves in evolutionary time, and what factors drive the change. This is a unique opportunity to study social evolution (involving the descent, variation and selection of decision-making strategies) in a setting where it is possible to draw quantitative conclusions.

Project Title: The Dynamics of Affective Learning

                             Proposal #: 0527267
                             HSD Emphasis Area: Dynamics of Human Behavior, Psychology (Social)

Lead PI: Lisa Feldman Barrett (Boston College)
Co-PIs: Jon Horvitz (Boston College), Christopher I. Wright (Harvard Medical School, Massachusetts General Hospital)
Collaborators: Eliza Bliss-Moreau (Boston College), Peter Balsam (Columbia University)

Research Goals:

1. Document systematic individual variation in the process by which individuals learn that stimuli in the environment are threatening or rewarding (i.e., affective learning).
2. Investigate individual variation in the extent to which people use context to discern the affective value of a stimulus.
3. Link individual variation in affective learning to pre-existing individual differences in affective reactivity.

Thematic Areas:

1. Affective value and learning
2. Individual differences
3. Affective reactivity

Methodologies:

Associative affective learning proceeds when a neutral stimulus is paired with a stimulus of known value and over time, and many pairings, the neutral stimulus comes to acquire affectively valued properties. In the context of this grant, we use a "classical conditioning" paradigm to investigate individual differences in associative affective learning.

Study 1
Study 1 concluded in August of 2006 (N=94). Study 1 utilized a classical conditioning paradigm using 2 neutral CS stimuli (pictures of white European female faces) and one aversive auditory US stimulus(a loud (95 dB) buzzing noise). The experimental paradigm included two phases as proposed in the original study design—an acquisition phase (60 trials) and an extinction phase (50 trials).
Study 1 used self-report measures of individual differences—standard personality and affect questionnaires used extensively in the literature.

Study 2
Given the findings from Study 1 which suggested that the CS was not specifically acquiring value by being paired with a loud aversive noise (although see new results detailed below), we decided that it was

Figure 1: Experimental Contexts
Context A

necessary to change the unconditioned stimulus used in Study 2. We selected a wrist shock as the new unconditioned stimulus.
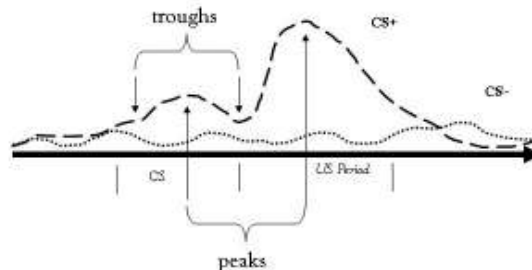
Study 2 investigated not only individual differences in the acquisition and extinction of affective value, but also in the renewal of affective value. Renewal occurs when participants are placed back into the original learning context following extinction, and the acquired affective value of the CS reemerges. To investigate renewal, participants completed acquisition in one experimental context (A), extinction in a second experimental context (B) and renewal in the original learning context (A). (See Figure 1). In addition to self-report measures of sensitivity to value, participants also completed a behavioral/perceptual measure. In this task, participants view a series of movies that depict neutral faces and gradually morph (in 1% increments) into a vivid facial depiction of emotion. Participants are instructed to advance a cursor until they see the onset of a facial expression and then

Context B

to advance to the next trial. Earlier detection of the facial expressions, therefore, is indexes greater perceptual sensitivity to affective properties. (N=45)

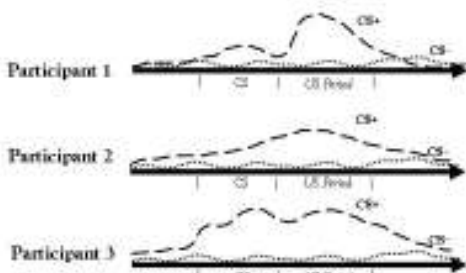**Recent Research Findings:**

Electrodermal activity (*EDA*) is used as the primary dependent variable in most associative affective learning paradigms in humans. The standard for coding EDA in the literature is to identify discrete responses (called phasic responses) which have a clear trough and peak and subtract the EDA for the trough from the EDA for the peak. (See Figure 2) As such, the resultant value reflects the amplitude of the phasic EDA response. Phasic responses must onset after the stimulus onset and be greater than .02 micro-Siemens in order to be considered stimulus specific. Phasic discrete responding of this nature results from a stimulus-driven sympathetic nervous system response. In cases where there is no phasic response, or the response does not meet the criteria described above, the data from that trial is scored as 0 (no learning, or non-usable data).

Figure 2: Typical EDA Points of Interest for Coding

troughs   CS+

CS-

CS   US Period

peaks

The problem with this coding scheme is that only some participants demonstrate phasic EDA responses (Figure 3, participant 1). Some never manifest phasic responses but instead show an increased mean EDA response across the entire trial (Figure 3, participant 2); and even those participants who do generate some phasic responses also show this mean increase (Figure 3, participant 3). Most participants demonstrate this gradual increase in EDA across the course of the CS and US analysis period, suggesting that they have a global sympathetic nervous system reactivity or regulation as a result of the stimulus presentation.

Figure 3: Typical EDA Response Curves

Participant 1   CS+   CS   CS   US Period

Participant 2   CS+   CS   CS   US Period

Participant 3   CS+   CS   CS   US Period

We believed that it was theoretically problematic to discard data from participants whom appeared to be generating affective responses, even if those responses are not phasic in nature. We derived a new method of coding EDA to account for variation in response pattern. Rather than scoring discrete responses, we take measure the mean EDA response for a given analysis period. By taking the mean of the EDA across a

given analysis period, we capture not only the phasic responses, but also global changes in sympathetic reactivity. Identifying individual differences that predict these different response patterns is a goal of future work.

Study 1
Our new analyses (using the coding scheme detailed above) reveal that neutral stimuli *did* acquire affective value over the course of acquisition and attenuate that affective value over the course of extinction, although there were no individual differences in the learning process.

Study 2
Study 2 demonstrated that neutral stimuli acquired value during acquisition, that value was attenuated during extinction, and that value was brought back online during renewal. Participants were significantly more physiologically reactive in response to the face which was paired with the shock as compared to the face which was not paired with the shock, over the course of the entire experiment.

Individual differences in affective learning were related to variation in sensitivity to affective value. Individuals who showed a perceptual sensitivity to affective value also showed clear patterns of acquisition and extinction. This suggests that in order for associative affective learning to proceed, individuals must be perceptually sensitive to the affective properties in their environment. Self-reported sensitivity to affective value (as indexed by Neuroticism and Extraversion) did not predict the pattern of results for acquisition or extinction.

Self reported, but not behavioral, sensitivity to affective value predicted the extent of renewal. Individuals who were low in Extraversion (and therefore high in Introversion which is consistently linked to self-reports of sensitivity to negative information and threat) demonstrated clear renewal effects. In contrast, participants high in Extraversion and thus low in Introversion did not demonstrate renewal effects. Neuroticism did not predict renewal effects. Renewal effects capture the extent to which context influences affective learning because renewed learning occurs when participants are returned to the original learning context. As such, this finding suggests that self-reported sensitivities, and thus sensitivities to which the participants in necessarily consciously aware, predict contextual influences on affective learning.

Challenges and Opportunities:

Our ongoing program of work continues to investigate individual differences in other affective learning phenomena including reinstatement and generalization. In order to more fully explain variation in affective learning, we are constantly trying new measures of individual differences in value sensitivity. This year we will add a measure of interoceptive sensitivity (i.e., sensitivity to one's physiological state) to all of our studies. Additionally, we hope to identify individual differences that predict the variation in EDA response patterns that are detailed above.

Project Title: Dynamics of Human Behavior: Modeling the Dynamics of Dyadic Interactions

                   Proposal #: NSF BCS-0527766
                   HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: Emilio Ferrer, University of California, Davis
Co-PIs: Diane Felmlee, Fushing Hsieh, Keith Widaman
Collaborators: Sy Miin Chow, Dave Sbarra

Research Goals:
1. To develop and compare statistical and mathematical models to analyze dynamic, dyadic systems
2. To identify dynamic patterns of affective processes in dyadic interactions
3. To examine whether dynamic patterns of affective processes are predictive of relationship quality and instability over time

Thematic Areas:
1. Statistical Methodology
2. Dyadic Interactions
3. Emotion

Methodologies:
Data collection methodology involves daily self-report data, questionnaires, and physiological measures (i.e., blood pressure, heart rate variability, impedance, respiration, galvanic skin response). Data analysis methodology involves time series analysis, dynamic factor analysis, differential equation modeling, exploratory non-parametric approaches, small-world network modeling, and survival analysis.

Methodological Findings:
We have conducted a number of analyses aimed at developing methods for examining dyadic interactions. We have investigated the use of state-space modeling (SSM) techniques for fitting dynamic factor analysis models directly to raw data. We have used the Kalman smoother via the Expectation-Maximization algorithm to obtain maximum likelihood parameter estimates. In particular, using Monte Carlo studies we have investigated the finite sample properties of the estimates in SSM when common factors are involved. Our results indicate that the factor loading estimates (i.e., relationship of the factors to the observed variables), transition matrix (i.e., representing the dynamics), and unique variances are asymptotically normal, accurate, precise, and robust, especially for moderate and long time series. The estimates of state residual variances show a positive bias for shorter time series but become accurate and precise with long series.

We have also examined the use of dynamic factor analysis for estimating dyadic interactions with multiple dyads. We have used simple ordinal least squares as the estimation method. Our findings are positive about the use of such methods but rely on strong statistical assumptions that are rarely met with empirical data. Our current analyses deal with these very issues of stationarity, factorial invariance (both over time and across dyads, parameter estimates and standard errors, missing data and subsequent sample selection, and external variables).

We have also studied the use of exploratory non-parametric approaches based on computational modeling applied to each couple. These methods provide with intuitive information about the dynamics for each person and dyad and serve as an initial step for building a model of dyadic interactions.

Findings about Dyadic Interactions:
One of our goals in the first set of analyses has been to represent intra-individual and dyadic processes. We have investigated the variability in affective experience of individuals in dyads, examining fluctuations over time in affect for each dyad, as well as examining differences in such relationships across dyads. For this, we fitted a number of exploratory and confirmatory models to data from all dyads and separately to each dyad separately. Our main objective here was to generate sample results based on information from each dyad.

We found that the daily fluctuations in emotional experiences show a clear, strong and consistent structure with a robust discrimination between positive and negative affect (general and specific-domain) and between the two individuals in the dyad. This was true for both the aggregate analyses and the individual dyad analyses. When fitting our PFA models, we used an exploratory approach in which we specified the expected number of factors and a target matrix guiding rotation to simple structure. The results indicate that the data are very much in line with such a specification, with very small cross-loadings of manifest variables on unintended factors.

With regard to the time series part of the model, our results suggest that most of the dynamics in the factors (i.e., positive and negative affect) are not predicted by the trait-like autoregressive part of the model that represents stability of affective experiences from one day to the next, but rather are the result of random shocks to the system that varied from day to day. Moreover, the dynamics appear to be moderate in magnitude and due almost solely to autoregressive influences of each factor at one time to the same factor at the next time, with a virtual absence of cross-lagged influences among factors within or between the individuals comprising a dyad. Based on these estimates, one would conclude that positive affect and negative affect have little in the way of mutual influences and that males and females within dyads have affective experiences that have little interconnection.

When the model is fitted to each dyad separately, however, the results reveal substantial variability in such dynamics across dyads. That is, although some dyads reveal little prediction in dynamics over time, other dyads exhibit very strong and systematic dynamics. When looking at the differences across dyads, important patterns are apparent. For certain dyads, lagged influences between factors over time are very large, suggesting that positive and negative affect have clear effects on each other, both within persons and, importantly, between persons comprising a dyad. These results confirm everyday phenomenology, in which our affective states seem to influence one another and we engage in interactions with those close to us that produce affective reactions in both partners to the interaction.

Overall, these results suggest that modeling dynamics for all dyads – or, in general, all individuals – appears to be an unreasonable approach, one that is likely to mask inter-individual differences across dyads in affective dynamics. The aggregate approach assumes a priori that all dyads have a similar pattern of variability and dynamics and, moreover, cannot adequately represent the dynamics for any particular dyad if the dyad departs from the norm or average. Because of this failure, it seems more reasonable to us to start from the information from each individual dyad and build up to generate results that apply to the sample and, hence, to the population, with results based on the uniqueness of each person's and each dyad's information.

Project Title: Transferring to Regulatory Economics the Risk-Analysis Approaches to Uncertainty, Inter-individual Variability, and Other Phenomena

> **Proposal #:** 0624218
> **HSD Emphasis Area:** Decision Making, Risk And Uncertainty

Lead PI: Adam M. Finkel, University of Pennsylvania Law School
Collaborators: Winston Harrington, Sandra Hoffmann, Elena Safirova (Resources for the Future)
Eldar Shafir (Princeton University)
Scott Ferson, W. Troy Tucker (Applied Biomathematics)
Consultants: Dale Hattis (Clark University), Carl Cranor (University of California, Riverside)

Research Goals:

1. To assess the typical and leading-edge treatment by regulatory economists of several important aspects of how the costs of environmental, health, and safety regulatory programs are estimated – notably uncertainty in total cost, inter-individual variability in the distribution of cost, and the treatment of "de minimus" and second-order effects.
2. To compare goals set and methods used on the "cost side" of the cost-benefit ledger with goals set and methods used by risk scientists to treat uncertainty (etc.) on the risk side of the ledger; formulate and test hypotheses as to why the goals and methods may differ across the two fields.
3. To estimate the distribution of costs, across types of producers, consumers, and households, of two recently-enacted environmental regulatory programs, by building a general-equilibrium model of the intervention and collecting data on expenditures, prices, employment, and other relevant inputs.
4. To explore the effects of uncertainty and variability in cost on the perception of laypeople and experts about the virtues of regulatory programs.

Thematic Areas:

1. Cost-benefit decision-making requires commensurable and nuanced information about both the benefits (risks reduced) and the costs of decision options.
2. Demands (by decision makers and citizens) for improved information about benefits or costs may depend on their awareness of the availability and value of such information.
3. Natural scientists and economists can benefit from a better understanding of how and why each field construes the tasks of quantifying uncertainty and variability.

Methodologies:

1. Literature review of recent Regulatory Impact Analyses (RIAs) conducted by federal environmental, health, and safety agencies, and close analysis of cutting-edge RIAs recommended by key personnel in those agencies.

2. Focused interviews with leading regulatory economists, both in federal regulatory agencies and academia, to explore hypotheses about why they treat uncertainty and variability in cost in the way(s) they do.
3. Construction of a computable general-equilibrium model for each of two recent regulatory interventions.

4. Surveys of laypeople and experts gauging their reaction to hypothetical regulatory programs, with and without information provided on the uncertainty and variability in the cost of the interventions.

Recent Research Findings:

The commencement of this work was delayed during FY 07 as the PI changed his primary academic affiliation. Methods for quantifying uncertainty and variability in health risk continue to improve (the PI currently serves on an NAS/NRC committee evaluating improvements in quantitative risk assessment at the U.S. Environmental Protection Agency). During 2007, there has been a large increase in the scholarly and popular literature about the likely costs of controlling greenhouse gas emissions over the next several decades; anecdotally, it appears that most analysis and commentary on this issue implicitly treats these costs as known with certainty and as uniformly distributed across the population (though perhaps not across the populations of different nations).

Challenges and Opportunities:

1. Economists tend to use different (and multiple) definitions of "cost" in the regulatory context—our preferred definition for this project ("cost is the sum of effects due to a regulatory intervention, both positive and negative, on goods that are traded in markets ") may require careful elaboration.
2. It may be difficult to tease out deficiencies in cost analysis due to lack of data from those due to lack of interest or facility on the part of analysts.
3. The project will improve the analytic basis for making cost-benefit decisions that are better informed by realistic estimates about costs and risks, and that are more responsive to public values and perceptions. The project will also serve as a proving ground for collaborative research among risk scientists and regulatory economists, two groups who work on the same problems but generally do so without direct collaboration.

Project Title: Integrating Risk Analysis and Risk Communication

                      Proposal #: SES-0433152
                      HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Baruch Fischhoff, Carnegie Mellon
Co-PIs: Julie S. Downs, Keith Florig, and Elizabeth Casman, Carnegie Mellon
Collaborators: Wändi Bruine de Bruin, Carnegie Mellon

Research Goals:

1. Build integrated assessments of three domains of risk
2. Identify new problems and solutions, based on expert models
3. Educate other research teams in using the methodology

Thematic Areas:

1. Radiological emergencies
2. Adolescent safety and violence
3. Animal vectors of disease and bioterror

Methodologies:

This project develops and applies the emerging methodology of *integrated assessment* to using the social, behavioral, and economic sciences in addressing complex social problems. The approach recognizes that formal models provide a unique form of insight into complex, unfamiliar settings. In order to be trustworthy guides, such models must be "behaviorally realistic." They must reflect current science about the focal behaviors and capture the substance and extent of expert judgment. If they achieve such realism, these models can then serve as templates for targeted risk communication instruments.

Recent Research Findings:

On radiological emergencies, we examined three critical decisions: (a) whether to provision a shelter, according to Department of Homeland Security guidelines; (b) whether to travel immediately after an attack; and (c) how long to stay in a shelter. In principle, shelters can provide valuable protection after an event dispersing radioactive fallout. For that to happen, however, those shelters need to be properly prepared and used. The expected value of preparations depends on the chances of being able to use a shelter and of its provisions being sufficient. The acceptability of risks from traveling before fallout arrives depends on the benefits that such travel provides (e.g., getting one to a good shelter).

The results of our analysis inform decisions about preparation, immediate response, and ultimate evacuation. The cost of the provisions on DHS's list would be trivial for many individuals, prohibitive for others. Authorities who count on citizen preparedness should reanalyze that expectation and see if they can make things better, with good communication and material support, for those who cannot act on their own. After an attack, authorities will have limited ability to collect, analyze, and disseminate information. They may only be able to identify the blast location, then communicate simple advice for people in broad areas. Investments in finer characterizations (e.g., plume models) may have little practical value, especially compared with investments in helping individuals to grasp and apply these simple rules (e.g., understanding

the risks of traveling in fallout to be with loved ones). Plausible ranges of shielding effectiveness and egress time lead to a wide range of optimal periods for staying in a shelter, in terms of minimizing radiation exposure. Other considerations (Fig. 1) might justify incurring the extra radiation exposure from evacuating earlier. Those pressures might be reduced by well-guided shelter preparations and plans for meeting the needs that impel people to travel (e.g., assured care for loved ones). Empirically evaluated messages are needed to ensure that individuals have the best possible chance of understanding what they are up against, so that they may make sound choices.

We also completed a workshop to explore following similar methodologies in addressing other risks. In collaboration with colleagues at Tsinghua University's Center for Crisis Management Research in Beijing, a team of 4 senior and 3 junior scholars from Carnegie Mellon engaged in a week-long set of activities in Beijing from 11-15 June 2007, the goal of which was to assess the status of risk analysis and risk communication in China as it relates to practical needs of Chinese government and industry, to test a coherent series of lectures intended to serve as a guide for risk managers on integrated risk analysis and risk communication, and to develop a strategy for ongoing collaborative research between Tsinghua and Carnegie Mellon. Our activities included a 2-day workshop at Tsinghua and visits with officials from several government and non-government organizations to give talks or conduct interviews on risk analysis/communication needs. A workshop on integrated risk analysis and risk communication, held on 14-15 June 2007, brought the Carnegie Mellon team together with two dozen Chinese engaged in various aspects of risk management. The workshop was co-funded by NSF-China. These activities come on the heels of a recent initiative by China's State Council to formulate emergency plans throughout the government (including government-owned industry), both across sectors and across levels (national, provincial, county, and local). The need for such plans was laid bare by the 2003 SARS epidemic in which key government agencies were slow to publicize and act on evidence that the disease was spreading, resulting in significant loss of life and economic activity. As a result of this State Council action, government agencies are keen to learn about risk management science and practice.

Challenges and Opportunities:

The Tsinghua workshop presented many challenges in risk communication in China, and a number of opportunities for continuing collaboration, including conducting a series of case studies worked top to bottom. Possible topics for which collaborations are ready include consumer electronics recycling, food and drug safety, and public health.

Additionally, we have the opportunity to conduct a risk ranking across a diverse set of risks. At the workshop, we discussed alternative motivations for doing risk ranking, including mere enlightenment for the risk management community, allocating research attention, and allocating investment in risk interventions. For the last, we discussed the prospects of ranking solutions vs. ranking risks. That is, if you want to maximize the utility of risk management investment, you really want a ranking of interventions by cost effectiveness, across a range of risks. The suggestion was made to see if the Beijing municipal government would be interested in sponsoring a ranking exercise for local public health risks.

Project Title: Understanding Dynamic Resource Management Systems and Land Cover Transitions in Montane Mainland Southeast Asia (MMSEA)

Proposal #: 0434043
HSD Emphasis Area: Agents of Change

Lead PI: Jefferson Fox, East-West Center, Honolulu, Hawaii
Co-PIs: Nicholas Menzies, David Thomas
Collaborators: Benchaphan Ekasingh, Yayoi Fujita, Louis Lebel, Khamla Phanvilay, Janet Sturgeon, Stephen Walsh and Xu Jianchu

Research Goals:

1. To use an environmental entitlements approach to inform economic, demographic, institutional, and cultural data collection at household, district, provincial, national, and international scales on factors affecting land-cover and land-use change in the region.
2. To link economic, demographic, institutional and cultural data to a comprehensive, high-resolution spatial database of land cover in MMSEA developed in a project funded by NASA.
3. To develop cellular automata and agent-based models that utilize the narratives of economic, demographic, institutional, and cultural change within the spatial framework to address "what if" questions concerning hypothesized changes in social and biophysical variables and to increase our understanding beyond the available empirical data.

Thematic Areas:

1. How do interventions planned and executed by national and international development agents affect land-use practices in ways both planned and not planned?
2. How do forces of change affect diversity and equality or inequality among individuals, groups, and nations?
3. How can spatial tools, data resources, and modeling approaches be used to advance our understanding of human/environmental interactions?

Methodologies:

This project built a multidisciplinary team to collect and analyze economic, demographic, institutional and cultural data; and to combine these data with a multi-temporal high-resolution spatial database to develop a narrative of land-cover and land-use change in the region. We are using cellular automata and agent-based modeling to address "what if" questions concerning hypothesized changes in social and biophysical variables and to increase our understanding beyond the available empirical data. The study is geographically tiered, with some broad analysis carried out for the region as a whole and other more intensive and complex analyses conducted for selected subareas.

Recent Research Findings:

In MMSEA shifting cultivation is rapidly giving way to commercial agriculture driven by demand, money and labor. To understand this change the research team adopted a conceptual model of landscape change based on two scenarios: a plantation economy with extensive monocropping of cash crops such as rubber; and a diverse agroecosystem with smallholders producing a variety of crops for consumption and sale. In Xishuangbanna, China, both state farms (recently semi-privatized) and minority farmers conform to the

plantation economy model—monocropping of rubber. One interesting finding is that small ethnic minority farmers appear to be better able to adapt to changing conditions for growing rubber and contracting resources for future production than the cumbersome ex-state farm companies. In northern Thailand, the landscape conforms more to the diverse agroecosystem model producing a variety of crops. Rural people in Thailand, however, are becoming increasingly divorced from farming, and education and consumerism appear to be creating a context where rural people will disintensify, even abandon their land, in favor of non-farm pursuits. In Laos, entrepreneurs have contracted farmers to grow corn, bananas and sugar cane for the Chinese markets. In order to meet the booming demand for rubber, highlanders, usually ethnic minorities, are planting rubber trees on family plots, and turning to relatives in China for advice and to merchants for seeds, grafts, and tapping tools.

Challenges and Opportunities:

Our greatest challenge has been to understand (and model) not only the policies and markets that drive land-use change, but also the ideologies of ethnicity, economic development, modernity, and scientific rationality that almost always underlie state policies and land allocations. Our greatest opportunity has been the ability to build a foundation for a long-term longitudinal study of land cover change in a region undergoing dramatic social, economic, political, and landscape change.

Project Title: Analyzing the Flow of Network-Embedded Expertise in Schools: A Longitudinal Study of Individual and Organizational Change

Proposal #: Collaborative Proposal: BCS-0624307 and BCS-0624284
HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: Kenneth A. Frank, Michigan State University
William R. Penuel, SRI International
Co-PIs: Christopher Hoadley, Pennsylvania State University
Dale Belman, Michigan State University
Collaborators: Jay Lemke, University of Michigan
Carol Edwards, NEA Foundation
Lia DiBello, Workplace Learning Research, Inc.
James P. Spillane, Northwestern University
Brian Rowan, University of Michigan
Gary Sykes, Michigan State University

Research Goals:

The primary goal of this research study is to study change processes linked to new institutional pressures on schools brought about by the threat of sanctions under the federal *No Child Left Behind Act (NCLB).* In particular, the research seeks to develop and test models that integrate accounts of individual and organizational change in response to *NCLB.*

In this study, our principal question is "How do social processes and structures formed during the implementation of previous reforms and innovations enable and constrain teachers' responses to new institutional forces?" This question calls for attention to organizational level factors that affect interactions, the formation of interactions in response institutional pressure and how those interactions affect teachers' behaviors. Therefore, we ask:

- How do formal opportunities for shared decision-making and informal opportunities for collaboration carry over or shift as a wave of pressure begins to take hold?
- How do interactions teachers draw on to respond to new institutional forces emerge from interactions regarding previous reforms?
- Which interactions, experiences and attributes that emerged through prior reforms are most strongly related to teachers' responses to new institutional forces?

Thematic Areas:

Linking individual and organizational change
Institutional theory
Network change
Educational reform

Methodologies:

The study team is collecting longitudinal data on teachers' classroom teaching practices, principal and other administrative leadership behaviors, and on teachers' social networks using questionnaires and interviews. We are using a combination of case analyses of schools' leadership practice's effects on

organizational functioning, social network analyses to model selection of ties and change in networks over time, and multi-level models to test the influence of network ties and individual characteristics on teacher change.

Recent Research Findings:

How do formal opportunities for shared decision-making and informal opportunities for collaboration carry over or shift as a wave of pressure begins to take hold?

➢ Organizational forms that emerged from an earlier school restructuring movement in the 1980s and 1990s are being used now to discuss NCLB-related concerns, including how to raise test scores of low-performing students.

Beginning in the 1980s, schools developed organizational structures designed to reduce the isolation of teachers and promote greater teacher involvement in school-level decision-making. Despite the fact these efforts had limited impacts on teaching and learning, these forms have persisted. They include the creation of grade-level and "vertical" teams that meet regularly to discuss curricular matters, the creation of common planning periods for teachers, and protocols and processes for structuring collaboration. Today, schools have appropriated these organizational forms to discuss strategies for improving the achievement of low-performing students, including underrepresented groups in the school.

➢ Relative to earlier reforms studied for schools in the sample, interactions concerning reading and math are less frequent.

The average teacher received help from 0.6 others concerning implementation of the reform whereas the average teacher received help from 0.32 others to increase STAR reading test scores and 0.35 others to implement STAR math test scores. Thus, in sum, there is as much interaction concerning STAR testing for both reading and math as there was about the reform. We also note that the differences could be a function of our instrument: school rosters were used to elicit names concerning help with the reform whereas responses to help regarding the STAR test were based on free recall. The differences in amount of help received for STAR testing for reading and math were not statistically different, although many of the interactions concerning reading and math were between the same teachers. Teachers received help from about 0.5 colleagues for a total of about 36 days in the school year for each subject.

Which interactions, experiences and attributes that emerged through prior reforms are most strongly related to teachers' responses to new institutional forces?

➢ Perceived pressure to change is linked to receipt of federal funds. Teachers in the aggregate perceive less pressure when they teach in schools not receiving Title I funds.

Principals and teachers in more economically advantaged schools reported little to know influence of NCLB on their individual or organizational behavior, relative to schools that received Title I funding for serving low-income children. This fact is not surprising, since the sanctions of NCLB apply only to Title I schools. Nonetheless, it is important, because NCLB is part of a larger set of institutional forces related to accountability in education, to which all schools are subject.

➢ Many teachers and principals do not distinguish NCLB pressures from state and local pressures associated with a larger set of institutional forces: accountability-based reforms. Even specific

requirements regarding teacher quality, which ostensibly affect their job status, are not distinguished by teachers.

This finding was surprising in that NCLB was "new" in its demand that schools be held accountable for performance of all subgroups and that all teachers hold a degree in the subject matter they taught. Before NCLB, California did not hold its schools accountable for high levels of achievement for each subgroup in a school. At the same time, accountability pressures on schools had been mounting for several years prior to passage of NCLB. Teachers had already adjusted in some ways to a tighter coupling between their classroom practice and organizational practice.

Challenges and Opportunities:

➤ A key challenge in struggling schools is high teacher turnover. This challenge creates practical problems for schools but also methodological ones, when studying network change. At least some aspects of network change are a function of levels of turnover, not responses to institutional pressure. This has implications for building school capacity and teacher induction.

Approximately 35% of the people on our rosters in 2005 were not on our rosters in 2007, and approximately 28% of the people on our rosters in 2007 were not on our rosters in 2005. This suggests about a 33% turnover in 2 years.

Project Title: Social and Economic Effects of a Natural Disaster

Project #: CMS-0527762
HSD Emphasis Area: Agents of Change

Lead PI: Elizabeth Frankenberg, UCLA
Co-PIs: Thomas Gillespie, Bondan Sikoki, Cecep Sumantri, Wayan Suriastini, Duncan Thomas

Research Goals:

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.

Thematic Areas:

The thematic areas that this project encompasses include the costs of disasters and the distribution of their impacts, the effectiveness of recovery strategies implemented by individuals and by assistance agencies.

Methodologies:

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 Tsunami Aftermath and Recovery survey (STAR) which locates and, if alive, re-interviews the same respondents. The first two follow up waves of STAR were conducted in 2005-2006 and 2006-2007, and the third follow-up wave is currently in the field. We use remotely-sensed data to quantify damage within the communities as well as the pace of recovery.

Recent Research Findings:

We have explored the impact of the tsunami on mortality and on mental health for survivors. With respect to mortality, the tsunami exacted a far higher toll on women, children, and the elderly than on prime age males. The differential effect on prime age women versus prime age men reflects several factors. Women were less likely to be able to swim, they were less likely to be at sea on fishing boats (which was a safe place to be), and they were more likely to be at home with small children or elderly relatives in their care.

With respect to mental health, we document a clear dose-response relationship between post traumatic stress disorder and degree of exposure to tsunami-related trauma. Levels of PTSD in areas outside the direct impact of the tsunami are non-trivial, suggesting that the mental health implications of a large-scale natural disaster are widespread. Exposure to trauma is more strongly related to PTSD than are demographic factors, and socioeconomic standing before the tsunami has almost no protective impact.

Challenges and Opportunities

This project presents a number of challenges and opportunities: how to track individual respondents in the upheavel that follows a major disaster, what to prioritize in terms of measurments, and how to transtion from a focus on short term costs to medium- and longer-term recovery strategies. One interesting opportunity is the exploration of links between exposure to trauma, development of post-traumatic stress disorder, and subsequent physical health.

Project Title: Collaborative Research for Data-Driven Analysis of Interdisciplinary Research Teams

Proposal #: 0623119
HSD Emphasis Area: Dynamics of Human Behavior

Lead PIs: Lisa Freeman, Kansas State University and Debra Street, University at Buffalo, State University of New York

Co-PIs: Sharmistha Bagchi-Sen, University at Buffalo, State University of New York; Michael Farrell, University at Buffalo, State University of New York; Justin Kastner, Kansas State University; Abbey Nutsch, Kansas State University

Research Goals:
1. to extend theoretical models of group development at different stages in their 'life courses' (teams in formation, established teams and teams in decline) and varying group composition
2. to develop standardized data instruments to study social dynamics of IDR teams
3. to inculcate interdisciplinary research (IDR) for students working on the project

Thematic Areas:
1. Social/cultural dynamics: internal social roles, norms, practices and trust, that is, a socially dynamic team culture, are necessary for IDR teams to become established and to thrive.
2. Organizational dynamics: evolution of social networks, as collaborations attempt to form (some never do) and mature, social expectations, processes, and roles of members are transformed as the organizational life course of IDR teams progress (regress) over time.

Methodologies:
Subjects are academic researchers at University at Buffalo, SUNY (UB) and Kansas State University (K-State) who previously or currently collaborate with at least two researchers outside their discipline to seek research funding support and/or to publish research findings as a product of IDR collaboration. IDR researchers were recruited through outreach workshops (K-State in fall 2006, UB in spring 2007) and lists generated using advice from knowledgeable faculty colleagues and administrators (e.g., the Office of the Vice-President for Research). We included (i) scientists who had tried IDR but the team failed to gel, (ii) researchers who are members of new or established IDR teams and (iii) those who are members of IDR teams that are winding down or inactive. We also began intensive ethnographic research on an 'IDR group in formation' at KState (summer 2007) from its inception and are in the process of staging a UB counterpart.

We are using multiple Delphi rounds of online survey data collection (Phase 1 open-ended exploratory survey complete, 33.5 percent response rate at K-State, 35 percent response rate at UB) to develop and refine standardized data collection instruments, intensive interviews with IDR investigators, and ethnographic observation of IDR teams in various organizational life course stages.

Recent Research Findings:
Open-ended responses from the Phase 1 online survey have been open coded using grounded theory techniques for the analysis of qualitative data. Among the social, organizational, and cultural concepts central to this exploratory work include key social relations, structural elements of the team social milieu and social dynamics relating to power structures, norms of group behavior, and role expectations. The demographic characteristics of IDR teams (size and composition in terms of rank, gender, disciplinary background among others), the power structures implied by group dynamics and institutional relations, and

the differences among teams in formation versus established or dying (active and inactive) teams were topics identified as important by respondents to the first round survey.

Some subjects defined the key to successful IDR teams in terms of process and the quality of social interactions, including mutual respect, equivalent efforts, trust, and satisfaction. Other researchers emphasized products, including funding, conference papers and publications, and scientific breakthroughs/new discoveries impossible within a single discipline. Themes relating to social dynamics of successful teams included mutual respect, open-mindedness, liking/compatibility, perseverance/commitment, shared decision-making, sharing (data/credit), enlightened leadership, choosing to work together, shared humor, good communication, and passion. Themes relating to the social dynamics that undermine team success include overbearing individuals, data/credit hogs, arrogance/large egos, lack of respect based on status/disciplines, teams composed 'top down,' communications breakdown, insufficient leadership, selfishness/greed, competition, and suppression of dissent. In terms of IDR team social dynamics that affect individuals positively, themes emerging from analysis of subject responses include opportunities for networking, generosity of individuals teaching about other disciplines, respect and encouragement, others valuing contribution, colleagues who share work and credit, mentorship and friendship. Aspects of IDR team social dynamics affecting individuals negatively include perceived status hierarchies (disciplines/ranks), competitiveness, lack of clear expectations, bullying, slackers, fear and hostility between ranks/disciplines, turf wars, critics who don't contribute, domineering individuals and weak leaders. These and other dimensions of social dynamics are being refined and explicated for use in a standardized closed-ended survey in Phase 2 (beginning 11/07).

Rolling recruitment for Phase 2 (accepting all eligible volunteers) will generate the highest possible participation rates for the next online survey asking respondents to rank order the importance of key conceptual categories tapping the social, cultural and organizational dynamics of IDR teams. Continuing expansion and refinement of lists of eligible researchers will maximize variation on key subject attributes (e.g., rank, tenure, gender). Beyond demographic diversity, future recruitment will also focus on maximizing the variation among "types" and "roles" of individual IDR team members (leadership, alliances, discipline, roles on projects). While the Phase 2 online survey is in the field, UB researchers will conduct interviews at UB and travel to KState for intensive interviews with IDR scientists there.

With regard to Research Goal 3, two Graduate Assistants have been hired. They are engaged with both survey data collection as well as observational research of the 'IDR group in formation,' and have pursued other interdisciplinary activities including preparing new curriculum materials for the graduate course Multidisciplinary Thought and Presentation (K-State).

Challenges and Opportunities:
Challenges: Persuading busy academic researchers to respond to online surveys and identifying sufficient researchers for the sample who have attempted to launch IDR teams but failed to do so. Opportunities: On both campuses, researchers have been able to identify and will have opportunities to observe 'new' IDR teams in formation, using ethnographic techniques for data collection. Observation of new team has begun at K-State (08/07) and will begin in Buffalo (10/07). In response to the recruitment workshops held at Kansas State and University at Buffalo, and their exposure to the first round of data collection, a number of researchers have volunteered for in-depth interviews, which will be started in fall 2007.

Project Title: IT-Enhanced Market Design and Experiments

                    Proposal #: IIS-0527770
                    HSD Emphasis Area: Agents Of Change

Lead PI: Dan Friedman, University of California, Santa Cruz
Co-PIs: James C. Cox, Georgia State University; James Spohrer, IBM Almaden Research Center; and Daniel Zeng, University of Arizona.
Collaborators: Nirvikar Singh and Ryan Oprea, University of California, Santa Cruz; Vjollca Sadiraj, Georgia State University; Christorpher Campbell, IBM Almaden; Steven Gjerstad, Purdue University; and Wenjie Zhan, Huazhong University of Science and Technology, Wuhan, China.

Research Goal:

To identify the market formats and agent behaviors that are most effective in realistic IT environments. We consider both one-sided markets (auctions) and two-sided, and study humans and automated agents who participate in markets asynchronously.

Thematic Areas:

The research falls mainly in the Agents of Change (AOC) area of emphasis but also has implications for the Dynamics of Human Behavior (DHB) and the Decision Making, Risk and Uncertainty (DRU) areas. Properly incorporating the new information technology into the economy, transforming markets and services, is a key to economic growth and greater social equity. The transformation itself is largely in the hands of business people and policy makers, and their work will be greatly aided by science. The IT science is solid but the economic science lags. Our fundamental research will help close the gap. Markets once were mainly local, but now increasingly coordinate and control human activities on a national and global scale, echoing themes of the DHB area of emphasis. And innovations in market strategies certainly reflect the main DRU themes at both the individual and group level.

Methodologies:

We develop new theoretical models for IT-enabled markets, and test and refine them (and previous models) in computer simulations and in laboratory experiments with human subjects and automated agents.

Recent Research Findings:

"Markups in Double Auction Markets," by Wenjie Zhan and Daniel Friedman, *Journal of Economic Dynamics and Control* 31:9, 2984-3005 (September 2007) studies the continuous double auction market with simulated traders using various markup rules. A higher markup trades off increased profitability against reduced probability of a transaction. The tradeoff in Nash equilibrium turns out to be remarkably close to the most efficient tradeoff. This may partially explain the "mysterious" efficiency of double auction markets.

"A Laboratory Investigation of Deferral Options," by Ryan Oprea, Daniel Friedman and Steven T. Anderson, UCSC Working Paper #635, March 2007 considers an irreversible investment opportunity has value V governed by Brownian motion with upward drift and random expiration. Human subjects choose

in continuous time when to invest. If she invests before expiration, the subject receives $V - C$: the final value V less a given avoidable cost C. The optimal policy is to invest when V first crosses a threshold $V^* = (1+w^*)C$, where the option premium w^* is a specific function of the Brownian parameters representing drift, volatility and discount (or expiration hazard) rate. We ran 80 periods each for 69 subjects. Subjects in the Low w^* treatment on average invested at values quite close to optimum. Subjects in the two Medium treatments and the High w^* invested at values below optimum, but with the predicted ordering, and values approached the optimum by the last block of 20 periods. Behavior was most heterogeneous in the High treatment. Subjects underrespond to differences in both the volatility and expiriation hazard parameters. A directional learning model suggests that subjects react reliably to ex-post losses due to early investment, and react much more heterogeneously (and on average more strongly) to missed investment opportunities. Simulations show that this learning process converges on a nearly optimal steady state.

"Financial Engineering and Rationality: Experimental Evidence Based on the Monty Hall Problem," with Brian Kluger, July 2006, is circulated as a University of Siena working paper. Financial engineering often involves redefining existing financial assets to create new financial products. This paper investigates whether financial engineering can alter the environment so that irrational agents can quickly learn to be rational. The specific environment we investigate is based on the Monty Hall problem, a well-studied choice anomaly. Our results show that, by the end of the experiment, the majority of subjects understand the Monty Hall anomaly. Average valuation of the experimental asset is very close to the expected value based on the true probabilities.

In their research project on "Dutch Auctions and Centipede Games," James C. Cox and Duncan James construct several new real-time auctions and compare their performance in experiments to generalized forms of centipede games. The central objective of the research is to attain a deeper understanding of inconsistencies between theoretical predictions and data such as the empirical failure of the predicted isomorphism of Dutch and first-price sealed-bid auctions and empirical failure of subgame perfect equilibrium predictions of play for the standard centipede game. Implementation of the new variants of Dutch auctions and centipede games has involved development of new experimental software. The new Dutch auction formats are of potential interest in e-commerce applications.

In their paper titled, "Is There a Plausible Theory for Risky Decisions?" (Experimental Economics Center Working Paper 2007-05, Georgia State University), James C. Cox, Vjollca Sadiraj, Bodo Vogt, and Utteeyo Dasgupta report an extension of the small-stakes risk aversion calibration critique of theories of risk aversion. They extend the calibration critique to decision theories that represent risk aversion solely with transformation of probabilities. Testable calibration propositions are derived that apply to four representative decision theories: expected utility theory, cumulative prospect theory, rank-dependent expected utility theory, and dual expected utility theory. Heretofore, calibration critiques of theories of risk aversion have been based solely on thought experiments. This paper reports real experiments that provide data on the relevance of the calibration critiques to evaluating the plausibility of theories of risk aversion. The paper also discusses implications of the data for (original) prospect theory with editing of reference payoffs and for the new dual-self model of impulse control. In addition, the paper reports an experiment with a truncated St. Petersburg bet that adds to data inconsistent with risk neutrality. The content of this paper has wide implications for theory development in economics and finance, most clearly for auction theory.

In their paper titled "Risky Decisions in the Large and in the Small: Theory and Experiment" (forthcoming in J.C. Cox and G.W. Harrison (eds.), *Research in Experimental Economics, Vol. 12: Risk Aversion in*

*Experiments,*JAI Press), James C. Cox and Vjollca Sadiraj examine a class of decision theories that contains expected value theory, expected utility theory, prospect theory, rank dependent expected utility theory, and dual expected utility theory, and explain the fundamental problems inherent in all of them. The paper focuses on two generic types of problems that are common to theories of risky decisions: (a) St. Petersburg-type paradoxes; and (2) implications of implausible risk aversion. The paper also discusses the generalization of the small-stakes risk aversion calibration literature, away from its previous focus on implications of decreasing marginal utility of money, to include implications of probability transformations. The paper explains why, in order to avoid implausible implications, theories of risky decisions must be developed for bounded domains. But such theoretical reformulation leads to testable hypotheses that follow from finite St. Petersburg games and calibrations of the large-stakes risk aversion implications of postulated patterns of small-stakes risk aversion. Testable hypotheses and experiments for risky decision theories on bounded domains are discussed in the third part of our essay. The content of this paper has wide implications for theory development in economics and finance, most clearly for auction theory.

In their paper titled "Revealed Altruism," forthcoming in *Econometrica*, James C. Cox, Daniel Friedman, and Vjollca Sadiraj extend Neoclassical preference theory to encompass social preferences. It introduces "more altruistic than" (MAT), a partial ordering over preferences, and interpret it with known parametric models. The paper also introduces and illustrates "more generous than" (MGT), a partial ordering over opportunity sets. Several recent studies focus on two player extensive form games of complete information in which the first mover (FM) chooses a more or less generous opportunity set for the second mover (SM). Here reciprocity can be formalized as the assertion that an MGT choice by the FM will elicit MAT preferences in the SM. A further assertion is that the effect on preferences is stronger for acts of commission by FM than for acts of omission. The paper states and proves several propositions on the observable consequences of these assertions. Finally, empirical support for the propositions is found in existing data from Investment and Dictator games, the Carrot and Stick game, and the Stackelberg duopoly game and in new data from Stackelberg mini-games.

In their paper titled "Trust in Private and Common Property Experiments" (presented at the panel on "Fairness Economics and Political Economy" at the 103rd American Political Science Association Annual Meetings, Chicago, Illinois, August 30-September 2, 2007), James C. Cox, Elinor Ostrom, and James M. Walker report the results from a series of experiments designed to investigate behavior in two settings that are frequently posited in the policy literature as generating different outcomes: private property and common property. The experimental settings closely parallel earlier experimental studies of the investment or trust game. The primary research question relates to the effect of the initial allocation of property rights on the level of trust that subjects will extend to others with whom they are linked. We find that initial endowments as common property lead to marginally greater cooperation or trust than when the initial endowment is fully owned by the first player as private property. Subjects' decisions are also shown to be correlated with attitudes toward trust and fairness measured in post-experiment questionnaires.

Challenges and Opportunities:

So far we have focused mainly on existing formats for one and two sided markets. We hope to begin running parallel markets in more than one format, to consider new hybrid formats, and to construct a greater variety of automated agents. It is always a challenge to coordinate the efforts of three very different labs, but it also creates unique opportunities.

Project Title: Collaborative Research: Modeling and Behavioral Evaluations of Social Dynamics in Prevention Decisions

   Proposal #: SBE-0624098
   HSD Emphasis Area: Decision, Risk, and Uncertainty

Lead PI: Alison Galvani, Yale University
Co-PIs: Gretchen Chapman, Rutgers University;
                 Ramadan Laxminarayan, Resources for the Future
Collaborators: Eunha Shim, Sanjay Basu, Jeffrey Vietri, Meng Li

Research Goals:

1. <u>Game theoretic insights into vaccination decisions.</u> Integrate a model of influenza evolutionary epidemiology with a game-theoretic model of age-specific vaccine demand. Use survey data collected in Aim 3 to parameterize our model and calculate age-dependent utilities for vaccination decisions. Compare Nash equilibria of vaccination behavior governed by self-interest and utilitarian vaccine allocation strategies determined using our novel algorithm.
2. <u>Global perspective.</u> Evaluate discordant incentives surrounding decisions of international influenza surveillance and reporting. Determine how the dilemmas that we identify in Aims 1 and 3 apply globally and affect international cooperation to perform conscientious surveillance.
3. <u>Questionnaire study and laboratory experiment to empirically test model predictions.</u> Aim 3a) Conduct a questionnaire study presenting hypothetical scenarios to examine the relationship between age and the decision to vaccinate. Infer how individual vaccination decisions are influenced by aggregate community vaccination behavior. <u>Aim 3b)</u> Perform laboratory game-theoretic experiments to parameterize the model derived in Aim 1 and to verify modeling predictions about the influence of both self-interest and altruism on vaccination decisions.

Thematic Areas:

1. Psychology
2. Epidemiology
3. Economics
4. Game Theory

Methodologies:

 This project combines game theoretic and epidemiological modeling with behavioral data from questionnaires and laboratory experiments.

Recent Research Findings:

Galvani, A., Reluga, T., & Chapman, G.B. (2007). Long-standing influenza vaccination policy is in accord with individual self-interest but not with the utilitarian optimum. *PNAS, 104*, 5692-5697. http://www.pnas.org/cgi/doi/10.1073/pnas.0606774104

In this paper we use previously-collected questionnaire data to parameterize a game theoretic model of vaccination.

We are in the midst of designing a new questionnaire on influenza vaccination. The questionnaire assesses beliefs and attitudes that form the basis of parameters for the model described in aim 1. We have also programmed an internet-based behavioral game theory experiment to test some key predictions of the model. Data collection for both the questionnaire and the game experiment will begin soon.

Challenges and Opportunities:

One challenge we face is the need to ask survey respondents questions that are, on the one hand, comprehensible and answerable or lay people and, on the other hand, capture the specific epidemiologic concept that corresponds to a model parameter and measures it in meaningful units. Units that are meaningful in terms of the model include probability, dollars, and quality-adjusted life years. In contrast, lay people often give more valid responses when using rating scales.

Project Title: DREAMAR: Decision-making in Rangeland Systems: An Integrated Ecosystem-Agent-Based Modeling Approach to Resilience and Change

Proposal #: SES-0527481
HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Kathleen A. Galvin, Colorado State University
Co-PIs: Dennis S. Ojima, Colorado State University, Randall B. Boone, Colorado State University, Michele M. Betsill, Colorado State University, Philip K. Thornton, International Livestock Research Institute and the University of Edinburgh
Collaborators: Maria Fernández-Giménez, Colorado State University, K.S. Rajan, University of Tokyo, Tom Veldkamp, Wageningen University, and Jill Lackett, Colorado State University.

Research Goals:
1. Represent household decision making in three areas on three continents using an agent-based model.
2. Assess policy or management questions using scenario analyses with linked ecosystem and household models.
3. Identify attributes of livestock-owning households that provide resilience to environmental change.

Thematic Areas:
1. Decision-making and risk
2. Resilience of the human-environment system
3. Human well-being and ecosystem services
4. Agent based models linked to ecosystem models

Methodologies:
We have constructed a spatially-explicit model called DECUMA that represent livestock-owning households as agents. Experts in pastoral systems have worked with us to parameterize DECUMA to represent household decision making, and new field work has supported that effort. The agent-based model has been tightly linked with a comprehensive ecosystem model called SAVANNA, and is now being linked to a second ecosystem model called DayCent. We are using the linked models to conduct scenario analyses, where the responses of households to environmental change and the resilience of their livelihoods are assessed.

Recent Research Findings:
 In early 2007, field work was conducted in Kajiado, Kenya to generate information on social networks and decision making, to help derive rules for DECUMA. One of the key questions being asked of DECUMA for Kajiado is the value of movement patterns to human well-being and the ecosystem. Accordingly, a questionnaire was designed and tested to collect information on the different types of movement that Maasai pastoralists undertake, and how movement decisions are made. Thirty-six households were sampled. The field work was carried out under the supervision of Claire Bedelian at the International Livestock Research Institute, Nairobi.

At this time last year we were in the midst of planning the structure for DECUMA, which did not exist. Now, after a busy year of development, we have essentially a complete model that represents decision making by pastoralists in Kajiado District, Kenya. Jacob Jawson added a graphical interface that allows the user to set the number of households to model, the suite of household files to use as initializing templates, and output characteristics. The interface includes behind-the-scenes calls to SAVANNA, so that a click on

a button in user interface starts the ecosystem simulation. As the simulation progresses, the suitability to livestock of cells used to represent the grided landscape are displayed on a map, along with the locations of households and livestock.

Our past modeling of livestock was population based. In contrast, in DECUMA houses have an explicit place in space, and households own a given number of livestock and graze those animals in places household members select. We programmed a livestock population dynamics module appropriate for individual households and herds. Animal condition indices influenced birth rates and death rates, yielding a population model sensitive to changes in forage availability. Other effects on death rates are included, such as disease and predation. After we confirmed reasonable responses of this module using simulated household data, we merged the module with DECUMA.

Households in the DECUMA model were required to track energy balances, livestock holdings, expenditures and incomes, to raise and harvest crops, and to seek relief when needed. We translated existing population-based code in FORTRAN into Java, and made extensive modifications to yield an agent-based model of household dynamics appropriate for DECUMA. Philip Thornton came to Colorado State University for a five-day working session on the DREAMAR project, and during that time reviewed the implementation of the module to be used for DECUMA and made suggestions. After we confirmed reasonable outputs from this module, we merged the module into DECUMA.

DREAMER team members sought to have household heads in our model change their mix of livelihoods as they aged. Using survey data, Shauna BurnSilver had defined households as having a given pattern of diversification (i.e., the household practiced some combination of 10 livelihood pathways). For example, as a household head ages, his or her likelihood of being involved in petty trade declines, but the potential to be a leader increases. BurnSilver used her data to assigned probabilities that household heads in age groups would select each of the 10 diversification methods, and assigned modifiers that alter the probabilities that a household in a given location will select a given pathway based on precipitation, wealth, and schooling. We used these data in a very simple agent-based model that had household heads aging. In essence, the static diversity pathways BurnSilver found in her household surveys were made dynamic. The result is now being merged with DECUMA.

We are adapting the SAVANNA model to the Mongolian study area (8500 km^2). The study area modeled is Bayan-Ovoo and Jinst Sums, plus a western portion of Olzitt Sum, all in Bayankhongor Aimag. The site spans from desert and desert steppe to high mountain meadows, and in elevation from 1249 to 3951 m. Maria Fernández-Giménez provided results from household surveys that she conducted in 1995, and repeated in 1999 and 2006, which will be used in DECUMA. Efforts to date have focused on putting in place spatial data used by SAVANNA or in parameterizing the model.

Challenges and Opportunities:
An opportunity to leverage ongoing work at the National Resource Ecology Laboratory on a system linking hundreds of DayCent simulations (DayCentIRC) with our agent-based modeling presented itself. We are now linking the DECUMA model with DayCent through DayCentIRC. Our challenges have been those typical of modeling and software development. We must balance our desire for more detail in the agent-based model versus its complexity and the time for software development, and our wish to conduct analyses and build broader impacts.

Project Title: The Dynamics of Human-Sea Ice Relationships: Comparing Changing Environments in Alaska, Nunavut, and Greenland (a.k.a. *Siku-Inuit-Hila Project* "Sea ice-People-Weather Project").

Proposal #: HSD 0624344
HSD Emphasis Area: Agents of Change

Lead PI: Shari Gearheard, University of Colorado at Boulder
Co-PIs: Roger G. Barry (University of Colorado at Boulder); Henry Huntington (Huntington Consulting)
Collaborators: Andy Mahoney (University of Colorado at Boulder); Yvon Csonka (Ilisimatusarfik – University of Greenland); Lene Kielsen Holm (Inuit Circumpolar Council-Greenland); Toku Oshima (Qaanaaq, Greenland); Mamarut Kristiansen (Qaanaaq); Qaerngaaq Nielsen (Savissivik, Greenland); Joelie Sanguya (Clyde River, Nunavut, Canada); Igah Sanguya (Clyde River); Ilkoo Angutikjuak (Clyde River); Geela Tigullaraq (Clyde River); Warren Matumeak (Barrow, Alaska); Joe Leavitt (Barrow); Nancy Leavitt (Barrow).

Research Goals:

1. Characterize sea ice and its use by humans at each location (e.g., seasonal patterns of use, use of specific features and zones, role of thickness in various activities, etc.);
2. Document changes to sea ice, with particular attention to the features most crucial for human uses (e.g., seasonality, shorefast ice formation, roughness, etc.);
3. Document change in human use patterns over time (e.g., effects of modernization in recent decades, effects of hunting regulations, effects of climate change, etc.);
4. Recent human responses to changes in sea ice (e.g., acquisition of new knowledge, changes in hunting patterns, changes in equipment, etc.);
5. Document impacts from sea ice changes and human responses (e.g., reduced role for elders as old knowledge becomes less relevant, changes in harvest patterns, increased risk, greater reliance on regional government, etc.);
6. Understand implications for future changes, impacts, and adaptations (e.g., shifts in hunting patterns, reliance on new technology, changes in regulatory regime, etc.).

Also:

1. Establish a working research team of interdisciplinary scientists, and Inuit, Inughuit, and Iñupiat hunters to work together to study sea ice, bringing indigenous and scientific knowledge and perspectives together.
2. Establish methods and approaches to link indigenous knowledge and scientific measurements to characterize sea ice and assess sea ice changes.
3. Produce creative research products, in particular, a sea ice encyclopedia documenting sea ice terminology and knowledge from 4 cultures/languages: Canadian Inuit, Iñupiat, Inughuit, and science/English.

Methodologies:

Our methodology has a three-pronged approach. These methods collect information in different ways, but all complement one another and help to build a more complete picture of local-scale sea ice conditions and usage as well as changes in both of these:

1. *Knowledge exchanges*: Three representatives from each participating Arctic community involved, along with project scientists, form a unique research team of people with different backgrounds, expertise, and experience. As a team, we travel to each of the three communities where we meet with local experts and learn about local sea ice conditions and sea ice use. The emphasis is time spent on the ice, learning about and engaging in local activities.

2. *Sea ice data collection*: Up to four sea ice measurement stations are operating (during the sea ice season) at each community location. The stations are used to measure the thickness and temperature of sea ice and snow on a weekly basis. These measurements help quantify the sea ice regime at each community in terms of ice growth and melt, snow accumulation, and the timing of the annual cycle. We have trained local people in each community how to install these stations and take the measurements.

3. *Traditional knowledge interviews*: Interviews with local sea ice experts are on-going in each of the study communities. Local people conduct these interviews (both individual and group interviews) and translators help to compile English transcripts for analysis and to combine with information collected by the other methods.

Recent Research Findings:

- Sea ice in all three communities has changed during the lifetime of the current eldest generation and is continuing to do so. The changes have resulted in changes to sea ice use. For example:

  - Barrow:
    - Landfast sea ice forms later and breaks up earlier, leading to greater susceptibility to coastal erosion from autumn storms
    - Landfast ice is less stable and predictable and there has been a rise in the number of hunters stranded on drifting ice in recent years
  - Qaanaaq:
    - Fjord sea ice is thinner and less stable. This has made travel on sea ice more hazardous and has prevented access to some hunting grounds for first time in living memory
    - Dynamics and freeze up in Baffin Bay and Smith Sound has changed. Lack of multi-year sea ice means southern Smith Sound no longer gets choked with ice, which means more ice passes through instead of forming a continuous ice cover
  - Clyde River:
    - Knowledge exchange at Clyde scheduled for April, 2008
    - Initial research shows that sea ice forms later and breaks up earlier by about 2-3 weeks each. That's over a month lost in the sea ice season
    - Sea ice itself is softer than usual, the quality (as judged through traditional methods) and texture is not the same

- A comparison of ice growth data between Qaanaaq and Clyde River reveals a significant difference in the ice regimes. A simple energy budget estimate based upon ice growth, snow cover, and air temperature suggests that ocean heat flux is significant near Qaanaaq, where it retards ice growth during the winter and increases bottom-melt in spring. The data from Clyde River suggest ocean heat is a less important

component of the energy budget. Identifying differences like these in the sea ice regime will help us to understand the different ways in which the sea ice is changing at each community.

Challenges and Opportunities:

• Logistics of knowledge exchange trips are very complicated and work intensive. However, both trips held so far (Qaanaaq and Barrow) were very successful and all trip objectives were achieved. We had tremendous logistics help from VECO.

• Language barriers exist (there are 4 working languages), however, the project team has been communicating well using English as the common language. The different languages are actually a benefit in many ways as everyone is taking a great interest in learning the similarities and differences in the different Inuit dialects.

Project Title: Accelerating the Diffusion of Innovations: A "Digital Diffusion Dashboard"
Methodology for Global Networked Organizations

Proposal #: SES-0527487
HSD Emphasis Area: DHB: Dynamics of Human Behavior

Lead PI: Julia C. Gluesing, Wayne State University
Co-PIs: Kenneth R. Riopelle, Wayne State University
James A. Danowski, University of Illinois at Chicago
Collaborators: Ford Motor Company, Chrysler Corporation, General Motors Corporation, IBM

Research Goals:

1. Examine whether diffusion through new technologies in organizations produces different kinds of
diffusion curves than do traditional processes
2. Create a database of a range of innovations across three organizations that will become available in the
public domain to other researchers
3. Increase the speed at which innovations can be implemented in global organizations

Thematic Areas:

1. Communication and social network research as it intersects with new approaches to diffusion theory in
online organizational systems
2. Relationship between technology and the human and social dynamics of change
3. Dynamic display of diffusion patterns, associated social networks, and message networks

Methodologies:

The study will advance the practice of organizational change and help accelerate the diffusion of
innovations in global networked organizations 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. Primary methodologies include:
*   Collecting email from innovation team members in real time and displaying the dynamic
communication networks and the central content of messages about the innovation as it occurs,
measuring the properties of diffusion curves, network structure and changes in message content.
*   Crawling the intranet and internet (including web portals, team collaboration centers, blogs and
wikis) to display web-based diffusion network structure and content.
*   Conducting ethnographic research, including interviews and observation of interactions among
innovation team members, to validate and supplement data gathered using automated means

Recent Research Findings:

The project team is just beginning to analyze data. Our initial findings from analysis of a global innovation include:

1. Significant diffusion events in the company are reflected in the content and structure of the email communication networks about the innovation. For example, the merging of innovation teams in Europe and the U.S. can be seen in the changes in frequency of word pairs that emerge in comparing emails generated at two different points in time.
2. There are indications of cultural differences in preference for face-to-face and email correspondence among members of the innovation diffusion team. This initial finding will be explored further as data collection and analysis continue.
3. Group betweenness centrality provides a marker for change in group structure and indicates appropriate time spans for more in-depth analysis.

Challenges and Opportunities:

Challenges encountered by the research team are related to the complexity and speed of change in the global automotive industry. The team has faced and is overcoming the following major *challenges* to data collection and creation of the "digital diffusion dashboard."

- The office of the general counsel in each partner company has had to review and approve the research and data collection procedures to ensure protection of proprietary and confidential information as ell as to protect the privacy and personal rights of employees. Confidential Disclosure Agreements have been developed through collaboration of legal staffs in the companies and at Wayne State University and University of Illinois at Chicago.
- Technology transfer offices at both Wayne State University and University of Illinois at Chicago also have worked with legal offices at the companies to protect rights to commercialization of software developed by the research team as well as to enable use of the software in the IT environments within each corporation
- Data collection has been slowed by the complexity of the IT infrastructure and by resource constraints in each corporation with whom we are collaborating. The research team has had to spend considerable time and effort developing workarounds and programming software to overcome the limitations.
- The individual who served as major sponsors of the research in each corporation have all been replaced due to corporate reorganizations, cutbacks, mergers and acquisitions. The research team has had to "re-sell" the project several times to retain the corporate partners and maintain access to innovation diffusion data. New corporate partners are also being sought to supplement the original corporate collaborators who may not be ably to supply all the data necessary to achieve project goals.
- The opportunities for the project research team have been created by new IT technologies to enhance research on social networks and on new collaborations in the research community:

- The research team has discovered, developed and implemented several new technologies to enhance data collection:
  1. *Condor*, a dynamic social network visualizer that displays both structure and message content in diffusion networks, developed by Peter Gloor and collaborators at MIT
  2. *Multinet/Negopy*, to analyze and display naturally occurring groups and structural and attribute data together, developed by Bill Richards and Andrew Seary at Simon Fraser University in Vancouver, BC. Our research team has worked with the developers to merge these two programs and to modify the software to analyze large data sets and alter parameters for data display.

3. *Wordlink* (developed by Dr. Danowski) has been enhanced to handle large data sets. The team is using this software to analyze message content and test differences in content at various points in time.

- The research team has become part of a collaboration innovation network (COIN), involving researchers in several locations around the world who are all studying innovation in social networks globally and share ideas, tools, research results and challenges in a monthly online meeting. Our research team is incorporating learning from this network into the project as well as sharing results of our own work with other researchers

- New opportunities for research collaboration have opened up at other corporations such as Visteon and EDS that the team is pursuing for data collection.

- The research team has also been asked to participate in the NIH Clinical and Translational S A at Wayne State University, which is an opportunity to extend the new research methodologies and further test diffusion hypotheses in the health care domain.

Project Title: Economic Development and Intergenerational Relations in the Tibet Autonomous Region of China

Proposal #: 052750
HSD Emphasis: Agents of Change

Lead PI: Melvyn C. Goldstein, Case Western Reserve University
Co-PI: Geoff Childs, Washington University in Saint Louis

Research Goal:

This project is investigating how rapid change and development in the Third World impacts intergenerational relations and the support networks of the elderly in rural settings. In particular, the project is examining how rural Tibetans and their families at three different stages of development are adapting to rapid socio-economic change.

Thematic Areas:

1. complexities of change
2. dynamics of human social and social behavior
3. managing rapid change

Methodologies:

The project is using a mix of methods including surveys, direct measurement (e.g., blood pressure), participant observation, in-depth interviews and participant observation. It is also utilizing a natural experimental research design that has selected three rural farming villages in the Tibetan Autonomous Region in China that differ with respect to the extent of economic development they have experienced but otherwise share the same language, culture, religion and social organization. This design is allowing us to examine the issues at question at an incipient stage of developmental change, an intermediate stage, and a later stage.

Recent Research Findings:

The study has found that a major paradigm shift has occurred with rural farmers moving from a predominately farming society to a system in which non-farm income plays a major role. In all three research sites, between 60-70% of all village males age 20-40 go out to earn income and about 70% of total village income now derives from non-farm sources. A decade ago such income comprised only about 25%. However, while all three farming sites are deeply engaged in non-farm work, the extent and success of the changes differs substantially. For example, the per capita income in the richest village is almost 3 times that of the poorest.

These changes have had (and are still having) a significant impact on household strategies and in particular on intergeneration relations. Based on preliminary analysis of the data, it appears as if the well-being of the elderly in the richer, more developed, village, is better than that in the middle-level village, which in turn exceeds that of the poorest research site. In other words, rather than modernization decreasing the status of the elderly as is commonly stated in the literature, we are finding that it has increased it in complex ways. More data will be collected on this issue during the fieldwork that will take place in Tibet in YR 03.

Project Title: Collaborative Research: DRU: Hypothesis Generation and Feedback in Dynamic Decision Making

                       Proposal #: 0624228
                       HSD Emphasis Area: Decision Making, Risk, and Uncertainty (DRU)

Lead PI: Cleotilde Gonzalez, Dynamic Decision Making Laboratory, Carnegie Mellon University
Co-PIs: Rick Thomas, University of Oklahoma; Rob Hamm, University of Oklahoma Health Sciences Center

Research Goals:

1. Contribute to understanding two basic mechanisms of Dynamic Decision Making: Hypothesis Generation and Feedback.
2. Investigate Learning in Dynamic Decision Making: What makes learning difficult? How to improve learning?
3. How are hypotheses generated while cues of a situation evolve over time? And how feedback changes human learning.
4. To develop realistic medical content for a case presentation diagnosis and management domain, for the simulation tool, MEDIC program.

Thematic Areas:

1. Performance of dynamic decision making tasks. The context used in this research is medical diagnosis.
2. Hypothesis Generation and Testing
3. Instance-Based Learning. Learning to manage patients with diseases modeled as dynamic medical systems (in which one can both request information and perform actions which affect the state of the system, and in which the state of the system can change spontaneously reflecting intrinsic disease processes) – descriptive models, identification of normative shortcomings, learning.

Methodologies:

We conduct this investigation using two main approaches: 1) laboratory studies with the support of computer simulations and learning tools and 2) computational cognitive modeling using two architectures previously developed by our team: HyGene (Thomas and Dougherty, 2005) and cogIBLT based on ACT-R (Gonzalez, Lerch, Lebiere, 2003).

Recent Research Findings:

• Humans have great difficulty understanding and interpreting the basic building blocks of dynamic systems (stocks, flows, feedback loops). We have found that large majorities of highly educated individuals are unable to predict and interpret the behavior of a stock due to the rate of change of flows, a phenomenon we denote *stock-flow failure*.
• Individuals have shown difficulty of learning in a dynamic medical diagnosis task (MEDIC). Outcome feedback is only helpful with ambiguous probabilities and outcome feedback becomes counter-productive when it is not needed in unambiguous environments.

- We argue there is a natural tendency for decision makers to search for information contingent on their currently held hypotheses – a process we refer to as *hypothesis-guided search*. If only one hypothesis is maintained in WM, then hypothesis guided search necessarily follows a positive-testing strategy. However, if more than one hypothesis is being maintained in WM, then the decision maker can search for information that differentiates amongst the hypotheses under consideration. We argue that cuing alternative hypotheses so that they are maintained alongside the focal hypothesis in WM enables decision makers to select diagnostic information. Two empirical studies conducted this year support the principle of hypothesis-guided search.

- Tutorials can increase student performance (from pre test to post test, using case diagnosis test questions) by focusing attention to a diagnosis's prototype and/or to the features that distinguish between competing diagnoses. These increases are comparable, and larger than the effect of reading textbook extracts alone.

Challenges and Opportunities:

- Getting research participants who have sufficient medical training presents a challenge. Medical school places great demands on student time.

Project Title: Modeling Time, Space, and Behavior: Combining ABM and GIS to Create Typologies of Playgroup Dynamics in Preschool Children.

                      Proposal #: 0324208
                      HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: William Griffin, Arizona State University
Co-PIs: Jennifer Fewell; Paul Torrens

Research Goals:

1. Investigate the origins of sociality.
2. Create new methodologies that combines behavioral observational data with GIS data
3. Develop computer simulations (agent-based models) of group formation in children

Thematic Areas:

1. Sociality
2. Computational Social Science
3. GIS

Methodologies:

We are collecting observational data of young children in a preschool setting. These data consist of individual and peer behaviors. Collection is occurring using handheld Tablet PCs; this allows us to map the preschool, thus providing a mechanism for recording time-stamped geo-spatial information.

Recent Research Findings:

Our first year pilot (based on about 15,000 coded observations) showed that we were successful at reliably acquiring individual and group behavior as it changes over a school year. We also developed a GUI interface for the Tablet PCs. This GUI contains maps of the preschool area, thus allowing coders to insert a time-stamped geo-spatial reference with each observed behavior. We also ported the author written agent-based based model of play group formation (PlayMate) to a standard ABM platform (Repast).

Challenges and Opportunities:

The major behavior observation problems have been resolved, however other two substantial hurdles remain. First, the large amount of data being acquired is forcing us to spend a lot of time developing database tools. Second, we are being forced to develop joint behavior and time-space theoretical models. Integrating geo-spatial information with behavior is not difficult – but putting it into an agent based model is requiring us to postulate the possible links between individual group characteristics, play propensities, play location, and timing.

Project Title: HSD: Research Community Development: Distributed Learning and Collaboration (DLAC) for Next Generation Educational Settings

Proposal #: 0623166
HSD Emphasis Area: AOC

Lead PI: Eric Hamilton, US Air Force Academy
Co-PIs: Ruimin Shen, Shanghai Jiao Tong University (Peoples Republic of China)
Guadalupe Carmona, University of Texas at Austin
Friedrich Hesse, Tübingen University (Germany)

Research Goals:

1. Build foundational roadmaps for integration of disciplines and ideas crucial to producing 21st century learning environments.
2. Enact a novel model for structuring hybrid-virtual research workshops
3. Create a series of new international collaborations to carry out future learning environment research, to produce results such as
    - Journal articles, special issues, research grant proposals
    - New or modified testbeds for distributed learning

Thematic Areas:

1. Future Learning Environments
2. Learning Technologies
3. International Collaborations
4. Early Career Research Opportunities

Methodologies:

This project builds on a symposium series that began in Shanghai and has created a growing set of international collaborations in the area of distributed learning and collaboration. Symposia are task oriented and produce action plans so that most of the work of the project occurs outside of the actual symposium meeting space. Additionally, the project relies on the use of a small number of minigrants to early career

Recent Research Findings:

Collaborations that have arisen to date affected a major initiative in e-learning in Mexico; joint papers and research in the area of modeling and interactive digital media, in Singapore and in Uganda, new research projects in tutorial dialog systems. The series has attracted co-funding from other US and overseas organizations, and the particular symposium in this HSD grant also benefits from a grant by the Australian Research Council and pending grants from Germany's scientific research funding agency (DFG).

Challenges and Opportunities

The project is predicated on the conjecture that international collaborations in the area of learning technologies and future learning environments can stimulate progress that is not readily possible when

conducted on a national level only. There have been numerous examples of this phenomenon of mutual benefit. These examples have the promise to contribute materially not only to research advances but to future high performance learning environments that provide more meaningful, customized, enjoyable and rigorous experiences to students. One challenge in research community development is to find appropriate blends of time and funding devoted to such collaborations. This is a challenge for researchers more generally. In the context of this grant, another significant challenge is to treat the evolving research community as a virtual organization and to determine ways it can be most productive to its members. What are the common research themes that draw participants? In what ways can the community leverage its organizational strength in the service of the broader research issues that are of interest internationally? How can the community define opportunities that allow researchers easy entry onto and exit from formal network collaborations and thus be an agile force?

Project Title: The Dynamics of Deception in Computer Mediated Environments

Proposal #: 0624267
HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: Jeff Hancock, Cornell University
Co-PIs: Claire Cardie, Cornell University and Mats Rooth, Cornell University

Research Goals:

1. The first research goal is to understand how computer-mediated environments affect the production and practices of deception. Research questions addressed under this goal include 1), Do people lie most frequently face-to-face, on the telephone, or by email? 2) Do people use different media to lie for different reasons, about different types of things, to different types of people? How do social and technological factors constrain and shape the properties of lies told online?

2. The second research goal is concerned with deception detection in computer-mediated environments Are humans worse at detecting a lie in a computer-mediated environments that remove nonverbal cues than we are in more cue-rich face-to-face environments? Recent research suggests that most nonverbal cues are not reliable for human detectors. If this is the case, is there any cost at all in losing these cues? Or, is it possible that the reduced trust observed in text-based interactions lead reductions in the truth-bias, in which people tend to believe that their partner is telling the truth? If the truth-bias is reduced in computer-mediated environments, does this lead to a paradoxical improvement in deception detection?

3. The third research goal seeks to employ advanced computational and natural language processing (NLP) techniques to analyze and identify deceptive and truthful messages. We have begun to determine how NLP techniques can be used to enhance our understanding the language of deception. If this is possible, the ultimate goal is to use this knowledge to develop systems that can assist in real-time deception detection in mediated communication, including email, instant messaging, chat rooms, and blogs. To this end, we are developing the Deceptive Message Corpus, a large-scale, publicly

Thematic Areas:

Our primary thematic area is the **dynamics of human behavior**. In particular, this project focuses on the dynamical nature of deception within the context of computer-mediated environments.

Methodologies:

The research project involves four methods, three of which are rooted in the social sciences, while the fourth is rooted in computational linguistics. The first is a diary method adapted from DePaulo et al (1996) and Hancock et al (2004). In this method, participants are asked to record in a PDA all of their social interactions and lies for seven days. For each interaction, the PDA requests information about the type of deception, whether the deception was self or other oriented, and the nature of the relationship with the deception target.

The second method is a cross-validation technique. In this procedure, participants that engage in online dating are asked to come into the lab. Before they come to the lab we download their online dating profile. Once they arrive in the lab, we measure several aspects of their self-presentation, including their height,

weight, age, and income (among others). The information from the laboratory measurements are compared against the information presented in their online profile, which allow for discrepancy calculations.

The third method is standard experimental procedure, in which participants come to the lab and are randomly assigned to medium condition (text-based or face-to-face), suspicion condition (suspicious vs. not suspicious) and to role (liar vs. partner).

The fourth method involves computational linguistics and corpus development. In this method, language produced in the project are entered into a corpus in which they are identified as deceptive or not deceptive. The corpus is then analyzed using NLP an computational linguistic techniques to examine whether deceptive messages differ from non-deceptive messages.

Recent Research Findings:

We have data from two completed studies. The first examined how frequently deception took place across different media. Seventy-six participants were asked to record all of their social interactions and lies for seven days. The results revealed that people lied approximately 1.6 times a day (26% of interactions). Lies were most frequently observed in telephone conversations (37.7%), while the least lies were observed in email (16.2%) and instant messaging (18.3%); face-to-face had a moderate amount of deception (22.3%). Technology also appeared to affect the content of deception. Lies about actions were most likely to occur on the telephone, while lies that provided an explanation were most likely to occur in email. Lies about one's feelings were least likely to occur in email.

The second study examined self-presentation in online dating profiles using a novel cross-validation technique for establishing accuracy. Eighty online daters first rated the accuracy of their online self-presentation. Participants' physical attributes were then measured (height, weight and age). A comparison of their online self-presentation and observed attributes revealed that deviations tended to be ubiquitous but small in magnitude. Men lied more about their height, while women lied more about their weight, with participants farther from the mean lying more. Participants' self-ratings of accuracy were significantly correlated with observed accuracy, suggesting that inaccuracies were intentional rather than self-deceptive. Overall, participants reported being the least accurate about their photographs and the most accurate about their relationship information. Deception patterns suggest that when lying, participants strategically balanced the deceptive opportunities presented by online self-presentation (e.g., the editability of profiles) with the social constraints of establishing romantic relationships (e.g., the anticipation of future interaction).

Challenges and Opportunities:

The largest challenge to date has been developing the Deceptive Message Corpus. One challenge here involves the nature of computer-mediated communication, which tends to not be very grammatically well-formed. As such, current parsers and taggers have some difficulty dealing with some of language. We have just recently developed a relatively robust pre-processor that cleans the texts in a way that permits more efficient tagging and parsing. A second challenge is that other researchers have been reluctant to share their own data. We hope to address this question at the HSD meeting and seek advice.

Project Title: HSD: Enhancing Control and Empowerment for the Elderly through Assistive Technology

          Proposal #: SES-0527648
          HSD Emphasis Area: Dynamics of Human Behavior

Lead PI's: Allen Hanson, University of Massachusetts, Amherst, Department of Computer Science; Phebe Sessions, Smith College School for Social Work

Co-PI's: Smith College: Julie Abramson, David Burton
          UMass Computer Science: Roderick Grupen

Collaborators: Highland Valley Elder Services; Mitsubishi Electric Research Laboratory

Research Goals:

1. To obtain and use feedback from elders, family caregivers of elders, and professionals who serve elders about the potential benefits and challenges of some computer-based assistive technologies for elders;
2. To enable such feedback to affect the design of a reconfigurable experimental system, or "Sandbox system", based on existing component technologies;
3. To understand the influence of recursive feedback from exploratory focus groups, implementation of an integrated system of technologies in a senior center, and interdisciplinary collaboration between computer scientists and behavioral scientists on the design of technologies;
4. To assess the experience of elders with these technologies and their potential to contribute to enhanced functioning in elders;
5. To prepare current and future practitioners in computer science and social work for collaborative research efforts which are based on an appreciation of elders' perspectives and priorities, and which integrate an understanding of human behavior with an understanding of various applications of assistive technology.

Thematic Areas:

1. Use by elders of computer-based assistive technology;
2. Adaptation and reconfiguration of technologies that would make them more functional for use by elders;
3. Learning and training issues affecting elders' competence with these technologies;
4. Perceptions of capacity of technologies for enhancing quality of life, increasing sense of mastery and control, and prolonging ability to remain living at home;
5. Expectations of variations in utility for elders with different cognitive and physical capacities and impairments;
6. Cross-disciplinary collaboration and integration of perspectives from behavioral and computer sciences;
7. Issues in education for cross-disciplinary research and practice.

Methodologies:

Behavioral science: Design of research methods has been influenced by an Advisory Group of elder citizens committed to the project in collaboration with the Research Team. The first phase of research has used focus group methodology, a semi-structured interview design, audio recording of interviews and verbatim transcription of data, interview notes from computer science research team members, qualitative

data analysis with three levels of thematic coding by three members of the research team, and independent review of data by four other members of the team. The second phase of research involves implementation of designated "Sandbox" technologies, now named ASSIST, into a senior center with elder subjects. A mix of quantitative and qualitative measures will be employed.

Computer science: The computer science team provides reconfigurable experimental systems supporting field tests designed to provide empirical data that can be used as dynamic feedback to the behavioral science team. This development cycle links technological innovation with principled methods for testing and evaluating the technology, which in turn drives further development.

The computer science team has developed:
1. a distributed sensor network infrastructure embedded in a small smart space for research, development and testing;
2. the ASSIST user system according to interface recommendations for elderly users. The system is composed of the five applications described below, an operating interface for the system, as well an email system, an internet portal, and access to games for the elderly;
3. five technology demonstrations as part of ASSIST, including:
   a. a daily event planning calendar that reminds users of important events, such as appointments and medication times;
   b. an address book containing information about friends, relatives and caregivers;
   c. an easy to use videophone application for face-to-face communication with family and friends;
   d. a fall detection system based on a distributed sensor network within the home;
   e. a system for finding specific "lost" objects such as keys, cell phones, coffee cups, and remote controls.

The ASSIST system will now be implemented in the Amherst Senior Center.

Recent Research Findings:

Focus group findings: Elders, family caregivers, and professionals who serve elders reported that they perceive great potential for computerized, assistive technology and the particular applications being developed by the Computer Science team to empower elders and contribute to their well-being. At the same time, their enthusiasm is tempered by some significant ambivalence about the increasing importance of technology in every area of their lives. Though focus group participants are for the most part eager to see the technologies that were presented become available to them, they would like to see their concerns recognized and considered in choices about design and application of technology.

The positive responses to technologies, in descending order of significance, included:
1. Potential for improved family and other long distance relationships through enriched (video) communication;
2. Potential uses in health care through increased monitoring of health status and communication with health care providers through video communication;
3. Enhanced management of multiple tasks, access to information, and opportunities for leisure;
4. Increased communication about falls and other threats to safety;
5. Increased sense of competence and power when technical skills are mastered;
6. Reduced caregivers' burdens, enabling alternative means of monitoring safety.

The concerns about the technologies, in descending order of significance, included:
1. Compromised privacy;
2. Potential for augmenting negative family and other long distance interactions with increased visual information;
3. Compromised quality of health care, substituting preferred "face to face" interactions with health care providers with communication "through machines"; "high tech over high touch";
4. Potential for increasing social divisions, between those who are computer literate, have access to high speed communication capacity, and can afford to keep upgrading technical capability, and those who cannot; experience of shame, of being "left behind" without this capacity.

Suggestions to influence design and implementation of technologies for elders:
1. Attend to sensory needs of elders, including reduced visual and auditory abilities and adapt interface technology to a range of capacities;
2. Compare the proposed technologies to those already available and implement easiest to use and most cost effective;
3. Consider the relative advantages and disadvantages of RFID and computer-based technologies at different stages of elders' life cycle and with different degrees of impairment;
4. Recognize the tensions between privacy and safety and develop balanced solutions for a range of problems;
5. Attend to the learning styles of elders in training and need for relationally based, ongoing support to acquire and maintain these skills;
6. Increase social networking, by elders for elders, and cross-generationally, around these technologies;
7. Make these technologies available as quickly as possible!

Project Title: Cognition in Natural Environments: Using Simulated Scenarios in Complex Decision Making

 Proposal #: SES-0527675
 HSD Emphasis Area: DRU (Decision Making, Risk Perception, and Coordination)

Lead PI: Glenn W. Harrison, University of Central Florida
Co-PIs: Steven Fiore, Charles Hughes, Eduardo Salas
 Senior Personnel: E. Rutström, S. Burke, S. Pattanaik, C. Stapleton, J. Weishampel
Collaborators: Nature Conservancy of FL, FL Division of Forestry, IDV Corporation

Research Goals:

1. Investigate the relationship between visualization using virtual reality (VR) and decision making in complex situations. Specifically, does VR visualization lead to a convergence of the decisions made between experts and non-experts?
2. Assess the experience of users as they interact with the virtual environment (i.e., presence), and how that may attenuate the decision making processes
3. Investigate the use of virtual environments as an effective tool to serve both laboratory and field-centric scientists. Specifically, does VR provide a setting that includes naturalistic cues of field studies and retains the controls innate to laboratory experiments?

Thematic Areas:

1. Naturalistic decision making
2. Visualization of forest fires
3. Perceptions of presence

Methodologies:

1. We conducted pilot experiments to demonstrate the feasibility of Virtual Experiments, as applied to the choice of whether or not to pay for a prescribed burn to protect property from wildfire damage. The key issue was whether this environment assisted participants in identifying the true, underlying probabilities that they property would be damaged. After controlling for the risk attitudes of subjects, we see some tendency for decisions to move towards those predicted with true beliefs, although we stress that these are pilot experiments with a small sample. This tendency suggests that the VR experience did have some effect on shifting beliefs towards the true risks that the property would burn. We also find that those subjects who had some prior experience with video games had the least problems with the VR environment, as expected. A preliminary design of this experiment appears in [Fiore et al., 2007]

2. We develop the concept of virtual experiments, combining insights from virtual reality in computer science, naturalistic decision-making from psychology, and field experiments from economics. The methodological objective of virtual experiments is to bridge the gap between the artefactual controls of laboratory experiments and the naturalistic domain of field experiments or direct field studies. The lab environment enhances internal validity when used correctly, but often suffers from external validity because the task and presentation are not the same as subjects encounter in their natural environment. But running experiments in natural environments, while maximizing external validity, runs the risk of including potential confounds that cannot be controlled by the investigator. Our virtual experiments should allow a

continuum of tasks and environments that spans these two extremes and permits the effect of naturalistic settings to be systematically studied. This should provide tools for policy analysis that combine the inferential power of replicable experimental treatments with the natural "look and feel" of a field domain.

3.   We developed the visualization using FARSITE to simulate the progression of the fire based on moisture, fuel load, tree and brush density, tree and brush types, crown height, etc,. The output from FARSITE is then input to our visualization program that provides an interface through which participants can fly over and into the chosen forest, before, during and after a burn. The rendering is done in the context of SpeedTree, a commercial product for rendering trees. We have extended the SpeedTree renderer to add integration with FARSITE data and the visual effects of fire and smoke.

4.   In order to conduct preliminary assessment of the user experience within the virtual environment we collected subjective data on perceptions of *presence*. Survey questions were administered to participants to evaluate their subjective sense of Involvement, Adaptation/Immersion, Sensory Fidelity, and Interface Quality.

Recent Research Findings:

1.   Irradiance caching offers a simple, straightforward method for increasing rendering efficiency without adding significant algorithmic complexity or an additional rendering pass. A current limitation of irradiance caching is that it has yet to be extended to rendering participating media (smoke, fire, fog, mist, etc.) In contrast, path tracing offers a more complete solution to the rendering problem, including participating media, but lacks computational efficiency. We have developed a caching technique within a path tracing framework that combines the performance of caching with the generality of path tracing, resulting in a renderer that efficiently supports participating media. [Johnson et al., 2007]

2.   Graphics presentations of smoke and sparks are commonly handled by processes called particle systems. Particle systems use some fixed number of particles per frame, where particle information is sampled from emitters represented by locations, and a range of potential initial particle parameters, such as origin, size, etc. For some complicated effects, especially where there are many potential emitters, where the location of the emitter is not well-defined, or when particle origins or other parameters cannot be easily defined by an analytic boundary, the problem of generating new particle samples becomes difficult. One concrete example of such a scenario comes in the form of a large-scale detailed forest fire simulation, where each leaf (or portion of leaf) that is burning is an emitter of flame particles, and there are potentially thousands of leaves visible at any given time. We propose a method for using visible pixels as potential particle emitters and performing sampling in image-space. This allows for a simultaneous sampling of all particle emitters. Using only on-screen pixels as emitters is sufficient if one assumes that the simulation of off-screen particles is unnecessary. This is reasonable if the primary purpose of the particle effect is visual. Our method is simple, works well with normal particle systems, and creates potentially new ways of generating particle effects, such as emitting particles based on image or animation data. [Konttinen, Pattanaik & Hughes, 2007]

3.   We have developed scene and level of detail management (LOD) techniques for achieving interactive frame rates for a forest walk-through. The framework selects the LOD based on object visibility, in addition to projected size. Moreover, visibility is calculated at run-time so we can support dynamic scene modification, such as interactively altered trees due to wind, explosions or fire. We also introduce an inertial level of detail model to minimize popping artifacts – rather than instantly switching the LODs, discrete LODs are smoothly blended over a number of frames. [Micikevicius & Hughes, 2007]

S. M. Fiore, G. W. Harrison, C. E. Hughes & E. E. Rutström, "Virtual Experiments and Environmental Policy," *Frontiers of Environmental Economics*, Washington, February 2007.

J. Johnson, P. Shirley, E. Reinhard & C. E. Hughes. "Extending Irradiance Caching to Path Tracing Participating Media," in preparation, 2007.

J. Konttinen, S. Pattanaik & C. E. Hughes, "Image-Space Particle Emission," *SIGGRAPH 2007*, San Diego, August 6-9, 2007, Poster.

P. Micikevicius & C. E. Hughes, "Visibility-based Forest Walk-through Using Inertial Level of Detail Model," *Journal of Defense Modeling and Simulation*, in press.

Challenges and Opportunities:

1. Developing a user interface that meets the needs of computer game novices but does not seem too limiting to those who would self-classify as experts is a human-computer interface design challenge.
2. Using a commercial product (SpeedTree) helps us to rapidly create the required visualization software but provides a challenge to releasing all the resulting software into the open source community.

Project Title: Large-Scale Analysis of Computer-Mediated Intimate Relationships

                         Proposal #: IIS-0624356
                         HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Marti Hearst, University of California, Berkeley
Co-PIs: Gerald Mendelsohn, University of California, Berkeley and Coye Cheshire, University
                         of California, Berkeley
Collaborators: Andrew Fiore, Lindsay Shaw Taylor (PhD students)

Research Goals:

1. Capture and characterize relationship formation at its early stages and at a massive scale.
2. Contribute to our understanding of the effects of computer-mediated communication on interpersonal relationships.
3. Suggest design improvements for online dating sites in order to positively effect the well-being and happiness of members of society.

Thematic Areas:

1. Computer-mediated communication and its effects on society
2. Psychology of relationship formation and personality
3. Computational Linguistics

Methodologies:

Method 1: Large-scale survey administration to members of a large online personals website. The intention is to capture relationship formation at its early stages by tracking communicating dyads before they meet in person, through their face-to-face meeting, and on to the establishment of a relationship. Our goal is to have access to their perceptions of each other throughout the crucial but ambiguous process of relationship formation. By taking an initial sample in the hundreds of thousands, we should be assured of a large set of participants who progress to a full-fledged relationship.

The proposed work is an interdisciplinary combination of methods from the fields of social psychology, human-computer interaction, and quantitative sociology. We use questionnaire techniques from personality studies, the results of which we plan to analyze with statistical methods and computational linguistics analysis. This will be followed by a new round of questionnaires and analysis to determine the effects of the intervention as well as a longitudinal analysis of relationship retention.

Method 2: Small-scale controlled experiments.

Recent Research Findings:

Before users of online personals communicate or meet, they view one another's profiles. In order to better understand the role these profiles play in the initiation of contact, we conducted a controlled experiment in which we asked 65 participants to rate different parts of 50 randomly sampled existing online profiles. Participants variously saw just the photograph, just the free text portion, just the fixed-answer portion, or

the entire profile, and they rated them using 5-point Likert scales along 8 dimensions (attractive, genuine/trustworthy, masculine, feminine, warm, self-esteem, extroverted, self-centered).

Among other findings, we were able to show that certain portions of the profiles predicted attractiveness ratings of the entire profile. Not surprisingly, we found that the attractiveness of the photograph predicted whole-profile attractiveness. Less predictably, we also found that the free text response was also a strong predictor of whole profile attractiveness. Furthermore, even when the photograph is rated attractive, if the other two components are unattractive, the entire profile will be seen as unattractive. When examining the relationship between the other dimensions and the attractiveness dimension, we found that for female profiles, the only predictor of overall attractiveness was the "extraverted" dimension. Males also rated female profiles as marginally more attractive when they were less masculine. For the male profiles, the only significant predictor of overall attractiveness was "masculine". For the female profiles, the whole profiles were seen as more attractive to the degree that the female photographs were rated as having higher "self-esteem" and were seen as relatively more "feminine" (both with only marginal significance). Results were also analyzed (comparing dimensions other than attractiveness) assigned to the photographs to whole profiles dimensions. Male profiles were seen as significantly more attractive overall when the photographs were rated as being more "genuine/trustworthy" and only if the photographs were also rated relatively *less* "warm/kind" (note that the correlations between "warm/kind" and "feminine" were high for the male photographs). Female profiles' photographs were rated as significantly more attractive when they were seen as relatively less masculine, and marginally more attractive when they were more feminine. Male photographs were rated as significantly more attractive when they were rated as "extraverted," "genuine /trustworthy," and less attractive when the photos were seen as "warm/kind." Interestingly, there was a *positive* relationship between "feminine" and attractiveness for the male photographs. In the free text ratings for the male profiles, there were significant positive relationships between attractiveness and "extraversion," "genuineness /trustworthyness," and "femininity". These results parallel what was seen for male photographs. We intend to investigate further the differences between whole-profile response ratings and these individual pieces' ratings.

Challenges and Opportunities:

Unfortunately, the commercial partner for this research has been experiencing difficulties in provided access us with to the user pool. Working with people at the company, we have developed survey software that resides on a machine within their premises. This software has been in place for at least 1.5 years (since the time we submitted the grant proposal), but we have not received the go-ahead to start running the study. Representatives from the company continue to reassure us that they want to run the studies with us, and that they continue to work through their internal roadblocks. We remain optimistic that the data will be gathered, but we also have reason to worry that there will be no end to the roadblocks, and we are considering other alternatives.

Project Title: Facilitating Change in Higher Education: A Multidisciplinary Effort to Bridge the
Individual Actor and System Perspectives

Proposal #: 0623009
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Charles Henderson, Western Michigan University
Co-PIs: Andrea Beach, Western Michigan University
Noah Finkelstein, University of Colorado at Boulder
R. Sam Larson, University of Denver
Collaborators: **Advisory Board:** James Dearing, Kaiser Permanente
James Fairweather, Michigan State University
Jeffrey Froyd, Texas A&M University

Research Goals:

1. Bring together researchers from three disciplinary communities who are working on the promotion of
fundamental changes in STEM instruction at the college level: 1) STEM Education Research
Community; 2) Higher Education Research Community; 3) Faculty Development Community.
2. Clearly articulate models for promoting fundamental changes in STEM instructional practices in higher
education that are consistent with available empirical and historical evidence as well as theoretical
perspectives about human and organizational change.
3. Develop interdisciplinary collaborations to work on refinement, revision, and testing of these models.

Methodologies:
We are developing a National conference to address these issues. The conference will be held June 16-19,
2008 at Brook Lodge in SW Michigan and called "Facilitating Change in Undergraduate STEM: An
Invitational Symposium Integrating Multiple Perspectives". Conference web site <
http://www.wmich.edu/science/facilitating-change/>

Forty participants will be invited to attend. All conference costs will be paid by the NSF grant. Some
travel money will also be available. This is conceived as a working conference. Participants from different
backgrounds will engage in substantive discussions focused on improving change models and theories. The
conference will build on a multi-disciplinary literature review completed by the organizers.

Recent Research Findings:
Conference planning is progressing as expected.

Challenges and Opportunities:
WE ARE EXPECTING TO RECEIVE A COMPLEMENTARY AWARD FROM THE NSF-REESE
PROGRAM TO SUPPORT THE PREPARATION OF A COMPREHENSIVE LITERATURE REVIEW
THAT WILL HELP INFORM THE CONFERENCE.

Project Title: AOC: Agents of Change: Transnational NGOs as Agents of Change: Toward Understanding Their Governance, Leadership, and Effectiveness

                    Proposal #: SES-0527679
                    HSD Emphasis Area: AOC

Lead PI: Margaret Hermann, Moynihan Institute of Global Affairs, Maxwell School, Syracuse University

Co-PIs: Derrick L. Cogburn, School of Information Studies, Syracuse University
Hans Peter Schmitz, Department of Political Science, Maxwell School, Syracuse University

Collaborators: Tosca Bruno (Moynihan), Bruce Dayton (Moynihan), Lou Kriesberg (Program in the Analysis and Resolution of Conflict), Steve Lux (Executive Education), Christine Mahoney (Political Science), Jishnu Shankar (South Asia Center/Languages and Linguistics), David Van Slyke (Public Administration).

Research Goals:

Our goal is to investigate the factors contributing to the organizational effectiveness–or relative ineffectiveness–of transnational non-governmental organizations (TANGOs). Specifically, we aim to: (1) better understand their organizational structures, communication and coordination strategies, and how governance and leadership choices influence their effectiveness as agents of change; (2) create indicators and baseline data for scholars and the NGO community; and (3) develop materials for training graduate and doctoral students as well as professional development courses for TANGO leaders.

Thematic Areas:

We are focusing on TANGOs in four sectors: (1) environment; (2) human rights; (3) conflict resolution; and (4) development (sub-divided as humanitarian relief and sustainable development). The project is developing indicators to explain the evolution of TANGOs, their funding strategies, their networks and partnerships, how they perceive issues of transparency and accountability, how they evaluate their own impact, and the challenges and opportunities of working with governments and the private sector.

Methodologies:

The project is a large-scale, systematic, elite interview study of the senior leadership of transnational NGOs. A representative sample of 180 TANGOs registered in the US and classified according to their fiscal effectiveness, capacity, size, and the sector in which they operate, was drawn randomly from the Charity Navigator database. In order to accommodate the geographically distributed nature of the project team, a web-based collaboratory environment was created to support the data collection, analysis, and project administration.

Primary data come from 2-3 hour interviews conducted with senior leadership of the sample. A structured interview protocol was developed and pilot tested on senior TANGO leaders associated with the Moynihan Institute's Transnational NGO Initiative. Doctoral students in the Maxwell School and School of Information Studies were trained by the PIs on the interview protocol and in the use of the collaboratory for remote data storage and virtual meetings. Researchers conducted digitally recorded interviews in the field, and uploaded the files into the collaboratory. These interviews were downloaded, transcribed and then

loaded into a computer-assisted qualitative data analysis software (CAQDAS) application called Atlas.ti. Our codebook has 412 codes, which allows us to code and analyze the data qualitatively, and export the dataset for quantitative analysis in SPSS.

Status:

We have completed 110 out of 180 interviews. Forty-three interviews have now been coded and forty serve as the base for the findings presented here (as of September 2007). The distribution of the sample is as follows: environment (n=8), human rights (n=6), humanitarian relief (n=4), sustainable development (n=19), and conflict resolution (n=3). A cross tabulation of sector and organizational efficiency is as follows:

Efficiency Sector	High	Low
Environment	5	3
Human rights	4	2
Humanitarian relief	4	0
Sustainable development	14	5
Conflict resolution	1	2

Preliminary Research Findings:

An analysis of the preliminary data reveals that, not surprisingly, those organizations with budgets in the billions of dollars were the most effective and generally these organizations were engaged in humanitarian relief or sustainable development activities on the ground. Those TANGOs focused on conflict resolution and human rights were the least fiscally effective and maintained the smallest reserve capacity for future operations. Humanitarian relief NGOs find themselves having to engage in *both* advocacy and service more often than transnational NGOs from other sectors. Indeed, environmental, human rights, and conflict resolution NGOs are engaged in advocacy over 60% of the time while those working on sustainable development are primarily engaged in the delivery of services (68% of the time). Interestingly, transnational NGOs with particular agendas tend to co-locate their headquarters in particular parts of the United States (e.g., environmental NGOs on the West Coast, and conflict resolution and human rights in NYC and DC.

Challenges and Opportunities:

Interdisciplinary and Logistical

Our disciplines range from political science and public administration to psychology and information sciences. We have worked to integrate our various perspectives, and through weekly meetings our team has designed the project, its instruments, and coordinated our work. The administrative and research team was geographically distributed, with researchers conducting interviews around the country and abroad. Our collaboratory infrastructure helped us to overcome these challenges, by creating opportunities for the team to access project documents from any location with Internet access. We used webconferencing to hold regular administrative and research meetings with the team. Another challenge has been scheduling interviews with busy CEOs. However, once we begin an interview with a CEO, he or she generally becomes intrigued and gives us much more time than requested. Moreover, they generally ask to remain involved with the study and to participate in our professional engagement activities.

Methodological and Analytical: Integrating Qualitative and Quantitative Approaches

Atlas.ti was designed primarily for qualitative research, but we have adapted its capabilities to generate more quantitative output. As a result, we are now simultaneously producing two datasets, one qualitative and one quantitative. The qualitative method allows for the recording of several, possibly even contradictory statements on a given variable. While this can be valuable for a qualitative researcher, it would undermine the quantitative data set. To address this, we developed a process of forcing the coders to select one single value from the qualitative codes. While this procedure somewhat limits the richness of qualitative analysis, it allows us to use the data across multiple methodological traditions.

Next Steps:

- Completion of interviews
- Finalize coding of interviews
- Expand the use of Atlas.ti in visualizing/presenting results
- Presentations on methodology and results (APSA/ISA/ICA)
- Publications on methodology and results
- Develop a publicly accessible database

Project Title: Contending With Materiel Convergence: Optimal Control, Coordination, and Delivery of Critical Supplies to the Site of Extreme Events

Proposal #: 0624083
HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: José Holguín-Veras, Rensselaer Polytechnic Institute
Co-PIs: Tricia Wachtendorf, University of Delaware
Satish Ukkusuri, Rensselaer Polytechnic Institute

Research Goals:

The overall research goal is the development of new methodologies and tools to foster accelerated convergence between the dynamic <u>needs</u> and <u>supplies</u> of critical resources in the aftermath of an extreme event while recognizing the organizational/community factors that impact material supply convergence during disasters. Objectives are as follows:

1. Synthesize the <u>social sciences' state of the art thinking about convergent behavior</u>.
2. Determine hazard, communication, organizational, and demographic features that may impact material convergence and supply needs
3. Provide robust estimates of the dynamic resource requirements (immediate and short term) following an extreme event (e.g., the amount of blood and water that is needed), <u>i.e., what is needed</u>.
4. Estimate the amount of critical resources available on site / in adjacent areas, <u>i.e., what is available</u>.
5. Estimate <u>optimal pre-positioning strategy</u> (in the case of anticipated extreme events).
6. <u>Estimate the dynamic pattern of unmet needs</u>, i.e., the difference between items (1) and (2) above. This provides estimates of what needs to be transported to the impacted area from elsewhere.
7. Estimate, on the basis of control theory, the <u>donation priorities</u> needed from the general public and emergency agencies.
8. Find out, in dynamic fashion, <u>the most effective ways to deliver, store and distribute the critical supplies needed, estimated in (5) to the impacted area</u>.
9. Ensure the models developed <u>are consistent with social sciences' state of the art thinking</u>.
10. Identify <u>institutional impediments</u> to coordinated multi-institutional private sector and public agency response to extreme events, and formulate institutional mechanisms to overcome these obstacles.
11. Identify ways in which <u>tighter integration of the information technology</u> systems can be achieved among the stakeholders involved in orchestrating the response.

Thematic Areas:

1. Emergency Logistics
2. Material convergence
3. Disaster Management

Methodologies:

Qualitative Analysis Using In-depth Interviews, Geographic Information Systems Mapping, Statistical Data Analysis, Network Modeling, Optimization Theory, Control Theory

Recent Research Findings:

1. *Estimation of immediate resource requirements*

The research team conducted an empirical estimation of immediate resource requirement needs after a disaster. This was done by means of statistical analyses of the requests made by the State of Louisiana to the Federal Emergency Management Agency (FEMA) using the Action Request Forms (ARFs). The analyses provide insight into the resource requirements after a disaster, their temporal evolution, and the key types of commodities requested, as well as their relative importance. Autoregressive integrated moving average (ARIMA) models were estimated for the requests of key commodities (i.e. electrical equipment, transportation equipment and machinery, water and ice, medical supplies, food). It was found that, although qualitatively, the temporal patterns of requests seem similar (a peak of requests during the first week and then rapidly declining over the following weeks), the different commodity groups follow structurally different ARIMA processes. Taken together this information provides crucial information for emergency planning as it will help emergency agencies to develop appropriate contingency plans.

2. *Operational planning for handling resources*

In order to develop optimal pre-positioning and inventory management strategies for critical supplies the research team introduces a cost minimization multi-commodity, multiple supplier, two echelon, multi-period stochastic inventory model for disaster planning of fixed lifetime commodities. Initial results show the effect of considering lifetime of goods when selecting inventory managing strategies, as they will affect pre-positioned and safety stock levels. It was found that shipment size and frequency are key planning factors that play an important role in the continuous provision of critical supplies during an extreme event.

3. *Factors in convergence management*

The research team conducted a qualitative analysis of in-depth interviews with key actors involved with the Katrina disaster response. Community/organizational social capacity/vulnerability, assets and supply network visibility, and communication social and technical systems were among the factors than can impact supply chain processes. Findings point to the need to account for specific capacities/vulnerabilities in model development. Moreover, models should incorporate the generation of dynamic organizational network output to better familiarize those in the emergent multi-organizational network. Technologies would still depend on timely input into the system, successful communication of information, continuity of infrastructure that supports these technologies, and user-friendly approaches. Pre-disaster and real-time identification of bridge organizations may prove useful to emergency responders immersed in a catastrophic response.

4. *Catastrophic events*

The research team identified ways in which the catastrophic disaster events present unique challenges to emergency supply chain processes, setting the context for organizational and systemic arrangements distinct from disaster events. Findings point to the need to consider the potential differences that may play out in emergency, disaster, and catastrophe events.

Challenges and Opportunities:

There are a number of challenges that deserve specific mention:

Data acquisition: Obtaining the data about immediate resource requirements (IRR) has required numerous Freedom of Information Act requests, and a considerable amount of human resources to transfer paper records into electronic formats. In spite of this challenge, the team has been able to collect the data, and conduct one of the first comprehensive studies of the dynamic IRRs.

Analytical complexity: This project seeks to integrate social science state of the art thinking into analytical formulations that account for material convergence and emergency logistics. This is in itself a challenging proposition because of the huge complexity of the subject matter.

In spite of the acknowledged constraints and challenges, the team has already produced important contributions. First, it has been proven that it is indeed possible to estimate analytical models to provide estimates of IRRs. Although these models have been estimated with data from Katrina only, the experience suggests that it may be indeed possible to estimate more general models, once the data are available. Second, the effective integration of material convergence and emergency logistics offers the potential of significantly improving the efficiency of the logistical response, and to close the gap between resource requirements and supply.

Project Title: TSUNAMI: Social Cognitive Modeling of Preparedness and Effectiveness of Warnings

                       Award ID #: 0527387
                       HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Bruce Houghton, University of Hawaii
Co-PIs: Duane Gill, Mississippi State University, Christopher Gregg, Eastern Tennessee State University
Collaborators: Liesel Ritchie Western Michigan University, Douglas Paton, University of Tasmania, Stephen Meinhold, Jennifer Horan University of North Carolina, David Johnston, Institute of Geological and Nuclear Sciences, NZ

Research Goals: To refine an empirical model that predicts preparedness for natural hazards to consider the case for tsunami hazard in the USA, by:

1. acquiring and interpreting survey data from 7 coastal US communities,
2. mapping cognitive reasons for evaluating preparedness and warnings in a positive or negative manner and
3. evaluating hazard education and risk reduction strategies and identifying appropriate risk communication strategies.

Methodologies:
Data have been collected using a mix of quantitative and qualitative methods. For the quantitative component, data collection is subdivided into two main phases of bulk data acquisition (phase I and phase II). Phase I collected data on the intention formation (motivators and factors that mediate the relationship with intentions) aspects of the model. Phase II data collection in September-October 2007 will examine the relationship between intentions and preparedness (including assessment of the role of proposed moderators). We collected the survey data from adult residents of 6 U.S. communities, Coronado, California, Kauai County, Hawaii; Seaside, Oregon, Ocean Shores, Washington, New Hanover County, North Carolina, and Kodiak, Alaska. There are a total of 2800 participants in the study.

Recent Research Findings:
Phase 1 has revealed considerable diversity amongst the 6 communities, suggesting that there is no unique single approach that could be applied at this stage to all of the communities. For example, Kodiak, Ocean Shores, Seaside and Kauai have accepted that tsunamis will occur in their communities and understand the downstream risk and impact on their community. Coronado and New Hanover, on the other hand, have yet to be convinced of any specific danger and feel that the risk has been exaggerated and does not impact their community. In Coronado and New Hanover, people are uncertain as to whether a warning system exists and also do not know what action they should take during a tsunami evacuation. In contrast, there is good knowledge of warning systems in Kodiak, Ocean Shores and Seaside.

Challenges and Opportunities:
Researchers in this study are spread over three countries, 7 institutions and 8 time zones. There are also significant contrasts in expectations and culture which both enrich and complicate. We have also encountered problems of literacy challenges in some communities that we ideally would have hoped to survey.

Project Title: Children and Technology Project

Proposal #: 0527064
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Linda A. Jackson, Michigan State University
Co-PIs: Yong Zhao, Alexander von Eye, Hiram Fitzgerald, Rena Harold
Collaborators: 20 middle schools in the lower peninsula of Michigan and one after-school program in Detroit, Michigan. See Participants listed on the project website: 1

Research Goals:

1. To describe children's information technology use and the socio-demographic characteristics related to it.
2. To describe the relationship between children's information technology use and their cognitive, social, psychological and moral development.
3. To provide suggestions for future research and public policy regarding children and information technology.

Thematic Areas:

1. Developmental psychology
2. Human-Computer Interaction
3. Youth information technology use

Methodologies:

Surveys, standardized tests, ethnographic interviews.

Recent Research Findings:

The Children and Technology Project is a 3-year longitudinal study of the impact of technology use on children's cognitive, social, psychological and moral development. We are currently 1.75 years into the project. Thus, the data needed to address the project's developmental questions have yet to be collected. However, we have analyzed a portion of the data from Year 1. Five manuscripts have been generated from these data and submitted for publication and presentation. One journal article has already been accepted. The following are citations for all 5 manuscripts and abstracts for 2 that are informative about the project's research findings.

Jackson, L. A., Zhao, Y., Qiu, W., Kolenic, A., Fitzgerald, H. E., Harold, R., & von Eye, A. (in press). Cultural differences in morality in the real and virtual worlds: A comparison of Chinese and U.S. youth. Cyberpsychology and Behavior.

In this research we examined cultural differences in morality in the real and virtual worlds and the relationship between the two. Approximately 600 Chinese and 600 U.S. youth, average age 12 years-old, completed surveys assessing their moral attitudes and behavior in the real world, and the acceptability of a diverse set of morally questionable online behaviors. Findings indicated that: (1) Chinese youth considered good moral character to be more important than did US youth whereas U.S. youth considered exceptions to

moral behavior that advanced individual goals to be more acceptable than did Chinese youth; (2) Chinese females had the highest level of moral behavior, followed by U.S. females and then Chinese and U.S. males, who did not differ; (3) Chinese youth found morally questionable online behaviors to be more acceptable than did U.S. youth, with the exception of videogame violence, which US youth, especially males, found more acceptable; (4) Moral attitudes and behavior in the real world predicted the acceptability of morally questionable online behaviors whereas the importance of good moral character and the extent of Internet and other technology use did not. The more accepting youth were of exceptions to moral behavior that advanced individual goals, and the less moral their behavior in the real world, the more acceptable they found morally questionable online behaviors. Cultural differences are explained in terms of differences in perceptions of cyberspace as a venue for expressing individual autonomy.

Jackson, L. A., Zhao, Y., Kolenic, A., Fitzgerald, H. E., Harold, R., & von Eye, A. (submitted August 8, 2007) Race, gender and Information Technology use: The new digital divide. CyberPsychology and Behavior.

This research examined race and gender differences in the intensity and nature of IT use and whether IT use predicted academic performance. A sample of 515 youth, 172 African Americans and 343 Caucasian Americans, average age 12 years old, completed surveys as part of their participation in the Children and Technology Project. Findings indicated race and gender differences in the intensity of IT use; African American males were the least intense users of computers and the Internet and African American females were often the most intense users of the Internet. Males, regardless of race, were the most intense videogame players and females, regardless of race, were the most intense cell phone users. IT use predicted youth's academic performance. Length of time using computers and the Internet was a positive predictor of academic performance whereas amount of time spent playing videogames was a negative predictor. Implications of the findings for bringing IT to African American males and bringing African American males to IT are discussed.

Jackson, L.A., Zhao, Y., Qiu, W., & Kolenic, A. (accepted, August 16, 2007). Morality in Cyberspace: A comparison of Chinese and US youth's beliefs about acceptable online behavior. Hawaii International Conference on System Sciences, January 7-10, 2008. Waikoloa, Big Island, Hawaii.

Jackson, L. A., Zhao, Y., Qiu, W., Kolenic, A., Fitzgerald, H. E., Harold, R., & von Eye, A. (submitted July 13, 2007). Culture, gender and information technology use: A comparison of Chinese and U.S. youth. International Journal of Human-Computer Studies

Jackson, L. A., Zhao, Y., Kolenic, A., Fitzgerald, H. E., Harold, R., & von Eye, A. (submitted August 18, 2007). Race, gender and morality is cyberspaces. Computer Human Interaction (CHI) 2008 Conference. Association for Computing Machinery (ACM). Florence, Italy, April 5-10, 2008

In addition to the above publication and presentation submissions, the Children and Technology Project will be featured in the November 2007 issue of the American Psychological Association (APA) Monitor on Psychology, in the lead article by Erika Packard about mental health and the Internet.

Challenges and Opportunities:

Challenges have been working with the public schools to recruit participants and obtain cognitive ability measures from youth participants. These challenges have also been opportunities. The opportunity to work with middle school principals, staff and students has been enlightening and enriching. We have developed

good relationships with a number of schools geographically distributed throughout lower Michigan. In part as a consequence we now have a rich database that includes both quantitative and qualitative data as well as ethnographic interviews of 128 youth about their technology use and what it means to them. We have just completed transcribing these interviews and analyses will begin in the fall. We have to date collected 4 **waves of survey data and are poised to collect wave 5 in the fall.**

Project Title: The Repression and Dissent Nexus in the Middle East

                       Proposal #: 0527339
                       HSD Emphasis Area: Agents of Change

Lead PI: J. Craig Jenkins, Katherine Meyer; Ohio State University
Co-PIs: Phil Schrodt – University of Kansas, Lawrence, KS; Mary Ann Tétreault – Trinity University, San Antonio, TX; Jillian Schwedler, Christian Davenport – University of Maryland, College Park, MD

Research Goals:

This project examines the interaction between dissent and repression in the Middle East to advance understanding of the prospects for democratization and globalization there. It focuses on several important nations -- Egypt, Israel/Palestine, Jordan, Kuwait, and Turkey -- during the 1990s, a particularly contentious decade. These locations make it possible to examine the process of transformational change and the implications of cultural variation for conflict.

Research goals of the project include: (1) the development of research models that include dynamic and interactive processes in sociopolitical systems affected by extensive and often violent dissent and repression; (2) the creation of a database that integrates data from both qualitative and quantitative sources; (3) interdisciplinary and international partnerships involving senior and junior faculty; (4) professional training of and collaborative work with graduate and undergraduate students; (5) demonstration of the power of interdisciplinary, multi-method social science research.

Using multiple research methods to study the dissent/repression nexus in the Middle East (event analysis, field research, and social surveys), this research goes beyond most previous research which utilized a single nation and/or a single methodology. It also considers more conceptual refinements of dissent and repression, a theoretical lack in existing research. Finally, it takes seriously the social, political and cultural contexts surrounding contentious activities in each nation, features which are often overlooked.   Research questions include:

- How do dissent and repression influence one another and over what time period – e.g., quarterly, annually?
- What kinds of repression produce what kinds of dissent and vice versa?
- What are the social, political and cultural contexts that surround contentious activities?
- What consistencies and inconsistencies exist in the region regarding the nature of dissent, its sources, and its contexts?

Thematic Areas:

The importance of context: The team has just completed the project's second year. The research integrated data from in-depth surveys in the six countries with survey and event data and content analysis of newswire and newspaper data. A conference at Mershon Center, highlighting the team's work was held on July 31st, following a five week workshop of intensive study. Essential to that was the work of graduate and undergraduate students who each worked in depth on one country, focusing on the mechanisms and explanatory theories of repression and dissent in the 1990s. From the country case studies, four

overarching themes emerged that are critical to understanding patterns of repression and dissent across the region:

- The importance of rentier status, both oil and foreign aid, that creates internationally dependent states
- The size and out-migration of Palestinian and Kurdish populations creating highly mobilized diaspora communities
- The significance of the 1990-1991 Gulf War, which transformed political opportunities and transnational networks among activists
- The central role of technological and social networks that accompany globalization

The distinctiveness of issues: Although comparisons among the nations studied could be drawn, unique issues fueled conflict in each location. For example, in Turkey, regime changes during the 1990s were a trigger for state action, and civil dissent was fueled by the mobilization of resources within centralized groups, e.g., PKK and Dev Sol. In Israel/Palestine, state action was fragmented and piece-meal with frequent changes in leadership. A pattern of promises and broken promises was notable routinely spawned violent conflict between local tribal and informal groups as well as by larger bureaucratic organizations. In Kuwait, struggles at the times of parliamentary elections among secularists, Islamists and the ruling elite made transparent persistent cleavages within the Kuwaiti social system. Dissent erupted over the rights of women, foreign workers, the press, and stateless people.

The utility of multiple methodologies: The project utilizes multiple methodologies and sources of data. The latter include: (1) World Handbook of Political Indicators IV (http://www.sociology.ohio-state.edu/faculty/jcj.php), which provides event data from Reuters on relevant territories and is generated and utilized at The Ohio State University (OSU); (2) Kansas Event Data System (KEDS), which provides event data from Agence Francaise Presse; it resides at University of Kansas (KU); (3) Europa World Online Reports, Keesing, and Lexis-Nexus dissent and repression news stories, which have been consolidated at OSU; (4) Field work data which has been collected by American University in Cairo, KU, OSU, Trinity University, University of Maryland); (5) Kuwait General Social Surveys for the 1990s, country-specific demographic data and World Values Survey data merged at OSU; and the (6) Religion and State Data Set from Fox, 2006, merged at OSU. Using data from these sources in combination with each other has yielded a richly textured picture of contentious activity.

Challenges and Opportunities:
The project is replete with challenges and opportunities related to research goals 1 – 5 above. We mention three:
- ❖ Attention to detailed patterns of state violence, state sanctions, and civil violence and protest in each country using multiple methods of data collection provided an opportunity to examine the utility of theories of repression and dissent for explaining conflict in the Middle East and a challenge to correct and modify models deriving from such theories. (research goals 1, 2, and 5.)
- ❖ Attention to the social, political and cultural contexts of each nation using multiple methods made it possible to extract characteristics common to nations in the region, a significant move beyond generalizations based on case studies. (research goals 1, 2, and 5.)
- ❖ The nature of the work and its social and political importance has facilitated cross-disciplinary and international opportunities for graduate and undergraduate students as well as faculty. (research goals 3 and 4.)

Project Title: DRU Learning and Social Efficiency in Large Games

                            Proposal #: 0734780
                            HSD Emphasis Area: Decision Making, Risk and Uncertainty

Lead PI: Adam Kalai, Georgia Institute of Technology
Co-PIs: Ehud Kalai, Northwestern University & Andrew Postlewaite,
                   University of Pennsylvania

Research Goals:

1. To introduce equilibrium concepts based on computer science concepts.
2. To study learning in large games.
3. To design mechanisms for playing large games.

Thematic Areas:

1. Bounded rationality
2. Learning
3. Large games

Methodologies:

We are combining different approaches from game theory, economics and computer science.

Recent Research Findings:

1. Many interactions in complex environments, e.g., chess, are affected by computational limitations. An extreme example is the factoring game, where the first player chooses a large number and sends it to the second player who then attempts to factor it. Ignoring computational considerations, the second player can factor any number and win, but with computational considerations the game seems to favor the first player.

     This well-known issue in game-theory falls under the term bounded rationality, yet there is no general model of playing games with computational limitations. We propose an extremely simple model of a game with additional costs (computational or otherwise) for each strategy. We illustrate that this model fits nicely into existing concepts in game theory such as zero-sum games, potential games, and submodular games, showing that natural learning dynamics continue to converge to equilibrium.

2. Bayesian-Nash equilibria that fail to be ex-post stable are a poor modeling tool for many real life applications. Consider, for example, a simultaneous location choice game in which relocation costs are relatively low. No equilibrium is really stable if the locations observed after the formal play of the game are not compatible with individual incentives.

     Earlier literature has shown that in large (many players) games the equilibria are ex-post stable provided that several conditions hold. In particular (1) the number of possible players' types and the number of possible players' actions are finite and bounded, and (2) the payoff function of every player is continuous

and treats the opponents as if they are anonymous.   These restrictions severely limit the applicability of this earlier literature.

We show that ex-post stability is obtained in more general classes of large games, ones that relax the anonymity and finiteness restrictions above. In the class of game introduced here, players can influence each other asymmetrically, but each player's unilateral influence on any of her rivals is bounded. We show that this limited individual impact condition, together with a regularity condition on the payoff functions, guarantees approximate ex-post stability of Bayesian Nash equilibria in large games, even when we allow a continuum of types and actions.

3. Many important strategic problems are characterized by repeated interactions among agents. There is a large literature in game theory and economics illustrating how considerations of future interactions can provide incentives for cooperation that would not be possible in one-shot interactions. Much of the work in repeated games assumes public monitoring, that is, that players observe precisely the same thing at each stage of the game. It is well-understood that even slight deviations from public monitoring increase dramatically the difficulty the problems players face in coordinating their actions. Repeated games with private monitoring incorporate the idea that there typically may be slight differences in what players observe about each transaction. Equilibria in repeated games with private monitoring often seem unrealistic; the equilibrium strategies are highly complex and very sensitive to the fine details of the stochastic relationship between players' actions and observations. Furthermore, there is no realistic story about how players would arrive at their equilibrium strategies.

We propose an alternative approach to understanding how people cooperate. Players restrict attention to a relatively small set of simple strategies. As a first step we specify sets of strategies that have the following desirable properties: (i) the number of strategies in the set should be small enough that players might ultimately learn which perform well; (ii) the strategies should be simple in an intuitive sense; (iii) the sets should allow agents to cooperate when cooperation is productive. Using this framework, we investigate how the possibility of cooperation changes as the number of agents gets large.

Challenges and Opportunities:

The opportunity is great to discover novel paradigms for learning, mechanism design, and equilibrium concepts. Natural concepts such as bounded rationality in games seems especially suited for tools from computer science regarding computational complexity. The difficulty is that many complexity notions from computer science are based on worst-case complexity, which is not appropriate in many applications. Similarly, another possible opportunity would be to discover some alternatives to worst-case computational complexity that may arise from studying alternative models used in game theory and economics.

Project Title: Studying Dynamic Patterns of Husband-To-Wife Abuse

   Proposal #: 0525026
   HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: David Katerndahl, Department of Family and Community Medicine, University of
   Texas Health Science Center at San Antonio

Collaborators: David Katerndahl, Sandra Burge, Robert Ferrer

Research Goals:

To prepare for a large-scale longitudinal study of dynamics of husband-to-wife abuse, this exploratory research study evaluated 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 were 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
2. Explore the feasibility of conducting a large-scale longitudinal study of daily husband-to-wife violence and predictors.

Thematic Areas:

1. Domestic Violence
2. Complexity Science

Methodologies:

   This study recruited 20 adult Hispanic and non-Hispanic White women from a primary care clinic. Women were eligible if they reported abuse by their partners within the past month, but had never experienced serious injuries and were not afraid of their partners. Subjects confidentially reported 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 assessed the women's sense of safety during the study. To ensure safety, all subjects were escorted to a violence intervention center and connected to appropriate community resources. Analyses assessed whether changes in level of violence were cyclic and identified triggers of violent events from the previous day(s) measures as well as providing preliminary data needed to prepare for a larger, longitudinal study. Missing violence data was imputed using TISEAN software to maintain nonlinear characteristics. Each subject's data was analyzed using vector autoregression and chaos data analyzer. Resultant individual subject parameters were combined using statistical techniques of meta-analysis. Key innovative features included the day-to-day assessment of violent events and triggers, 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.

Recent Research Findings:

Of the 20 subjects enrolled, 4 (20%) withdrew prior to completing data collection. The remaining 16 women provided information concerning 586 days of which 225 (38%) included incidents of abuse. Unexpectedly, seven (35%) women left their abusive husbands after completing this study. Using cross-

correlation analysis, violence tended to occur on days in which arguments (r_s= .54) and stress (r_s= .36) were increased and sense of closeness was decreased (r_s= -.37). Vector autoregression suggested that prior violence, hassles, arguments, stress, closeness, and life events significantly accounted for current violence. However, only two variables (arguments and life events) predicted the following day's violence. Nonlinear measures were also performed. Mean LZ and Grassberger entropies (measures of the amount of information needed to describe the time series) were .977 and .139, respectively, with a mean Lyapunov exponent (measure of how sensitive the series is to initial values) of .054, a mean approximate entropy (measure of lack of regularity) of .535, and mean correlation time (measure of predictability) was .863. Based upon Lyapunov exponents and saturation of capacity dimension (suggesting the presence of an attractor), 3 (25%) of the 12 subjects with enough data demonstrated periodic dynamics, while 4 (33%) had chaotic and 5 (42%) had random dynamics. These results confirm that abusive relationships demonstrate nonlinear dynamics with predictability over the short-term at best. In addition, the nonlinear measures were associated with differences in abuse characteristics. While durations of the relationship and marriage were inversely related to LZ entropy (r_s = -.49 and -.51, respectively), duration of abuse was inversely related to correlation time (r_s = -.59). These results suggest that, the longer the duration of relationship, the more linear are the dynamics, but that the longer the abuse, the shorter the timeframe over which it is predictable. Frequency of threats was associated with the Lyapunov exponent (r_s = .64). Thus, the use of threats and insults may be important in sustaining this sensitivity to small changes. Cross-correlations with hassles were positively correlated with approximate entropy (r_s = .51), but inversely related to Grassberger entropy (r_s = -.48). Finally, prior-day predictors of abuse correlated with LZ entropy (r_s = -.50 for arguments), Lyapunov exponents (r_s = .66 for arguments), and correlation time (r_s = .75 for violence). These correlations suggest a complex relationship between same-day and prior-day predictors and nonlinearity.

Challenges and Opportunities:

This study demonstrated that sufficient daily information can be obtained without increased risk from women in abusive relationships to enable nonlinear analyses to be conducted and combined. However, qualitative interviews raised the need to assess drug use and, because women in extremely abusive relationships were excluded from participation, the results of this study are not applicable to the most violent relationships. Finally, with 35% of women leaving their husbands, this study demonstrated the potential of research protocols to serve as interventions.

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. Designed with the challenges of daily data collection and subject safety in mind, this exploratory study provided preliminary results needed for a full investigation of these dynamics.

This study demonstrates the potentially transformative nature of this work. It is the first study to demonstrate the feasibility of assessing the dynamics of domestic violence and its correlates in realtime without causing an escalation in that abuse. This could empower researchers to study violence "as it happens" rather than limiting their investigation to posthoc and potentially-biased recall of events. In addition, the resultant sense of support and empowerment expressed by participants demonstrates the potential for such research to, not only improve our understanding of violence as a phenomenon, but to simultaneously serve a positive role within the lives of subjects.

Project Title: Modeling in Social Dynamics: A Differential Approach

                    Proposal #: BCS-0527545
                    HSD Emphasis Area: Dynamic Human Behaviors (DHB)

Lead PI: D.J. Kaup, University of Central Florida
Co-PI's: Thomas Clarke, Florian Jentsch, Linda Malone
Collaborators: Rex Oleson, Mario Rosa, Robert Hauser, Alan Jolly, Jennifer Faulkner, Sivakumar Jaganathan, Kresimer Sivoncik, Matthew Rogers

Research Goals:

1. Expansion of HMFV Social Forces model for pedestrian motion to provide additional realism in simulations of crowd dynamics.
2. Develop techniques to validate models of crowd dynamics.
3. Develop multi-agent simulation framework allowing agents within the same simulation to be controlled by different models for pedestrian motion.

Thematic Areas:

1. Add personality, age, gender, grouping and cultural factors into the HMFV Social Forces Model.
2. Determine important characteristic factors, and what individual movements should be associated with given factors.
3. Add overlap elimination routine to HMFV model to provide more realism.
4. Optical flow analysis for extracting information on crowd dynamics from real world video.
5. Develop techniques and measures for comparing information from optical flow analysis with simulation output.
6. Develop quantitative approaches to measure when a simulation is a valid representation of a given crowd scenario and to differentiate among various crowd dynamics.

Methodologies:

Collect real world video footage of crowds in diverse non-emergency situations such as sports, concerts, schools, malls, and church events. Use this video footage to validate simulation models by statistically comparing the results of the models against relevant output acquired from real world footage. One method of comparison is tracking the flux of individuals moving through a discrete grid superimposed on both a video and the corresponding simulation. Tracking this flux (using the Lucas-Kinade optical flow algorithm) across the grid through time allows comparison between pedestrian movements in the simulation and observed movements on the video.

A quantitative test is proposed to test whether one simulation is similar to or different from another simulation or video. This analytical approach utilizes a multivariate, distribution free, affine invariant statistic. An affine invariant statistic is one which is invariant under nonsingular linear transformations of the data which include rotations, reflections, and rescaling. The benefit of the rotatability of the data is that it generates the same conclusions whether gathered from the original data or the principal components of the rotated data.
The approach proposed applies simplicial depth to principal component analysis (PCA). PCA is applied to statistics collected from a historic dataset of outputs from different simulations over multiple runs using

different seeds but with the same parameter values. The simplicial depth of these principal components is calculated. A second simulation with different parameter values (or a video of crowd footage) is then run and the data depth of the statistics collected is computed. From this, a nonparametric control chart based on the ranks of the data depths is created. Plotting these ranks allows us to detect potential outliers. Outliers would indicate that the original simulation and the new simulation (with different parameters) (or the crowd videos) were not statistically the same.

The HMFV model is based on each pedestrian being the effect of two kinds of forces, "social" and physical. The forces acting on individuals in the HMFV model are:

1. Physical repulsive contact force of wall on individual,
2. Physical frictional contact force of wall on individual,
3. Social force of wall on individual,
4. Physical repulsive contact force of individual on individual,
5. Physical frictional contact force of individual on individual,
6. Social force of individual on individual,
7. Self propelling social force arising from any attraction point,
8. Small random forces included for variations.

The parameters in these forces can be adjusted to model age differences, among other things. Characteristics to be used are the "sense" of personal space (how close an individual is willing to be in relation to obstacles or other individuals), speed (how fast an individual moves), and randomness (how random are an individual's motion). These characteristics are sufficiently distinct to present noticeable differences in their respective movements. To introduce personality factors into the HMFV equations we introduced a vector weighted to reflect five personality traits for individuals. Multiple simulations were run to determine appropriate ranges for the five personality traits and appropriate numerical factors for age groups. In order to better model high density crowds in the HMFV model, we have introduced a density dependent magnitude to the social force of any crowd which surrounds a pedestrian.

Recent Research Findings:

Addition of density dependent magnitude parameters to the HMFV model was observed to increase room exit times over that reported by Helbing (creator of the HMFV model). We also have shown that individual characteristics (such as age) can be incorporated into social forces by modifying the force parameters. These modifications can now be done on a group level, in that all individuals of a group will operate with the same parameters (which define how the individuals in that group tend to react to the environmental factors).

Using our comparison approach, we can quantitatively differentiate between two room exiting simulations with different densities, while sets of simulation data which differ only by seed number appear quantitatively similar. This shows promise for the analytically validating simulations of a particular crowd scenario, and in particular for determining the optimum parameters for simulations containing individuals of different ages, ethnicities, etc.

Challenges and Opportunities:

We need to gain more experience in how characteristic groupings can be used and how such groups might interact. Individuals could even be members of several different characteristic groups (such as age and sex

or ethnicity). Questions that need to be addressed include how to handle multiple modifications on a single force, whether or not these modifications remain some constant value, or how they should be allowed to be modified by events occurring in the environment.

Additional fine tuning needs to be done on our quantitative approach towards validating and comparing simulations and videos. Specifically, we need to optimize the number of principle components used and the number of outliers expected.

Project Title: Human Dynamics of Robot-Supported Collaborative Work

Proposal #: IIS-0624275
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Sara Kiesler, Carnegie Mellon University
Co-PIs: Susan Fussell, Jodi Forlizzi, Jessica Hodges
Collaborators: Pamela Hinds, Stephen Rock (Stanford University)

Research Goals:

1. Understanding how specific nonverbal and paralinguistic capabilities of robots (including gaze, voice, gesture, gaze, and movement) affect people's perceptions of and responses to that robot.
2. Understanding how humans and robots work together to affect, develop and maintain shared understandings.
3. Understanding how the introduction of a robot into a collaborative group changes group dynamics and group performance.

Thematic Areas:

1. Human robot interaction
2. Social psychology and organizational behavior
3. Design

Methodologies:

Laboratory experiments, field experiments, and observational studies.

Recent Research Findings:

Our first study showed that people's snap judgments about the personality traits of a nice or impolite online robot health interviewer matched their judgments of the traits of a human health interviewer, and were made equally rapidly. However, when people thought more reflectively about these questions, they responded that a robot interviewer would not possess human personality traits, moods and desires. The results suggest that people make anthropomorphic judgments of robots that are inconsistent with their abstract knowledge, and that they are apparently not aware of this inconsistency. The reaction time results suggest that neither guessing or uncertainty about robots does not explain the results.

Challenges and Opportunities:

One intellectual challenge is to find the cause of anthropomorphism, since it does not appear to be due to misunderstanding. One practical is developing affordable robots that can convincingly emulate aspects of human behavior such as eye gaze, facial expressions, and body movement.

Project Title: Archaeological Data Integration for the Study of Long-Term Human and Social Dynamics

Proposal #: 0624341
HSD Emphasis Area: AOC

Lead PI: Keith Kintigh, Arizona State University
Co-PIs: K. Selçuk Candan, Hasan Davulcu, Margaret Nelson, Katherine Spielmann (Subbarao Kambhampati)
Collaborators: archaeoinformatics.org, Alexandria Archive Institute

Research Goals:

1. Build a pilot information infrastructure for systematically collected archaeological data that will permit synthesis across projects with different recording protocols
2. Develop tools for concept-oriented, query-driven data integration in the presence of inconsistent data source ontologies, and inconsistent analyst ontologies.

Thematic Areas:

1. Archaeological synthesis; archaeological fauna; species diversity
2. Science informatics; data integration and sharing; long-term data preservation

Methodologies:

Our efforts: 1) choose a software platform able to support and facilitate development of the proposed research tools; 2) detailed software design specification; 3) develop interoperable metadata standards and user-oriented metadata acquisition tools; 4) acquire the archaeological datasets and metadata for the proposed pilot project.

Recent Research Findings:

1) GEON will provide the software platform for our development. At registration time the system will upload and convert legacy databases into a modern multi-user database and at the same time provide for transparent access to distributed databases. 2) We have developed an ontology-based design for metadata acquisition that will facilitate dataset registration and preserve subtle distinctions of absence vs. missing data. The same ontology structure will be used in to match the semantic demands of a query with the semantic content of available data sources. 3) Methods for identifying and resolving inconsistencies in alternative ontologies have been developed.

Challenges and Opportunities:

Kintigh leads a separately funded multi-institutional collaborative, archaeoinformatics.org, that is planning the development of a more expansive information infrastructure for archaeology to be built on the platform developed by the HSD project. This is an important opportunity as its efforts focus on the organizational and sociological dimensions of cyberinfrastructure development and on software development for text and images that are not central to this HSD effort.

Project Title: Long Term Dynamics of Population Growth, Agricultural Intensification, and Sociopolitical Change: Hawai'i as a Model System

Proposal #: 0624238
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Dr. P. V. Kirch, University of California, Berkeley
Collaborators: Dr. P. M Vitousek, Stanford University
                 Dr. S. Tujlapurkar, Stanford University
                 Dr. O. A. Chadwick, University of California, Santa Barbara
                 Dr. T. N. Ladefoged, University of Auckland
                 Dr. M. W. Graves, University of New Mexico & University
                 of Hawai'i at Manoa

Research Goals:

1. T o study how a complex early state-level society arose in the isolated Hawaiian Islands prior to and immediately after contact with Europeans in the late 18th century;
2. To integrate quantitative modeling with carefully-focused field analyses of landscape biogeochemistry, dryland and irrigated agronomic systems, human demography in relation to agricultural infrastructure and productivity, household-scale archaeology, and the development of social and cultural complexity
3. To develop evidence regarding location and transport of food resources across climatic/environmental gradients and the potential role transported resources played in integrating (and buffering) hierarchically-organized cultural systems.

Thematic Areas:

1. Tropical islands as model systems for human-environmental dynamics;
2. Agricultural intensification in relation to demography and social complexity; and
3. Integration of natural, archaeological, and historical evidence at different scales in relation to models of complex systems.

Methodologies:

1. Surveying agricultural locations, both irrigated and dryland, mapping surface agricultural features, placing them within geographic information system databases;
2. Excavations to recover soils for measuring nutrient abundance and status both for natural as well as agricultural soils and relating variation in these values to aspects of environment;
3. Developing chronologies of agricultural expansion across landscape to determine if soils undergo nutrient loss during time interval of agricultural use—extending this to irrigated agricultural sites;
4. Surveying to identify habitation sites for censusing purposes excavations to recover resource materials and datable samples.
5. Building integrated models incorporating baseline physical, environmental, agricultural, demographic, and human organizational variables to identify dynamic outcomes.

Recent Research Findings:

1. There is a "sweet spot" for dryland agriculture in Hawai'i where the combination of substrate age, rainfall and elevation produce optimal locations for fixed field or sustained farming, most likely for sweet potato;
2. The development of dryland agriculture in Hawai'i takes off in the 16th century AD and is mostly abandoned by the mid-19th century after the arrival Europeans and population collapse;
3. Both expansion and intensification can be identified in Hawaiian dryland agriculture and the extent of each can vary according to environmental and social factors;
4. The expansion of dryland agriculture led to expansion of populations along the leeward (more arid) zones of Maui and Hawai'i islands;
5. Population growth and agricultural intensification were inter-linked with increased socio-political competition among chiefs, particularly involving those whose polities were centered in more arid zones and which were more affected by droughts and production constraints; and
6. Evidence for the consolidation of power into fewer but more competitive chiefdoms in Hawai'i is concentrated in the 17th century, particularly on Maui.

Challenges and Opportunities:

1. We have discovered, as have many other researchers, that to conduct meaningful research on human dynamics requires larger spatial scales than traditionally is the case. And with this comes issues of coverage, sampling, and the creation of large databases.
2. With multiple inter-institutional researchers come issues of consistent and reliable measurement and classification, particularly for archaeological materials.
3. This research has produced valuable and provocative natural and cultural (including archaeological) databases that have been used to create predictive models.
4. This work has generally benefited from areas that have excellent preservation of archaeological and historical properties, including large agricultural complexes and systems. However, many undeveloped areas in Hawai'i are under pressure to develop economically.
5. The large spatial scale of this research has required us to focus on relatively non-invasive nature archaeological research, including remote sensing and mapping, employing excavation strategically.
6. The opportunity to link archaeological remains with Hawaiian oral traditions and early historic European accounts provides finer chronological control and rich detail on motivations and practices.
7. Building models upward from particular biological, geophysical, and archaeological observations to large scale complex systems requires linkages between levels of organization not usually attempted by archaeologists.

Project Title: Disseminating Computational Modeling in the Social Sciences

Proposal #: (SES-0433086)
HSD Emphasis Area: Dynamics of Human Behavior (DHB)

Lead PI: James A. Kitts, Columbia University
Co-PIs: Martina Morris, University of Washington
Michael W. Macy, Cornell University
Collaborators: Tanzeem Choudhury, Intel Research, Dartmouth College

Research Goals:

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 static 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 among 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. For example, models from statistical physics have been used to study healthcare organizations, population ecology models have been applied to the study of the evolution of industries, and neural networks have been 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, few 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. This project aims to make research in social dynamics both more rigorous and more accessible by offering training resources in computational modeling and by facilitating exchanges of models and methods among scholars from a variety of disciplines.

Project Progress for 2006-2007

An important focus of our efforts in the third year of the project has been the advancement of computational modeling among established researchers, including resources for faculty development and retraining. The investigators and graduate students working under this grant are publishing research papers that exemplify some best practices in computational modeling of social dynamics. (One of the PI's recent articles won the American Sociological Association's 2007 Best Paper award in Mathematical Sociology and his graduate student research assistant won the corresponding Best Graduate Student Paper award for a different paper.) More directly, the PI developed a seminar on computational modeling of social dynamics for academic and government researchers, delivering the first two seminars in February of 2007 at Victoria University of Wellington and Auckland University in New Zealand. He also participated in an expert panel on computational modeling of organizational behavior at the annual meeting of the Academy of Management in August, 2007.

In October of 2006, the PI collaborated with computer scientist Tanzeem Choudhury to organize an interdisciplinary meeting on theoretical modeling of social dynamics. This meeting aimed to foster intellectual exchange among mathematicians, natural and physical scientists (including biologists, physicists, computer scientists, and engineers), and social and behavioral scientists with a common interest in the application of mathematical and computational methods to problems of social dynamics. The meeting served three purposes: (i) to facilitate interdisciplinary conversations among diverse experts and give rise to future collaborative projects of high impact in areas of social dynamics, such as the evolution of social networks, evolutionary and ecological models of social behavior, population dynamics and demography, and organizational dynamics, (ii) to encourage and enable applications of these models to real-world problems such as epidemics or cascading failures due to natural disasters, and finally (iii) to help NSF identify and nurture emerging research agendas as part of the Human and Social Dynamics priority area. The workshop yielded a formal report, which is being distributed to researchers, educators, and other interested parties on the World Wide Web.

Broader Impacts

In developing and disseminating materials for learning and curriculum development, we aimed to improve training in dynamics within traditional social science disciplines. This year we have moved beyond formal learning contexts, offering a workshop report and seminars at professional meetings to assist faculty in integrating dynamic modeling into their own research programs. All of these efforts aim to increase the prominence and integrity of dynamic modeling practices in the social sciences, ultimately enriching our understanding of social dynamics.

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

Modeling Social Dynamics Workshop Website: http://seattle.intel-research.net/MSD/

Project Title: Extreme Weather Events, State Interventions, and Pastoral Livelihoods: Social and Ecological Impacts of Spring Snowstorms on the Tibetan Plateau

                        Proposal #: SBE-0624315
                        HSD Emphasis Area: Agents of Change

Lead PI: Julia A. Klein, Colorado State University
Co-PIs: Emily T. Yeh, University of Colorado; Kathleen A. Galvin,
                        Randall B. Boone. Dennis S. Ojima, Colorado State University
Collaborators: Xin-Quan Zhao, Northwest Institute of Plateau Biology, Chinese Academy of Sciences

Research Goals:

The main objective of this project is to investigate Tibetan pastoralists' vulnerability to extreme spring snowstorms, and to examine the short and longer term social and ecological implications of the snowstorms and of state restocking programs. We examine these issues in anticipation that these storms may become more frequent in the future.

Thematic Areas:

1. global environmental change (extreme weather events)
2. coupled human-environmental systems
3. pastoral human and ecological resilience/vulnerability to environmental change

Methodologies:

This work entails three main components. First, we will investigate how socio-economic status, ecological range condition, and the presence/absence of state restocking programs affect herder well-being and vulnerability to severe spring snowstorms. This investigation will be based on an evaluation of the effects of the 1998 storm, using pre- and immediate post-storm data as well as data gathered on the current status of the coupled human-environment system. This will involve a suite of methods, including structured and semi-structured interviews, participant observation, ecological field observations, remote sensing, and historic climate analyses. We will also conduct an experimental manipulation of snow timing and amount, both in the presence and absence of restocking, to assess the ecological effects of spring snowstorms. Detailed, socio-economic studies will also reveal how decisions are made at the household level, how pastures and livestock are managed, and what factors influence strategies for recovering from snowstorms. In particular, the historical component will examine how strategies affecting resistance and resilience to spring snowstorms have changed over time within the larger political economic context, including changes in property rights, markets, and implementation of various development schemes. Second, we will utilize the information gained from the first set of activities to modify and parameterize a coupled agent-based and ecosystem model to reflect the interactions of climate, extreme weather events, ecological conditions, pastoral management patterns, state policies, and socio-economic conditions on the Tibetan Plateau. Third, we will make predictions of future herder well-being and vulnerability to future extreme spring snowstorms under a suite of snowstorm frequency and intensities, management practices, and state policies.

Recent Research Findings:

Our first big field season will occur during the summer of 2008. Therefore, all of our findings to date consist of background information obtained to fine tune our research questions and study approaches. For example, recent interviews we conducted revealed that while larger scale government restocking programs occurred in response to snowstorms in Nagchu Prefecture in the Tibet Autonomous Region (TAR), the restocking that occurred in other areas, such as Yushu Prefecture in Qinghai Province, was conducted primarily by non-governmental organizations on a much smaller scale. Based on this information, we are modifying our questions regarding the restocking programs. We also recently learned how snowstorms relate to other grassland issues deemed important to pastoralists. For example, in Yushu Prefecture, villagers say the 1985 snowstorm killed lots of livestock, but that afterwards the grass never recovered. This is an important marker for people about when the grass condition got worse. Moreover, we learned that there may be a connection between snowstorms and the government's new resettlement program. Our researchers have met with two different families who were relocated under this new governmental policy who said that they chose to take part in the resettlement program because they lost most of their livestock in the blizzard of 1995 and did not recover their livestock numbers. We are further modifying our research questions to address how the snowstorms interact with these issues of concern to local pastoralists, such as grassland degradation and the government's grasslands resettlement policy.

We have obtained detailed information about snowstorms, livestock losses, and restocking programs from the late 1980's to the present from one of our study areas in Nagchu Prefecture, TAR. We have also identified 12 sites for the observational sampling component of this project. These 12 sites span a precipitation gradient, from 250 mm to 750 mm of mean annual precipitation. We are compiling climate data for each of these 12 sites from the Chinese Meteorological Association (CMA), the World Meteorological Association (WMO), and the Climate Research Unit (CRU). Our aim is to calibrate the CMA and WMO data (station data) with the CRU data (gridded and interpolated) so that we can conduct temperature and precipitation trend analyses by site from 1901 to the present. A researcher from our team has visited virtually all of these 12 sites and gathered data regarding snowstorm patterns, restocking, resettlement and other government grassland policies. She has also met with local officials to obtain permission and work out logistics for our more detailed research investigations.

We are working with remote sensing data to examine longer term snow anomaly trends (based on passive microwave sensors), to examine spatial patterns of snowstorms across the Tibetan Plateau (based on AVHRR data), and to examine pre- and post-snowstorm vegetation patterns. These results are still pending. Our field campaigns will commence in summer 2008.

Challenges and Opportunities:

Challenges: One of the primary challenges we face is identifying a site that meets all of the criteria for both the ecological experiment and the detailed socio-economic-political investigations. After much research we have concluded that no site can meet all of our criteria; therefore, we are in the process of prioritizing our criteria in order to select the best site.

Opportunities: Through the process of investigating all potential sites for the ecological experiment and the detailed socio-economic-political study, we have extended our connections to academic institutions and political jurisdictions beyond those which were included in our original proposal. Our network of potential collaborators has grown and will serve to only strengthen this project.

Project Title: Migration and Well-Being of China's Rural Population

                           Proposal #: 0527690
                           HSD Emphasis Area: AOC: Social, Political and Economic Dynamics

Lead PI: Arthur Kleinman (Harvard University)
Co-PIs: Winnie Yip (Harvard University)
Collaborators: William Hsiao, Ichiro Kawachi, SV Subramania, Martin Whyte (Harvard University); Daniel Kahneman (Princeton University); Jason Riis (New York State University); Qingyue Meng (Shandong University); Jing Jun (Tsinghua University).

Research Goals:

1. To examine the impact of out-migration on the health and well-being of the left-behind through three channels: a) remittances and income, b) social networks/capital, c) inter-generational relationships and d) cultural value change.
2. To test the validity of using the recently developed "Day Reconstruction Method" to measure well-being in a rural population.

Thematic Areas:

1. Internal migration
2. Well-being/happiness

Methodologies:

integration of ethnographic studies and household surveys. Our empirical work consists of three steps: pre-survey ethnographic studies to inform the study on hypothesis formulation and design of culturally and socially sensitive survey instruments; household surveys to collect quantitative data; and post-survey ethnography to resolve "puzzling" survey findings and provide rich qualitative information for interpreting survey results.

Recent Research Findings:

In July-August, 2006, we collected survey data from a sample of 1,810 households (and 7,712 individuals) in four counties in rural China: Anyue, in Sichuan province; Linquan, in Anhui province; and Caoxian and Chiping, in Shandong province. Forty-eight percent of the households in the sample have at least one household member who is a migrant worker.
Ethnographic studies were also carried in the same site. We have the following preliminary findings:
1. Migration is highly related to the local economic conditions. The poorer the area, the higher the out-migration rate.
2. Key characteristics of migrants: migrants are typically young (between 15 and 35 years old; for women, 60% are between 15 and 24 years old); have completed junior high school education (9 years); and from households with lower income. Seventy-seven percent of our migrant samples work in cities outside their home province and most of them are away from home all year round.

3. The primary reasons for migration: earn more money to subsidize the family's expenses for day to day living necessities and to improve the family's living standard in general. About 12% also expressed that the main reason to work as migrant worker is to "expand their horizons".

4. Relationship between out-migration and economic conditions of the left-behind: The median annual earning was 9,600 RMB in 2005 (mean=11,000RMB). Meanwhile, the median and mean annual amount they sent home were approximately 1,000 RMB and 2,300 RMB, respectively. This suggests that the majority of earnings are retained by the migrants, to pay for expenses in the city. About forty-five of the migrant samples worked at places that did not provide food and housing. Although the money that the migrants sent home represent only a small share of their total earnings, it has significant impact on the economic well-being of their left-behind households. Remittances represent about 50% of total household consumption expenditure for households with migrants and there is much variation across the four counties, which we are currently examining what the plausible explanations are. Excluding remittances, migrant households' consumption expenditure are 30% lower than those of migrant households. After remittances, migrant households' consumption expenditures are almost the same as non-migrant households.

5. Ethnographic findings further suggest that the left-behind in general found the primary positive impact of migration are economics ones. However, the interviewed also expressed concerns that while migration offers unparalleled opportunities for *individual* economic gains, its effect on the village as a whole is unclear. Migration seems to be thought of as a last resort, something only undertaken if absolutely necessary. One respondent put it this way: if he could earn an income of 1000 RMB if he migrated or 600 RMB if he stayed home, he would stay home, because of the additional burden migration puts on the left-behind and the extra expenses associated with living away from home.

6. DRM data showed similar psychometric properties as those collected in the US and Europe from urban and more educated samples.

7. Elderlies whose children have migrated are less likely to receive social support and spend more time laboring in the field and/or looking after grandchildren. Our preliminary findings show that these adversely affect the elderlies' well-being.

Challenges and Opportunities:

Although our data showed strong and positive relationship between social capital/network and different measures of health and well-being, we did not find any relationship between out-migration and social capital/network in the sending community, irrespective of whether social capital/network is measured at the individual or aggregate level; based on the communitarian or the network approach. Thus, at present, we are not able to establish the linkage between out-migration and the health and well-being of the left-behind through the social capital/network channel.

A planned follow up survey for the same households/individuals in 2008 may help us understand the reason.

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

Proposal #: SES-0527615
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Jeffrey Kling, The Brookings Institution
Co-PIs: Greg Duncan, Northwestern University
Larry Katz, Harvard University
Ronald Kessler, Harvard University
Jens Ludwig, University of Chicago
Lisa Gennetian, The Brookings Institution
Lisa Sanbonmatsu, National Bureau of Economic Research

Research Goals:

1. To examine the long-term effects of neighborhoods on behavior, and how they evolve over time.
2. To assess if effects of a housing mobility experiment on mental health persist over the long-term and if
there are effects on clinically significant psychiatric disorders
3. To examine whether effects of a housing mobility experiment differ for subpopulations including
gender, age and history of youth problem behavior
4. To better understand the social processes by which neighborhood environments influence behavior

Thematic Areas:

1. This project is not thematically related to HSD's area *Agents of Change*, as it is designed as micro-data
collection of low-income families who participated in a housing mobility in five U.S. cities.
2. With the aim of informing whether a housing mobility experiment can have long term effects on mental
health processes and of understanding how the long-term effects of neighborhoods on behavior evolve
over time, this project is thematically related to HSD's area *Dynamics of human behavior.*
3. As described in recent research in the behavioral economics literature, environmental factors such as
neighborhood conditions may influence decision making. Because moves to lower-crime, lower-
poverty neighborhoods could change future orientation, responses to risk, and even altruism by
reducing exposure to neighborhood stressors and temptations, this project contributes to HSD's
thematic area *Decision-making and risk.*

Methodologies:

Data from a randomized housing voucher experiment known as Moving to Opportunity (MTO) will be 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. By lottery,
families were assigned to one of three groups: a Traditional Voucher group, a Low Poverty Voucher Group
and a control group. Outcomes of the Low poverty Voucher or Traditional voucher groups will be
compared to outcomes of the Control group on a wide range of outcomes. The random-assignment design
of the demonstration means that differential outcomes for the treatment groups relative to the Control group
(occurring after program entry) can be interpreted as estimates of treatment effects of eligibility for these
programs (commonly known as intention-to-treat effects).

Recent Research Findings:

Data collected during 2002 suggest that moving to a less disadvantaged area through MTO produces a variety of beneficial changes for female youth (15-20 years old when interviewed, and so 8-16 at the time of random assignment) with respect to risky and criminal behaviors as well as mental health. However MTO moves had little effect on outcomes for female adults beyond mental health, and on balance had detrimental effects on the risky and criminal behavior of males. Further, MTO had no detectable effects on youth math and reading achievement.

Challenges and Opportunities:

This study is an opportunity to assess MTO's long-term effects (9 to 12 years after random assignment) for 6800 youth ages 10 to 20, all of whom were 11 or younger at the start of MTO, as well as 4600 household heads, across a wide range of outcomes measured from survey data on education, employment, delinquency, and mental and physical health; reading and math achievement tests; and administrative data on arrests, employment, welfare receipt and school outcomes. This research expands the range of prior MTO work to epidemiology and psychiatry by focusing more intensively on the effects of neighborhoods on clinically significant emotional problems. Further, we will better understand the behavioral mechanisms behind neighborhood effects, particularly on those mechanisms that influence gender differences in youth responses to neighborhood change.

There are no challenges to report to date. Analysis of the earlier qualitative data is ongoing. The MTO long term survey data collection will begin in May of 2008. Preliminary results of the data will be available the fall of 2009.

Project Title: Economic Growth, Social Inequality, and Environmental Change in Thailand and Cambodia

Proposal #: 0433787
HSD Emphasis Area: Agents of Change

Lead PI: Alan L. Kolata, University of Chicago
Co-PIs: Robert Townsend, University of Chicago and Michael Binford, University of Florida
Collaborators: Jane Southworth, Peter Waylen, University of Florida; Collaborating Institutions: Thai Family Research Center, Center for Khmer Studies

Research Goals:

The principal research goal of the project is a comparative analysis of social inequality, economic growth and environmental change in the rural sectors of Thailand and Cambodia. The major contribution to the disciplines is an integrated analysis of detailed, longitudinal ecological, social and economic data sets to develop conceptual and formal models that relate economic growth, social inequality and environmental change, particularly with respect to land cover and land use change.

Methodologies:

The project deploys a methodology that integrates quantitative and qualitative based methods to understand the trajectories of economic growth and environmental change over the past 25-50 years in selected study areas of Thailand and Cambodia. We have conducted two years of field socio-economic surveys and biophysical studies with satellite remote sensing and ground data collection methods in NW Cambodia to replicate annual surveys in Thailand. The project GIS contains nearly every appropriate dataset available for the study areas, and many at the national or Mekong River basin scale, from government agencies and NGOs in both Thailand and Cambodia and a spatially and temporally comprehensive selection of Landsat TM and ETM+ data covering the study areas in both countries.

Recent Research Findings:

Several results, both substantive/empirical and methodological, have been identified to date: 1) Land uses in Thailand and Cambodia emerging in different landscape positions vary significantly, and are controlled by different physical and social factors at different scales; 2) rural villages have distinctive spatial characteristics in Cambodia and Thailand, and may be the results of variable forms of social organization and adaptation to environmental and infrastructural factors; 3) the dominant, recent land-cover/land-use changes were forest conversion in Cambodia vs. infrastructure development in Thailand; and 4) combining Complex Adaptive Systems theory of social-ecological systems with Land-Use/Land-Cover Change analysis provides a context-independent set of characteristics by which to examine landscape dynamics because land use, land cover, and their change over time are the tangible expressions of the activities of the social-ecological system. This may allow generalizations about human and social dynamics that can be applied to specific systems in specific places.

In the first result, seasonally flooded forests around Tonle Sap are influenced by annual and inter-annual patterns of lake-level changes, which in turn are controlled by climate variation in the entire Mekong river basin extending into south-central China. In contrast, upland environments depend on local precipitation and have been transformed in response to local, regional, and global socio-economic drivers. Specifically,

upland deforestation in the Siem Reap region surrounding the economically important temple complex of Angkor accelerated dramatically between 1995 and 2005, after Angkor was named a UNESCO World Heritage site. The floodplain zone was a mosaic of multiple change trajectories but the largest percent of change occurred from non-forest to forest since 2002. Floodplain dynamics are controlled more by regional hydrologic processes of the larger Mekong basin than by anthropogenic factors in the drainage basin.

In the second research finding, most rural, agricultural villages in the study provinces in Thailand are clustered and their inhabitants farm multiple plots around the villages. These villages have existed for many generations and have grown as densely clustered households because the land outside the villages is more valuable as paddy fields. They also have dense social networks with surrounding villages and towns and possess multiple civic associations that organize collective social life. Villages in the Cambodian provinces tend to be aligned along roads or waterways. Some villages formed after the Khmer Rouge era and Vietnamese occupation, both of which caused massive population dislocation. Others formed or reformed since political stability began in 1998. People pioneering or repopulating a region build houses along roads to facilitate transportation. Also, minefield clearing is proceeding but roadsides were the first areas cleared. The social organization of these emergent or re-colonized villages differs from the Thai villages. There are few autonomous civic organizations or institutions for collective social interactions, and ties of social solidarity are weakly developed.

In the third result, preliminary analysis of multi-temporal Landsat data indicates that much forest clearing in northwestern Cambodia is done plot-by-plot by gradual thinning, leading first to sparse forest and then to scrub, probably by small holders and mostly along roads. There is a second pattern of clearing in which large blocks of forest are cleared and roads are built to the cut areas, presumably to remove logged timber. These clearings are probably created by larger organizations, and may be the product of illegal logging. In Northeast Thailand, agricultural intensification, spread of rubber, teak, and eucalyptus plantations, and new reservoirs have been the major landscape changes. The Northeast Thai landscape is dotted with reservoirs and canals, many of which were built in the past 15 years, but the Cambodian landscape to the south has only two reservoirs and almost no large-scale irrigation development. The Thai data indicate that there is more income inequality across villages in areas that are developing quickly, though this pattern has lessened over time as national markets developed and the wage rate for unskilled labor increased. Structural economic models under development identify key variables driving growth in per capita income and inequality, including education, access to formal financial system, and occupation, but there is more inequality within groups than this set of models can explain. The work in Cambodia suggests that villages are sociologically and structurally different from their Thai counterparts, e.g. households have a much greater tendency to be risk averse than in Thailand. The unique historical circumstances of Cambodia over the past 30-40 years, a period marked by conflict, civil war, genocide and slow social and economic recovery, are significant contributing factors to this difference.

In the fourth result, work on the cross-boundary area of two provinces, one each in Thailand and Cambodia, has led to a new theoretical perspective on the use of Complex Adaptive Systems (CAS) theory to examine the social-ecological systems (SES) that drive land-use/land-cover change. A major challenge to the emergence of land-use land-cover change (LULCC) research as a science has been the ability to develop a theoretical framework that is not restricted to specific case studies or types of human-environment interactions. In part, our research tests whether the concept of Land-use land-cover (LULC) diversity, as embedded in the framework of CAS, allows researchers to generalize across a range of different SESs. We focus on the spatial and temporal patterns, as well as the frequency distributions, of two measures of LULC diversity in the adjacent, but different landscapes of Sisaket province, Thailand, and Otdar Meanchey province, Cambodia, to assess the utility of LULC diversity as a concept for cross-site

comparison. Our results suggest that LULC diversity reflects the dynamic complexity of the human-dominated landscape. As such, it provides a measurable means of abstracting landscapes so that comparisons can be made between areas that would otherwise be context-dependent.

Challenges and Opportunities

A major challenge of the project remains effective integration of large-scale data sets deploying both quantitative and qualitative research methods.

Project Title: Democratic Epistemics in Lab-Based Processes

                          Proposal #: 0622477
                          HSD Emphasis Area: Decision, Risk & Uncertainty

Lead PI: Roger Koppl, Fairleigh Dickinson University
Co-PIs: Robert Kurzban, University of Pennsylvania; Lawrence Kobilinsky, John Jay College of Criminal Justice

Research Goals:

How can we build error-reducing mechanisms in the organization of forensic science and other lab-based social processes? Might a kind of democracy in decision-making counteract the effects of bias, parochialism, and undetected flaws in protocol? Such "democracy" would consist in randomized redundancy, for example random redundant testing of forensic evidence. We ask:
1. Everything else equal, will people transmit false information to a decision-maker if they have an incentive to do so?
2. Can a simple institutional mechanism, "democratic epistemics," be implemented to reduce or eliminate the distorting effects of the bias in (1)?
3. How do factors such as the size of a bias (1) interact with a mechanism as in (2)?
   Answering question 2 means testing democratic epistemics as an institutional mechanism, tying together the research question with the experimental method. Question 3 addresses its robustness.

Thematic Areas:

1. error detection and correction
2. organization of science
3. social epistemology

Methodologies:

In this experiment, Senders represent forensic labs and Receivers represent a judge or jury. There are N Senders and one Receiver, each describable, in the behavioral game theory tradition, as having a set of information, a set of decisions, and payoffs associated with all possible outcomes. In each round, a randomizing device chooses a "correct" Object from a set of 3 Objects: circle, triangle, square. This information is known to Senders but not the Receivers. Senders send a message consisting of one of the Objects to Receivers, who then must submit a decision about what they believe the correct Object to be. (In the context of forensic science, this message corresponds to a lab indicating "match," "no match," or "inconclusive.") The Receivers' information consists only of the communications they will receive from Senders, their own payoffs for correct versus incorrect guesses, and limited information about Senders' payoffs (see below).

Senders get a payment if the Receiver indicates the correct Object. Senders, however, also get an additional payment depending on which Object the Receiver chooses *independent of the correct Object*. This payment corresponds to the bias on the part of the lab personnel. This payoff information is private (i.e., unknown to the Receivers).
In the Baseline condition, there was one Sender and one Receiver. Senders received a payment of $3 for leading the Receiver to the correct Object (a "hit") if the Sender sent the correct Object and the Receiver

chose this Object. Senders received an additional payment, depending on the treatment, of either $1.00 or $5.00 for a "supplemental" Object. This payment induced a bias in the preferences of Senders. The Sender received this payment as a function of the Object chosen by the Receiver independent of what the correct Object was. Thus, if the correct Object was square and the supplemental Object was circle, and the Receiver choose circle, the Sender got a payoff of $5. A Sender with a $5 supplemental payoff thus had an incentive to report the supplemental Object (circle in our example) regardless of what the correct Object was. This incentive is the Sender's bias.

Further experimental treatments were run with 2, 3, 4, and 5 Senders per Receiver. Everything was identical, including the High and Low Bias treatments, except that there were multiple (2, 3, 4, or 5) Senders per Receiver. Each Sender was told that the Receiver would have access to the information (shape) sent by each of the other Senders, and then would guess the correct shape based on this information. In each round all three Senders had the same bias level, but they did not necessarily have the supplementary shape. Crucially, Senders were not informed of the biases of the other Senders. We call the one-Sender treatment "monopoly epistemics" and the multiple-Sender treatments "democratic epistemics."

Recent Research Findings:

Results collected so far show that 1) experimental participants can be induced to send accurate information when the induced bias is small; 2) participants can be induced to send inaccurate information when the induced bias is large; and 4) *democratic epistemics can improve system performance* in the sense of lowering Receiver error rates. The benefits of democratic epistemics derive not from making the experts in the system better, but from the structural redundancy that lowers Receiver error rates.

Our results show that it is not necessary to improve the reliability of the individual units with the system (Senders) in order to improve system performance. A chain is only as strong as its weakest link; a net(work), by contrast, is stronger than it's individual knots (nodes). Showing that improving the reliability of individual crime labs does not require improving the reliability of individual crime is important for policy and institutional design.

Challenges and Opportunities:

Our research program supports the design of institutions for the governance of lab-based social processes. We can reproduce alternative network structures in the experimental economics laboratory and compare their epistemic properties. This experimental paradigm presents many **opportunities** for application to problems not only in forensics, but all lab-based social processes including medical testing and research science. Thus, it may have the potential to be helpful in the formulation of science policy. The **challenge** in each such application is to construct an integrated series of experimental designs that begins with a clean test of a well-defined theoretical problem and progressively increases ecological validity until policy implications or "real world" institutional designs can be formed.

Project Title: Globalization and Offshore Sourcing of Knowledge Work: Economic, Relational and ICT Dynamics

Proposal #: 0527180
HSD Emphasis Area: AOC

Lead PI: Kenneth L. Kraemer, University of California, Irvine
Co-PIs: Jason Dedrick, University of California, Irvine
Collaborators: Erran Carmel, American University
                      Gloria Mark, University of California, Irvine
                      David Brownstone, University of California, Irvine
                      David Fitoussi, University of California, Irvine
                      Alain Pinsonneault, McGill University

Research Goals:

1. Understand the factors shaping firm decisions to offshore knowledge activities.
2. Identify the impacts of offshoring for firm performance.
3. Assess the broader societal implications of offshoring for trade, economic growth and employment.

Thematic Areas:

1. Globalization of new product development (NPD) in electronics hardware and of software development.
2. Relative importance of economic and relational factors and ICT in offshoring decisions.
3. Impacts on firm performance

Methodologies:

Field interviews with US multinational firms in the computer hardware and software sector, case studies of these firms, interviews with offshore firms providing development services, national survey of 400 firms in electronics manufacturing and software and services.

Recent Research Findings:

Although we continue to work on offshoring of new product development in relation to hardware, we focused this year on offshoring of software development, including packaged software, custom software and software services. The goals was to determine whether trends in software were significantly different from what we discovered earlier in new product development for hardware.

1. Our earlier finding was that offshoring of manufacturing is pulling more routine knowledge work in NPD offshore. Now it is also pulling higher-value design activities and even some R&D offshore as well, although those are driven mainly by cost and availability of skilled scientists and engineers, or by the need to be close to customers that have moved offshore (e.g., test equipment suppliers for motherboard production lines).

2. Findings in manufacturing are now reinforced by findings in new product development for software. Production work such as software coding and testing is now pulling design work offshore. The result is that often only the system requirements and implementation activities remain on shore.

3. Proximity requirements are a key underlying factor that affects location, but operates different for hardware than for software. For hardware, proximity tends to pull other activities offshore whereas for software, proximity so far tends to keep activities onshore.

For hardware, proximity requirements are dictated by the fact that so much manufacturing has been outsourced and moved offshore. In turn, the supply base and sources of innovation have clustered around these manufacturing facilities. In some cases, these clusters have involved hundreds and even thousands of firms with capabilities that no longer exist in the U.S. These existence of these capabilities has the effect of pulling some higher level development activities such as prototyping to the manufacturing sites to take advantage of expensive physical modeling and testing equipment, facilities for production engineering and so on. These capabilities are also pulling some design activities to the production location as the need for oversight of contractors and faster problem resolution to ensure speed to market means that designers must be close to development and manufacturing. On the other hand, in many cases we find that design can be separated geographically from development and production, and remains mostly in the U.S..

For software, proximity may be required to the onshore customer or end user, to high-cost firm specific assets that would be too expensive to duplicate offshore (e.g.,ATM network), or to mission critical operations which cannot be interrupted to switch them offshore. As major offshore locations such as India and China become important software markets themselves, such capabilities will likely develop in proximity to those markets.

Challenges and Opportunities:

The challenge we face in the next year is to develop and successfully field a questionnaire to about 400 firms so we can determine the extent to which the phenomena we discover in our fieldwork can be generalized to a broader population of firms.

An opportunity that has arisen is the prospect of gaining access secondary data on offshoring, which would expand our capabilities for data analysis. We are in discussions about this prospect with a research team at another university. If this opportunity comes to fruition, we will need to request supplemental funding.

Project Title: Anthropological Modeling of Social Structure, Genetics and Language Speciation in Indonesia

Proposal #: 0725470
HSD Emphasis Area: Agents of Change

Lead PI: J. Stephen Lansing, University of Arizona
Co-PIs: Michael Hammer, Tatiana Karafet, Joseph Watkins. University of Arizona
Collaborators: Eijkman Institute for Molecular Biology, Ministry of Public Health, National Language Institute, Indonesia

Research Goals:

The Indonesian archipelago encompasses great cultural, genetic and linguistic diversity, from patrilocal wet-rice farmers in Java and Bali to matrilocal communities in the mountains of Flores, and hunter-gatherers in the forests of Borneo and West Papua. Taking advantage of this broad diversity, this project's research goal is to build and test anthropological models to explain observed patterns of genetic and linguistic variation at the levels at which they originate.

Thematic Areas:

Until now, most studies of genetic and linguistic evolution and differentiation have focused on large-scale regional or continental patterns, characterized from a phylogenetic perspective. Yet all such patterns arise from processes that begin at the community level. Our approach is to gather information at the community level to address community based, island based and region based questions.

Methodologies:

In collaboration with Indonesian researchers and public health teams, our research team has been collecting genetic, linguistic, demographic, environmental, medical and ethnographic data from villages throughout the archipelago.

A combination of modeling and inferential approaches is necessary to investigate the processes under study. Thus, we are developing our own genetic and linguistic models appropriate for the spatiotemporal scales under study, designing inferential strategies, creating software to implement the models and to make inference, and working with developers to extend their own highly regarded software packages.

Recent Research Findings:

We tested our approach of examining linguistic and genetic variation by beginning with the contact zone eastern Indonesian island of Sumba, where Neolithic Austronesian farming communities settled and began interacting with aboriginal foraging societies ~3,500 years ago. Using historical linguistics, we reconstructed the phylogeny of the languages of Sumba based on a 200-word Swadesh list sampled from 29 localities. Thus reconstruction supports the hypothesis that Sumbanese languages derive from a single ancestral Austronesian language. However, the proportion of cognates (words with a common origin) traceable to Proto-Austronesian varies among language sub-groups distributed across the island. When we combine these results with genetic data, we found a positive correlation between the percentage of Y

chromosome lineages that derive from Austronesian (as opposed to aboriginal) ancestors and the retention of Proto-Austronesian cognates. We also found a striking correlation between the percentage of Proto-Austronesian cognates and geographic distance from the site where many Sumbanese believe that their ancestors arrived on the island. Thus, indeed, language-gene-geography correlations can be established on a fine scale. Consequently, historical patterns of social interaction between expanding farmers and resident hunter-gatherers largely explain community-level language evolution on Sumba.

A second project begins in noting that many studies have argued that reproductive skew biased towards dominant or high-ranking men is very common in human communities. Indeed, demographic statistics collected over short time scales support these claims. If this pattern persists, then reproductive skew should produce a genetic signal. As an illustration of a modeling project examining communities on a regional scale, our research group posed the question: Are these differences are heritable and potentially subject to cultural selection? However, using our community genetics based sampling strategy and some new inferential techniques, we found that only 5 of 41 Indonesian communities showed any statistically significant departure from neutrality. Thus, male dominance seldom translates into increased fertility over deep timescales, and reproductive skew rarely has evolutionary significance.

The discovery that neutral processes explain most haplotype distributions in these communities parallels earlier results from the development of neutral theory in genetics and ecology. In anthropology, the availability of community-level data enables us to distinguish both genetic and cultural selection from neutral demographic processes. This first test of the neutral theory in anthropology suggests that, as in genetics and ecology, the appropriate null model is neutrality.

Challenges and Opportunities:

Discrepancies between genetic and linguistic differentiation can arise through a number of processes: genetic admixture can occur without language change, languages can be transmitted horizontally without significant genetic change, and/or genetic and linguistic evolution may proceed at heterogeneous rates. The challenge and the opportunity is to employ an effective combination of approaches to investigate the processes by which larger patterns such as human sociality, language patterning and disease susceptibility emerge.

Project Title: Market Creation as a Policy Tool for Transformational Change

                Proposal #: 0624354
                HSD Emphasis Area: Agents of Change

Lead PI: Robert Lempert, RAND
Co-PI: Steven Popper, RAND
Collaborators: Barry W. Ickes, Penn State University and Edward Parson, University of Michigan

Research Goals:

Economics provides an excellent understanding of the efficiency-enhancing potential of markets, but the introduction of markets often also leads to a transformation of a society's values, incentives, and institutions. We call this a market-induced transformation. This project aims to study how market-induced transformation can be included in and used to improve policy analysis and the policies it informs. Specifically, this project seeks to:

1. Integrate and advance the understanding of market-induced transformations. We will examine how the potential for such transformations can lead to different outcomes (some beneficial some perhaps less so) than might be expected when considering only the most narrowly defined efficiency-enhancing potential of markets.

2. Exploit this understanding by developing a set of policy analytic tools to compare and assess the effects of alternative policies that seek to achieve their goals by fostering market-induced transformations. In particular, we will examine how consideration of market-induced transformation might affect the appropriate design of policies to reduce emissions of climate-changing greenhouse gases.

Thematic Areas:

1. In climate policy optimal regulatory interventions are typically back-loaded so that the costs of adjustment are minimized. Gradual regulation, however, introduces a time-inconsistency problem – current policymakers cannot bind their successors, and in subsequent periods the argument for gradual adjustment will be renewed. We will study how market-induced transformations may alter the policy environment.

2. There is currently vigorous debate over the appropriate design of policy interventions to reduce greenhouse gas emissions, for instance, the proper balance of standards, taxes, and trading systems. We will study how the consideration of market-induced transformations may affect the assessment of such policy designs.

Methodologies:

This project will address these questions with three interlaced research tasks: 1) examine case studies of market-induced transformations initiated by past policies; 2) evaluate and modify as necessary several theoretical frameworks and their corresponding mathematical models that aim to capture the key features of such transformations; and 3) calibrate these models against the phenomenology expressed in the case studies and use them to establish a decision tool set for assessing and comparing policies using market transformations against other possible policy approaches.

Recent Research Findings:

Our research is still in its initial stages and has not yet generated any findings.

Challenges and Opportunities:

This project aims to provide important contributions to both scholarly and current policy debates. The primary challenge will be managing the required multi-disciplinary approach.

Project Title: Pathways to Health: Adaptation and Change in the Context of an Oil and Pipeline Project in Chad

Proposal #: BCS-0527280
HSD Emphasis Area: Agents of Change

Lead PI: Lori Leonard, Johns Hopkins School of Public Health, Department of Health, Behavior & Society

Co-PIs: Siba Grovogui, Johns Hopkins University, Department of Political Science
Daugla Doumagoum Moto, CSSI/Tchad

Collaborators: Ray Weil, University of Maryland, College Park, Department of Environmental Sciences Irwin Shorr, Shorr Productions, Inc.

Research Goals:

1. To examine how households in southern Chad respond to changes in property regimes, particularly the transition from communal land trusts and collective ownership to individual and private holding in the context of a major oil and pipeline project. We are particularly interested in the implications of changing land tenure systems for agricultural production practices and soil systems and are tracking soil quality; the introduction and use of fertilizers, pesticides, and other technologies; the types of crops planted and crop rotation; the amount of land farmed; the length of fallow periods; the distance of fields from households; the distribution of land by type of crop; and the gendered and age-related distribution of agricultural land and labor in the household.

2. To investigate how the loss of land and changes in agricultural production practices and soil systems impact household food security.
3. To examine how food security in the context of changes in systems of land tenure and agricultural production practices is related to patterns of household food consumption and to the nutritional and health status of household members.
4. To provide interdisciplinary training to young researchers from the US and Chad and to contribute to the development of research capacity in Chad.

Methodologies:

At the core of the study are 120 households (comprised of roughly 1,200 individuals) in three different localities that we have been following since 2001. The localities include a small village and a sub-regional center in the oilfield region as well as a peri-urban locality that has recently been annexed to the capital city of N'Djamena. The localities were selected to allow for comparisons across settings that vary in terms of proximity to the oil and pipeline project; forms of household livelihood and levels of integration into the cash economy; and access to health care facilities and institutions of governance. Throughout the year, fieldworkers are in regular contact with the households and conduct household surveys on different topics, including:

1. Cases of illness and household decision-making around care
2. Household revenues and expenditures
3. Food security and coping strategies
4. Dietary diversity
5. Agricultural production practices

6.   Land loss and compensation received for the loss of property, its uses and management

In addition to these household surveys, we use a diverse set of data collection methods that includes the anthropological techniques of participant observation and ethnographic interviewing; soil sampling and nutrient analysis from soil and plant samples; inventories and geographic mapping of households' agricultural land and land use patterns; and anthropometry. For instance, we interview local authorities about social transformations, conflicts, and the evolution of custom and jurisprudence on family, property, and entitlements through discussion of land claims brought to them. We have also mapped and measured the land claimed by the households we follow and we are tracking soil fertility along with other information related to soil quality and conservation practices in a sub-sample of the agricultural fields of village-based households.

Recent Research Findings:

Data from our dietary diversity surveys shows that diets are least diverse in the village locality and most diverse in the urban center. The small town occupies an intermediate position on this continuum. In addition, seasonal variation in diet and in the diversity of the diet is most pronounced in the village locality and least variable in the urban center. Food consumption patterns suggest that village households consume primarily those foods they produce, relying less heavily on the market than households in the small town or, most significantly, the urban center. While 50 percent of the households we follow in the urban locality continue to cultivate fields on the outskirts of the city or small gardens along the riverbank, all of these households supplement their own production with food purchased in the market.

Across all of the sites, food security -- measured by indicators such as the number of meals served and self-reports of the adequacy of food supplies as well as the use of coping strategies -- varies from year to year. Reports of food security are highly sensitive to shifts in domestic production even though Chad relies in all years on food imports in order to meet demand. Although food shortages are common across all three sites, households in the village, who grow their own food but also rely on the production and sale of staple crops for cash, are most likely to report food shortfalls and more frequent use of coping strategies. Households in the urban locality are least likely to report shortages and rely less frequently on coping strategies. Common coping strategies including reducing the number of meals served, reducing the quantity of food served at meals, and eating 'famine foods' or foods that are not desirable but that are inexpensive. The picture that emerges from this data is one of chronic hunger that is not however recognized under the sign of 'crisis.'

The influx of cash into the village economy resulting from payments made for land ceded to the oil companies has so far had little impact in terms of these food consumption patterns. However, it has had a major impact on the amount of land available to farmers, particularly in the village locality. More than 80 percent of the households we follow in the village have lost land or fruit-bearing trees to the oil companies. This has led to more intensive land use practices and the introduction of social practices such as the leasing or the sale of land and the marking of land boundaries – practices that were previously unknown in this region. Soil conservation techniques are not widespread, in part because the only commercial fertilizers available are produced and distributed by the cotton company for cotton production and in part because of the lack of ox-carts or other means of transporting large quantities of organic material to the fields. Laboratory analyses currently underway of soil samples gathered during the summer of 2007 will allow for a more complete picture of the health of the soils and provide a baseline against which to track the impact of more intensive farming practices.

Challenges and Opportunities:

We face methodological and temporal challenges. These flow from the fact that our aims are organized thematically and chronologically. We imagined a succession of events corresponding to different disciplinary interests. In practice, the transition in all sectors of social life and the economy is occurring nearly simultaneously and not in succession. This requires sustained and concurrent attention from all the collaborators, giving us little time to reconcile interests, methods and directions. This will be dealt with over time as team members adapt to one another's disciplinary requirements. In terms of opportunities, we highlight our success in integrating student research and learning into this project. We have sponsored two undergraduates through an REU supplement, and multiple graduate students from the US and Chad. In addition, we have provided annual training to our Chadian research team which has emphasized the importance of an interdisciplinary approach to the study of social change.

Project Title: **Dynamic Modeling of System Safety to Manage Risk and Enable Internal and Cross-Stakeholder Alignment**

Proposal #: 0527660
HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Nancy G. Leveson, Massachusetts Institute of Technology
Co-PIs: Joel Cutcher-Gershenfeld, John Carroll, Massachusetts Institute of Technology

Research Goals:

Enable policymakers, managers, technical experts, and other stakeholders in complex, technical organizations to understand and constructively address system safety, based on (1) new insights from dynamic models of social and organizational factors, (2) innovations at individual, group, and system levels in the use of these dynamic models.

Thematic Areas:

1. Understanding the socio-technical processes behind accidents and the complex relationships among all the system components (social, organizational, and technical)
2. Improving risk assessment and decision-making through the use of powering modeling, simulation, and visualization tools.
3. Using dynamic models to improve decision-making at individual and group levels, as well as foster increased alignment within and across stakeholders in technical and scientific organizations.

Methodologies:

Modeling the integrated social and technical aspects of system risk using static   structural and dynamic models formal analysis of the resulting models.

Recent Research Findings:

We have completed a model of the new NASA exploration systems mission directorate (from Congress and the White House down to engineering project management) and demonstrated how the model can be used to improve decision-making about high-risk factors in the new program.

Challenges and Opportunities:

All the modeling so far has involved non-profit and governmental entities. We are currently working on determining the applicability of the approach to a commercial enterprise (i.e., oil refining)

Project Title: Intentional Vision in Humans and Robots

Proposal #: 0433653
HSD Emphasis Area: DHB, Decision Making, Risk And Uncertainty

Lead PI: Daniel T. Levin, Vanderbilt University
Co-PIs: Megan Saylor, D. Mitchell Wilkes, Kazuhiko Kawamura

Research Goals:

1. Explore adults' and children's' beliefs about the capabilities of humans, computers, and robots
2. Specify behavioral differences in interactions with intentional vs. mechanical audiences, and about how different audiences might interpret behavior.
3. Explore how basic kinematic properties, and more abstract properties of human action might be segmented, and ultimately identified by a machine vision system.

Thematic Areas:

1. Concepts and Theory of Mind
2. Human-Computer, and Human-Robot interaction
3. Machine vision

Methodologies:

We have employed a range of behavioral methodologies to meet goals 1 and 2. These have included illustrated questionnaire studies to assess concepts about different kinds of intelligent system. These questionnaires not only ask about subjects' beliefs about these systems, but also ask them to make concrete predictions about their actions. We have also asked subjects to segment actions (e.g. give a response when one meaningful action begins and another ends), and have measured their movements when engaging in actions characteristic of face-to-face teaching by demonstration. To ask about the emergence of these beliefs we have also used developmental interview techniques to understand how preschoolers construe different kinds of intelligent artifact. In addition, we have applied machine vision techniques, and motion analysis to movement data acquired by a hand tracking system, and via video.

Recent Research Findings:

We have found that adults make fundamentally different predictions about the behavior of computers and people, and initially, at least, equate anthropomorphic robots with computers. However, if they are required to focus on a robot engaging in a series of intentional-appearing behaviors, subjects begin to differentiate robots and computers. In studying the development of this kind of belief, we have found that preschoolers initially employ a hybrid conceptual model for category-defying robots by assuming that robots have many mechanical features on the one hand, but that they also have psychological and biological features as well. Then, they transition to a more mutually exclusive model. We have also completed initial experiments testing the effects of viewing videos, and of direct interaction on children's concepts, and have observed that these concepts become progressively more resistant to change by these simple experiences as children age.

In experiments testing subjects' assumptions about computers' perception of action, we have observed that they presume that computers process action in smaller, more concrete chunks, and that this effect is predicted by individual differences in ratings of computers' ability to understand the goals of human action, independently of their beliefs about computer intelligence overall.

Finally, in experiments exploring the relationships among kinematic features, rated events, and event segments, we have found that both rated looking, and rated hand-to-object contact are strong predictors of breakpoints. In addition we have coded a series of kinematic features, and have observed that some of these predict breakpoints, but that the strength of this prediction is more modest.

Challenges and Opportunities:

This research can inform the development of new interactive technologies by helping us understand the concepts people use when considering the capabilities of such systems. A key challenge is to integrate these behavioral findings into models of imitation learning.

Project Title: Community Risk Management of Hurricane and Tsunami Surge Hazards

Proposal #: SBE0527699
HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Michael K. Lindell, Texas A&M University
Co-PIs: Carla S. Prater, Texas A&M University; Harry Yeh and Cherri Pancake, Oregon State University
Collaborators: Toshitaka Katada of Gunma University (Japan)

Research Goals:

1. To refine existing mathematical models of warning and evacuation and to evaluate their accuracy using new data on household evacuations in rapid onset disasters.
2. To improve our evacuation management decision support system (EMDSS) by refining its mathematical model and assessing its data requirements, output precision, and run-time requirements.
3. To empirically test the usability of EMDSS as a tool for evacuation management and to identify features needing to be improved, added, or deleted.
4. To conduct a community policy process review that examines the potential utility of EMDSS as a risk management tool for local jurisdictions.

Thematic Areas

1. Evacuation Model Refinement and Empirical Studies
2. DSS Improvement and Comparison
3. Refinement and Usability Testing for the DSS
4. Community Policy Process Review

Methodologies

1. Laboratory Experiments
2. Post-Disaster Surveys
3. Elite Interviews
4. Content Analysis

Recent Research Findings

1. An evaluation of the usability of a new *Official's Guide for Hurricane Evacuation Decision Making* involved 113 research participants who read the *Official's Guide*, took a 43 item *Hurricane Knowledge Test* (*HKT*), and performed a hurricane tracking task. There was only a moderate level of performance on the *HKT* ($M = 26.8$; $Md = 28.0$) and substantial variance in performance ($SD = 6.6$, with a range from 9-40 items correct).
2. Analyses of tsunami hazard management plan quality in 43 Pacific Northwest coastal counties show that most plans have a weak factual basis, unclear goals and objectives, weak policies, and few coordination and implementation mechanisms. The average plan quality score is 12.25 out of 50 points and ten counties never mentioned tsunami risks in their local plans at all.

3. Content analysis revealed local newspapers in Pacific Northwest coastal jurisdictions showed a significant spike in Indian Ocean tsunami coverage but there was no corresponding increase in discussions of emergency management topics in city council minutes during this period.

Challenges and Opportunities

1. The evaluation of the *Official's Guide* is being followed up with analysis of data from a hurricane tracking task and an assessment of local officials' mental models of hurricane evacuation.
2. The evaluation of plan quality revealed nonsignificant correlations with jurisdictional characteristics such as budget size, so a survey will be conducted to collect data on planning departments' use of different planning tools, organizational capacity and commitment, technical resources, data sources, and contacts with other agencies and community groups.

Project Title: Disaster, Resilience and the Built Environment on the Gulf Coast

                     Proposal #: 0624088
                     HSD Emphasis Area: AOC

Lead PI: John R. Logan, Brown University
Co-PIs: Scott Bell, Brown University; Phil Brown, Brown University; Steve Hamburg, Brown University; Rachel Morello-Frosch, Brown University; Jack Mustard, Brown University

Research Goals:

1. Track neighborhood recovery within New Orleans and account for disparities in rebuilding across neighborhoods.
2. Identify impacts of Hurricane Katrina on mobilization and coalition formation by environmental and other advocacy groups in the region.
3. Develop an inventory of storms in Gulf Coast states during the 1950-2000 period, and estimate the geographic extent of damage at the county and subcounty levels.
4. Evaluate resilience and recovery of the physical environment after major storms in the Gulf Coast.
5. Estimate the impacts, short and long term, of storms and storm risk on employment and population patterns at the county and subcounty levels during 1950-2000.
6. Measure soil toxicity and public health risks across New Orleans neighborhoods.
7. Create educational materials and curricular tools for public dissemination of results through schools and nonprofit organizations.

Thematic Areas:

1. Population and environment.
2. Disaster recovery.
3. Ecological resilience.

Methodologies:

This is a multimethod project involving researchers from several disciplines (sociology, geography, ecosystem ecology, geology, and public health). It incorporates data collection and analysis of data of the following types:

1. Field observations of neighborhood association meetings and other civic activities.
2. Structured interviews with leaders of advocacy organizations.
3. Intensive interviews with residents of impacted neighborhoods within New Orleans.
4. Collection of documentary materials regarding the public planning and policy formation process.
5. Estimation of wind damage from individual storms based on archived data on storm trajectory, wind speeds, and rate of movement across space.
6. Compilation and GIS mapping of data on employment (County Business Patterns), net migration across counties (using census and other demographic resources), and spatial distribution of the population (and population subgroups).
7. Estimation of multivariate spatial and time series models of storm impacts.

Recent Research Findings:

This project is in its first year, although in many respects it is a continuation of an earlier one-year SGER project on Hurricane Katrina. Two reports from that study are available on the project webpage, www.s4.brown.edu/katrina/index.html. These studies document the large racial and moderate class disparities in the impact of the hurricane, the disproportionate dislocation of the black and renter populations, and the effects of these changes on the first post-Katrina elections in New Orleans.

Project Title: Decentralization and Local Public Goods: How Does Allocation of Decision-making Authority Affect Provision?

   Proposal #: SES 0624256
   HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Malgosia Madajewicz, IRI, Columbia University
Co-PIs: Regina Dolgoarshinnykh; Ji Meng Loh; Alexander Pfaff
Collaborators: NGO Forum for Water and Sanitation, Bangladesh

Research Goals:

1) (**DHB**) Theory: Determine what allocation of decision-making authority maximizes social welfare in a problem of providing a local public good. We will:
   (i) Compare outcomes when a central organization, such as a NGO, government or private firm, makes all decisions and when the community which will be using the public good makes all decisions in a dynamic model of interaction between individual agents. Outcomes will include social welfare, access to the public good, costs of access. We will examine central organizations with different objective functions.
   (ii) Determine what allocation of decision-making authority maximizes social welfare.
   (iii)Determine how the welfare-maximizing allocation of decision-making authority and outcomes in the two cases in (i) depend on individual and average attributes of social networks, individual and average community wealth, wealth inequality, and size of community.

2) (**DHB, AOC**) Empirical: Collect original data generated by an organizational experiment to test and revise the theory and distill policy implications. In the empirical context, the organizational change which we will observe will be due to a natural disaster; the natural occurrence of high concentrations of arsenic in groundwater in Bangladesh. We will:
   (i) Conduct an organizational experiment in which we choose randomly which village receives one of three types of interventions to provide access to safe water and which is in a control group in which no intervention occurs. The interventions will correspond to organizational forms we study in the theoretical model.
   (ii) Determine which intervention yields the best average outcome. Determine for which types of communities each intervention is best by examining how the outcomes of each intervention vary with characteristics of social networks, distribution of wealth, and size of village.
   (iii)Use the control group to study communities in which collective action occurs in the absence of any intervention, i.e. determine the attributes of communities which solve the public good provision problem on their own.

Thematic Areas:

1. Dynamics of human behavior
2. Agents of change

Methodologies:

1. Dynamic models of interaction between individual agents whose behavior has stochastic elements and who are placed on a graph which models social networks. Solution methods include analytical methods as well as simulation.
2. Household surveys which collect new data.
3. Econometric analysis of data.

Recent Research Findings:

1. We have been determining the pros and cons of different models for our analysis before proceeding further with one particular model. Thus far, we have a very preliminary result regarding the effect of the size of group of agents on whether or not agents participate in a collective action to provide a local public good. The decision which agents make is whether or not to contribute money to build a well. If a well is built, everyone in the group can use it, even those who did not contribute. The effect of group size on the probability of contributing seems to be non-linear. The probability of participation seems to decrease with the number of agents, as is the case in most existing literature. However, this relationship only holds up to a certain size of the group. Then it reverses and the probability of participation increases with the number of agents. The result requires further work to determine its sensitivity to assumptions.

2. We have completed the groundwork for the empirical work. We have collected data on basic characteristics of the sample villages. In all the sample villages at least 70% of wells have unsafe levels of arsenic, therefore there should be considerable demand for safe water. We have re-tested a subsample of the wells for arsenic in order to check the accuracy of the testing program which preceded our project. We have determined the potential sources of safe water in the sample villages. Finally, we have completed a pilot baseline survey and finalized the questionnaire. The baseline survey of all 10,000 households will begin on September 8, 2007.

Challenges and Opportunities:

1. Developing a modeling framework which provides as general an environment as possible for the interaction between agent decisions and factors which are likely to affect participation in a collective action and at the same time allows us to solve the model has been a challenge.
2. Another challenge has been resolving tensions between constructing an experiment in the field which yields high quality research results and our partner development organization's objectives, methods and cultural attitudes.
3. In the process of developing the models of community participation which we will test in the field, we will conduct a workshop to bring together the expertise and opinions of academics and development workers in Bangladesh. This workshop will provide an opportunity for sharing information and extracting lessons regarding successful policies even before the project yields any results in an area in which information is rarely shared.
4. Our project has provided an opportunity to monitor, albeit on a small scale, the well tests for arsenic which have been done in Bangladesh.

Project Title: Understanding Agents of Scientific Change: The Case of Embryo Research

Proposal #: 0623176
HSD Emphasis Area: Agents of Change

Lead PI: Jane Maienschein, Arizona State University
Co-PIs: Manfred Laubicher; Gary Marchant; Daniel Sarewitz
Collaborators: (US) Joel Gereboff, Jason Robert, Michael Dietrich, Scott Gilbert, Henry Greely, Stuart Newman, Jeffrey Schwartz, (Australia) Rachel Ankeny, (Austria) Gerd Müller, (Canada) Brian Hall, Francoise Baylis, (Germany) Christina Brandt. Hans-Jörg Rheinberger, Urs Schöpflin, (UK) Nick Hopwood

Research Goals:
1. Identify, collect, document and analyze episodes of importance in embryo research, seeking to understand the complexities of scientific change in social context.
2. Develop a collaboratory environment in which an interdisciplinary and international network of scholars -- who normally work on disparate questions with apparently incompatible tools -- can pursue shared research.
3. Create such an environment by developing a dynamic, interactive database that makes joint intellectual projects, scholarly documents, and research tools available to multiple user groups.

Methodologies:
Analytic methodologies from History and Philosophy of Science and related disciplines such as legal and religious studies; interdisciplinary collaborations are enabled by a collaborative digital research environment (e.g., SharePoint and Basecamp, and supported by an open-source object-oriented digital repository system (Fedora). Collaborations start with workshops that bring researchers into the process, continue with developing targeted research projects within the digital environment.

Recent Research Findings:
Our team is currently working on multiple Research Projects (see webpage) that ask questions and draw on methods across disciplines, with a focus on the agents that have contributed to changing embryo research over time. These include people, places, practices, concepts, contexts (social, policy, legal, religious, and scientific), images, and literature. The result is an accumulating knowledge base that forms the basis for further research projects. See our developing website for more information and examples:
http://embryo.asu.edu/

Challenges and Opportunities:
With our expertise in databasing, content production, and workflow management acquired over the past eight months, we have the opportunity to become the world's foremost electronic source for comprehensive information and new research about embryology in context. Major challenges lie in (1) establishing and increasing active international collaborations and (2) working with our partners at the ASU library, the Max Planck Institute for the History of Science in Berlin, and the Marine Biological Laboratory to find new ways to store and retrieve content, render our content accession process more efficient so that it facilitates transformative research, and make electronic searches productive to users.

Project Title: Inter-organizational Decision Making and Organization Design for Improved ICT Coordination in Disaster Relief
Proposal #: CMMI-0624219
HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Dr. Carleen Maitland, College of Information Sciences & Technology, Penn State University
Co-PIs: Dr. John Yen and Dr. Andrea Tapia, College of Information Sciences & Technology, Penn State University; Dr. Benita Beamon, Department of Industrial Engineering, University of Washington
Collaborators: Paul Currion, independent consultant

Research Goals:

This research aims to answer the following question: *How do organizational designs and decision making processes for ICT-related coordination bodies in the disaster relief industry affect performance in both the organization itself and subsequently in the relief supply chain?*

To this extent, the research aims to: (1) develop an agent-based architecture that will assess coordination performance outcomes of a variety of organizational designs through its focus on decision making and information sharing in a highly complex context with mixed organizational interests; and (2) develop analytic models to predict the effects of coordination-enhancing organizational designs on relief supply chain performance.

Thematic Areas:

1. Inter-organizational coordination
2. Recognition Primed Decision Making
3. Relief supply chain performance

Methodologies:

Qualitative, simulation and modeling methods are used. Qualitative data gathered in the process of comparative case study research of coordination bodies is used to provide contextual information for the simulated decision making in the agent architecture. To date four coordination bodies, namely ECB4, NetHope, Humaninet and the UN Office for the Coordination of Humanitarian Affairs have been successfully recruited for the study and over 20 interviews have been conducted. The qualitative data also provides contextual information to guide the modeling of supply chain performance. To date the case study research is comparing coordination bodies that differ on characteristics such as funding mechanisms, number of members, and the centrality of disaster relief to their mission. In- depth interviews with and observations of staff and members have provided rich data on the process, context and criteria for decision making. Data gathered from interviews will be supplemented by content analyses of organizational charts, meeting minutes, memos, press releases, and policy documents.

Recent Research Findings:

Our case study research has found that decision making in the context of inter-organizational coordination in voluntary organizations is participative and involves little controversy. It appears this is the result of four

factors: policies that encourage members to define potential projects which results in controversial projects being avoided, policies that allow members to participate only in those activities in which they have interest, a general degree of homogeneity among those engaged based partly on the freedom to choose and the relatively small size of the organization, and that members have developed trusting relationships over the years. These circumstances enable the coordination bodies to actually carry out projects, however projects that would address more contentious information sharing issues are not undertaken.

These findings provide the basis for extension of the RPD-based agent architecture to include factors such as interpersonal trust in the decision making simulations. Further the case study preliminary findings suggest that the agent architecture may be a valuable tool that through experimentation can help the organizations find designs to facilitate tackling difficult issues. In the domain of ICTs difficult issues are those related to systems aimed at information sharing, rather than those to simply provide access. While access can help improve the flow of information through the supply chain, it is likely that real improvements will require information sharing.

The project has generated the following journal and conference papers:

Balcik, B. and Beamon, B.M. (Forthcoming). Facility Location in Humanitarian Relief. *To appear in the International Journal of Logistics: Research and Applications*.

Beamon, B.M. and Balcik, B. (Forthcoming). Performance Measurement of Humanitarian Relief Chains. To appear in the *International Journal of Public Sector Management*.

Yen, J., Maitland, C. and Tapia, A. (2007). Simulated Decision Making for ICT Coordination in Disaster Relief Using Cognitive Agents, AI in ICT for Development. *Workshop at IJCAI, Twentieth International Joint Conference on Artificial Intelligence*, Hyderabad, India; January 6-12, 2007.

Pusey, B., Maitland, C.F., Tapia, A. and Yen, J. (2007). A Survey of Trust Models in Agent Applications. *Annual Conference of the North American Association for Computational Social and Organizational Sciences (NAACSOS)*, Emory - Atlanta, Georgia , USA. June 7-9, 2007.

Maitland, C.F. and Tapia, A. (2007). Coordinated ICTs for Effective Use in Humanitarian Assistance. *The Journal of Information Technology in Social Change*, 1(1), 128-141.

Challenges and Opportunities:

To date no major challenges have been encountered. The team has enjoyed fairly open access to the relief organizations that are the subjects of the study.

Project Title: Dynamics of Social Networks

   Proposal #: 0624116
   HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Hernán A. Makse, Levich Institute and Physics Department, City College of New York
Co-PIs: Michael Batty (Centre for Advanced Spatial Analysis, University College London),
   Fredrik Liljeros (Department of Sociology, University of Stockholm),
   Shlomo Havlin (Bar-Ilan University, Israel)

Research Goals:

1. to provide a classification of social networks based on the self-similar measure
2. to understand the modular structure in societies and its influence on immunization processes in social networks
3. to develop an understanding of the dynamical laws of evolution of large-scale social networks
4. to unravel universal laws for complex networks from sociology to biology to technology

Thematic Areas:

1. social networks
2. self-similar concepts
3. modularity and communities

Methodologies:

In general, statistical physics methods are applied, which in particular includes the box-covering fractal technique and inferred methods. The basis of our project lies on the analysis of real-life large-scale social databases, whose accuracy is of fundamental importance.

Recent Research Findings:

1. Networks Classification

   We have completed a thorough scan for fractal and self-similar properties over a large number of social networks, as well as of networks from varying disciplines for comparison purposes. We have used our box-covering techniques (described in detail in Song, Havlin, Makse, *Nature* **433**, 392 (2005)), where we measure the number of boxes N_B of size l_B needed to optimally cover a network. The boxes represents communities and modules in the network structure as exemplified in Fig.1(a). The fractal exponent d_B quantifies the extent of fractality and the organization of the communities in the network, but it can still not capture all the structural network properties. Our basic hypothesis is that correlations in node connectivity play the determining role in the evolution of the system. Therefore, we have develop an analytical theory to investigate such correlations (Gallos, Song, Makse, submitted to *Phys. Rev. Lett.*). We were able to classify all network in a novel phase diagram, which is separated into three regimes by the limiting cases of random networks and fractal to non-fractal transition. Most social networks are characterized by strongly correlated hubs. This is akin to a ``rich club phenomenon'' where the highly connected individuals form a core in the center of the network. The reasons behind this behavior are still intriguing us and we are currently working on this aspect. The importance of these correlations in the network structure is highlighted in important applications, such as the implications for the efficiency of immunization process on

social networks, as well as for the time evolution of such networks. Our current studies indicate that immunization strategies are highly affected by this kind of topological structure.

2. Modularity

One of the most important features of social networks is their modular character. We have developed a new method of characterizing modules in such networks, based on our box-covering fractal technique (see Fig.1(a)). In this way, we are able to study the emergence of clustering in different scales, which in a society may successively represent families, neighborhoods, cities, counties, states, etc. Our striking finding is that the modular character is retained over these different observation scales in a self-similar way. This pattern may be used to explain how societies are hierarchically formed in a bottom-up approach. The form and stability of this structure has important implications in fields of extreme practical interest, such as in immunization strategies, information flow, rumor spreading and many more dynamical processes in the society. We are studying the exact contribution of the social organization and the modular structure to these applications.

3. Analysis of online communities

Using the Swedish online community database we have started to analyze members interactions and interests, such as for example the groups in which the subjects participate. By using the number of common groups where two subjects participate, we can derive a measure for the strength of a possible relation. This quantity represents the `weight' of relations in a social network. Consecutively adding the connections with strong relations, groups of friends emerge. On the other hand, by adding those edges with weakest weights, wide spanning networks emerge which can be related to the Granovetter hypothesis that week ties connect the groups, while subjects within a group are connected by stronger ties. These findings are compared to the information obtained by the 'favorites' list, where a member declares which people he/she considers to be friends in the online community. The idea is to quantify a measurement of the social pressure, which means that although the network is changing from time to time the underlying social structure may remain strongly conserved over time.

4. Cities

One of the fundamental results in urban development is the so-called Gibrat's Law, which states that the rate growth of a city is random and is independent of the city size. Our study of the existing data, though, seems to suggest a different picture. Smaller cities tend to grow in a faster rate than larger cities, while the variance of these growth rates follow the same trend. This shows that smaller populations may grow faster, but at the same time they are at a greater risk to shrink in size equally fast. We are currently studying different areas of different populations around the world in order to understand the extent of this phenomenon and whether it applies equally in developed or developing countries. Our mathematical approach is based on fractal growing algorithms which identify cities in coterminous geographical spaces; one such an example is in Fig.1(b) where we have identified the fractal human agglomeration surrounding the city of London (New Laws of Population Growth, J. S. Andrade, D. Rybski, M. Batty, H. E. Stanley and H. A. Makse, submitted to *Nature*).

Challenges and Opportunities:

It is widely believed that the complex structure of social networks arises from the collective emergent properties of the large number of individuals and their interactions. Despite the progress of analysis based

on small-scale data, the circuitry of social connections is so complex that the study of small groups may not suffice in explaining many emerging properties of the system as a whole. Recently, the introduction of statistical physics methods combined with advances in database technology has shed new light on the analysis of large-scale social networks. It is the purpose of this project to bring together concepts from the science of complexity and nonequilibrium systems into the science of social networks. By unraveling new architectural laws in the construction of these networks we aim to provide a fundamental view of the evolution of these systems.
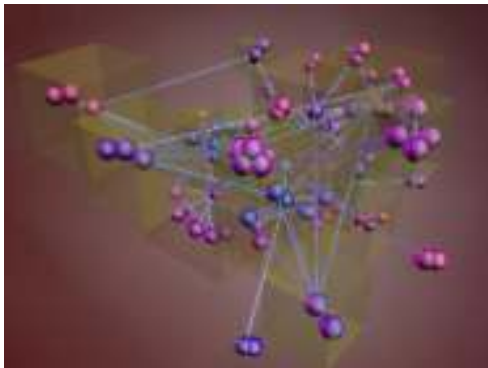
(a)   (b)

Fig. 1: (a) Representation of our fractal covering algorithm to identify modulus in complex social networks. The individual nodes are grouped in ``boxes'' at different scales representing the communities. This methods reveals the laws of evolution of modules in complex networks. (b) Example of our fractal clustering analysis in the human agglomeration in London. This analysis is used to determined the laws of human population growth.

Project Title: Collaborative Research: (DHB) Modeling and Analyzing Individual and Collective Human Spatial Behavior

                    Proposal #: BCS-0527689
                    HSD Emphasis Area: DHB: Dynamics of Human Behavior

Lead PI: Maja Mataric (University of Southern California)
Co-PIs: Robert Sekuler (Brandeis University)
Collaborators: Kristina Lerman (University of Southern California)

Research Goals:

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.

Thematic Areas:

1. Physical sensing of individual and crowd movement
2. Goal-directed navigation in interactive virtual environments
3. Mathematical modeling of crowd dynamics

Methodologies:

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 has developed tools for capturing and processing data that can be used for comparison with analytic models, to yield an understanding of the link between human collective behavior at different temporal and spatial scales. Our work is focused on the California Science Center which has allowed us to observe, record, and analyze natural crowd behavior.

Recent Research Findings:

We have systematically improved our human position data collection methods after studying the pilot laser and video data recorded in the California Science Center's Life Tunnel exhibit. We have collected several tens of hours of data from synchronized lasers at frame rates an order of magnitude higher than before. The result is a repository of several gigabytes of range-scan data from real-time human spatial activity that we believe to be the first of its sort. In order to work with this magnitude of data we have developed new software that allows for interactive annotation, calibration and editing. Playback at multiple timescales has allowed for detection and correction of a variety of counting errors, which has spurred us to simultaneously collect (and subsequently annotate) video data.

We have identified key factors associated with visual perception and memory that seem to strongly influence individual spatial behavior in geometrically complex, populated environments. These factors were identified from pilot experiments on a novel spatial search task that we designed with the dual objectives of (i) making both the geometric properties of the space as well as the number, distribution and physical attributes of the people in the space explicitly relevant to performance, while (ii) enabling a principled microscopic characterization of each subject's behavior. Our experimental platform is a realistic virtual model of the ground floor of the California Science Center populated with natural-looking artificial

agents. Despite a variety of technical challenges from using naturalistic stimuli and placing minimal constraints on subject's behavior, data from our initial experiments confirmed that the task and experimental platform satisfactorily met the above objectives. Analysis of the data revealed that attention biases produced by the presence of agents in the environment play a surprisingly important role in influencing navigation decisions.

Last year we developed a mathematical model to study dynamics of visitors to the Life Tunnel exhibit. In the model, each exhibit display is a node, connected to other displays (nodes) by links over which the museum visitors move. The simple phenomenological model we investigated last year described the collective dynamics of a homogeneous group of museum visitors as they move through the exhibit. Unfortunately, the model's predictions did not match experimental observations, e.g., it could not explain fluctuations observed in experimental data. We made two significant changes to the model this year. First, we used the empirical data to guide model selection. We measured real-life movement of visitors between displays using the methodology described above and left only the links that had significant visitor traffic along them. Second, we modeled visitor heterogeneity by introducing a stochastic term in the transitions between the displays. These changes led to a better agreement between the model and experimental data.

Challenges and Opportunities:

In the sensing part of the project, the suitable clustering and tracking algorithms run far slower than real-time, and processing our repository is a computational challenge. We will improve these methods in the coming year. We are also designing experiments to expand on these initial observations of the visitors behavior in virtual environments and will explore mathematical models of correlated groups of visitors who explore the museum together.

Project Title: Shared Governance of Risk

                       Proposal #: SES-0623900
                       HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Peter J. May, University of Washington
Co-PIs: Bryan D. Jones, University of Washington
Collaborators: WilliamWallace, Rensselaer Polytechnic Institute

Research Goals:

Enhance understanding of:
1. The coherence of federal homeland security and risk management policies.
2. The factors that shape organizational capabilities to respond to multiple risks.
3. The dynamics of organizational response for risk management.

Thematic Areas:

1. Policy processes: agenda setting and policy disruption.
2. Bureaucratic decision-making: responses to disruption in policy signals.
3. Systems modeling: modeling of organizational response to disruptions.

Methodologies:

Several datasets are being developed for tracing the impacts of policy disruption on decision-making for public risks. One set of data concerns the agenda of federal disaster agencies from 1984 through mid 2006. This has entailed collection and coding of rules and guidance documents issued by FEMA and DHS. A second set of data concerns the shifting federal agenda from 1988 through 2004 for eight policy systems that comprise major components of what is currently labeled as homeland security. For each subsystem we are collecting data from congressional hearings, public testimony, and public laws about changing issue emphasis, policy justifications, and subsystem makeup. The primary educational component of the project has been the offering of an advanced undergraduate seminar on "The Politics of Risk."

Recent Research Findings:

One set of findings concerns organizational attention shifts regarding disaster preparedness and domestic security. Any organization and especially public agencies are confronted with a plethora of competing agency demands. We develop a theory of organizational responses to major policy disruptions and apply it to the way that disaster agencies responded to new policy signals about terrorism threats over the past decade. The agency-level response to presidential and congressional initiatives concerning terrorism in the mid 1990s was a bureaucratization of the problem that tended to dampen the policy signals. In contrast, after 9/11 the centralization of attention within the top-levels of DHS to the terrorism threat and reliance on hastily devised grant programs led to a number of negative consequences for agency functioning: oscillation in grant programs, poor relations with intergovernmental partners, and meddling from above. As a consequence, we argue a paradox of attention was fostered. In seeking to focus attention on terrorism, the broader homeland security agenda suffered.

The second broad set of findings, which is just emerging, concerns the shifting dynamics of subsystems that address preparedness for and response to public risks surrounding disasters, terrorism, and other extreme events. Our research foci are the policy disruptions across the various subsystems that have been brought about by terrorism and how efforts to reshape the federal-level arrangements for homeland security have altered the makeup of these subsystems. Our preliminary findings show that the terrorism disruption began in some subsystems in the mid-1990s as they began to attend more to the terrorism threat and, not surprisingly, was heightened and expanded after 9/11. That disruption, however, played out in different ways for the subsystems we study. While the DHS has had an imprint within several of the subsystems, the original subsystems for the most part remain strong and the policy glue of homeland security has served as weak organizational device.

Samuel Workman, Peter J. May, and Bryan D. Jones. (2006) "Organizing Attention: Policy Agendas and Disaster Responsiveness," Paper presented at the Annual Meeting of the Association for Public Policy Analysis and Management, Madison WI, November 2006.

Peter J. May and Samuel Workman. (2007) "The Paradox of Agency Issue Attention: The Undermining of Homeland Security," Paper presented at the Oxford Workshop on Politics and Policy Making in the Bush Administration Federal Bureaucracy, June 23-24, 2007, Oxford England.

Peter J. May, Josh Sapotichne, and Samuel Workman. (2007) "Policy Disruption Across Subsystems: Terrorism, Public Risks, and Homeland Security," Paper presented at the Annual Meeting of the American Political Science Association, Chicago, August 29 – September 2, 2007.

Challenges and Opportunities:

There have been the usual challenges of project coordination and keeping on top of changing dynamics of policy areas—homeland security and terrorism—that are in constant flux.

The emphases that have evolved for this project provide promising opportunities for this research to make notable scholarly contributions to the study of bureaucracy and policy processes. Prior research on agendas of public bureaucracies has focused on budgetary outputs and enforcement actions. We provide a different perspective in studying the substance of agency agendas. Prior research on policy agendas has emphasized disruptions within single subsystems. We provide a different perspective in studying policy disruption across a number of policy subsystems.

Project Title: Collaborative Research: Parks as Agents of Social and Environmental Change in Eastern and Southern Africa

 Proposal #: 0624343 (McCabe); 0624226 (Goldman); 0624265 (Leslie)
 HSD Emphasis Area: Agents of Change

Lead PI: J. Terrence McCabe, University of Colorado at Boulder
Co-PIs: Abe Goldman, Mike Binford and Brian Child, University of Florida; Paul Leslie, University of North Carolina - Chapel Hill;
Collaborators: University of Dar es Salaam, Tanzania; Makerere University, Uganda; University of Namibia; University of Zimbabwe; Harry Oppenheimer Okavango Research Centre; Botswana Wildlife & Natural Resources Department

Research Goals:

1. To examine the ways in which parks act as agents of change in eastern and southern Africa.
2. To establish the types and phases of response by local households and communities to the constraints and opportunities associated with parks and the relationships among responses.
3. To clarify how responses to costs and benefits, constraints and opportunities associated with parks contribute to transformation of local social-ecological systems (SES) and whether and how they create the conditions for more widespread transformations.
4. To establish the range of differing responses and impacts of parks across varying ecological, demographic, and policy contexts in different countries and identify the factors that lie behind these variations.

Thematic Areas:

1. A *focus on human agency and process* as central to understanding a social-ecological system (SES), both by considering the perceptions and decision making that drive action, and by considering the consequences of that agency for the SES, which includes the park and surrounding areas. We take agency to comprise actions that implement decisions by individuals and social entities such as families and communities. This implies a need to understand the perceptions and decision making processes that inform and produce those actions.
2. An examination of the dynamic processes by which parks precipitate and accelerate transformation of social-ecological systems under diverse circumstances. We expect that the impacts of parks progress through a series of stages. In these *phases of response,* we expect that early response entails a period of *accommodation* followed by a phase of *adaptation*. The first phase is short term with little in the way of longer-term implications. The second phase is likely to entail new adaptive behaviors, strategies, social practices, and/or institutions. The third phase may result in a significant *system transformation and reorganization* as further changes are induced in both the social and biophysical realms of the SES. This may produce a new set of relatively stable conditions in the immediately affected areas. In the fourth phase, the impacts radiate outward as the direct effects of the park diffuse and indirectly affect more distant areas.
3. Consideration of *response diversity* -- individual- and community- level heterogeneity in responses to parks. Response diversity may have important longer term implications for system resilience.
4. Consideration of *actions at multiple levels*, which may sometimes have opposing objectives and consequences.

Methodologies:

1. Focus group discussions, open-ended interviews, and participatory mapping;
2. Household surveys;
3. Analysis of decision-making and distribution of benefits;
4. Time series analysis of land use, land-cover change, and landscape fragmentation analysis.

Recent Research Findings:

Our results are very preliminary at this stage of the research, having recently completed only one field season of research. However we can report that data collected so far suggest that many of our hypotheses may be supported. These hypotheses include:

1. The effect of parks on transforming land use is determined by the interaction between the relative value of alternative uses of resources and the influence of power relationships on the distribution of benefits.
2. Parks attract roads and special interest groups, which influence patterns of settlement and institutional organization, and increase land and social conflicts.
3. Responses to parks are mediated by perceptions of risk and by local mistrust of institutional power and intent.
4. Response diversity within and among communities is directly related to the variability of perceived severity of risks (variability measured within or among communities).
5. Parks have a differential impact on men and women, and on elite and non-elite groups, generally increasing differentiation.
6. Parks in landscapes characterized by high population density (and agricultural saturation) will be less likely to precipitate rapid transformations in livelihood strategies than those where population density is lower

We do not have enough data at this time to address hypotheses that relate to resilience or identity of the social and ecological systems in the areas with proximity to parks.

Challenges and Opportunities:

Working in five countries and dealing with the varying conditions, regulations, and systems of permissions in the host countries confronts us with multiple challenges as well as opportunities. We are also faced with coordinating research activities and personnel from different universities in the US and overseas. We believe that we have the opportunity to make a unique and important contribution to the literature as no one else, to our knowledge, is undertaking the type of comparative work we are doing on the impacts of parks. We also have the opportunity to involve researchers and policy makers from the host countries who may influence the ways that parks and protected areas are managed and how the resources and hazards associated with them are distributed.

Project Title: Decision Models for Bulk Energy Transportation Networks

Proposal #: 0527460
HSD Emphasis Area: Decision Making, Risk, and Uncertainty

Lead PI: Jim McCalley, Iowa State University
Co-PIs: Sarah Ryan, Stephen Sapp, Leigh Tesfatsion
Research Assistants: Natalia Frishman, Esteban Gil, Junjie Sun, Yan Wang
NSF HSD Project Homepage (General Info and Publications):
http://www.econ.iastate.edu/tesfatsi/NSFEnergy2005.htm

Research Goals

This work targets what we call the **National Electric Energy System (NEES)**, which is comprised of physical infrastructure, industrial and governmental organizations, individual and corporate decision-making entities, and associated information processing systems for
- Electric generation and bulk transmission systems
- Natural gas production and pipeline systems
- Coal production and rail/barge transportation systems
- Water reservoirs and hydroelectric production systems
- Influence of carbon dioxide, sulfur dioxide, and nitrogen oxide constraints
- Markets and market agents which comprise economic systems for bulk energy trading

Our objective is to develop a suite of software tools and data for answering questions in three thematic areas, as follows.

Thematic Areas: Research Questions

National Scale:
(1) What energy flow patterns would yield significantly improved energy system performance? What operational production and/or transportation changes need to be made to realize these improvements?
(2) What infrastructure weaknesses exist? How do the effects of catastrophic events propagate through the network? What infrastructure enhancements would realize the most performance benefit?
(3) How do national environmental constraints influence energy system performance?
Regional Scale (e.g., ISO-NE, MISO, PJM, NYISO, CAISO):
(4) What is the influence of market design on energy system performance?
Local Scale (e.g., Alliant, MidAmerican Energy):
(5) Can we reflect the influence of possible changes in raw fuel production and transportation on a company's profits from investing in a specific type of plant at a specific location?

Methodology: Two Complementary Modeling Approaches

- As detailed at our NSF HSD Project Homepage (see above), we have developed two complementary and related classes of decision models, a structural model and an agent-based behavioral model, to address the above research questions.
- Input data to the structural model includes topology (nodes, arcs), supply and demand at gas and coal supply points and electric demand points per unit energy flow cost along each arc, and arc capacities and efficiencies, all at each time *t*. Aggregated topologies are then used to represent the national US energy system. The model is solved as a generalized network simplex algorithm.

- The behavioral model is an agent-based computational test bed (Java) for studying the commercial network layer overlaying the NEES physical transmission network layer. To date the test bed incorporates market protocols and operational rules for ISO/RTO-managed wholesale power markets operating over AC transmission grids, with a specific focus on the ISO-NE and MISO. Human decision-makers are computationally represented as autonomous agents with learning capabilities and goal-seeking behaviors. Version 1.3 of this test bed has been released at http://www.econ.iastate.edu/tesfatsi/AMESMarketHome.htm as open-source software.

Recent Research Findings

Structural Model
- We have compared simulated energy prices from our model to actual energy prices based on the events of 2005 that occurred in the US, which included hurricanes Katrina and Rita. An interesting result is that the impact of Katrina and Rita in terms of additional energy costs is estimated to have been about $10.5 billion from September to December 2005.
- We have also developed a computational approach for assessing bulk investment in energy system transportation infrastructure that indicates the transportation links for which it would be most economically attractive to invest. For example, using a "reduced cost" metric, equivalent to profit per unit energy flow, it was found that the more profitable investments in the natural gas infrastructure are from Canada to the northeast and to the west, and from the southeast to the northeast. The more profitable investments in the electric infrastructure were found to be into the northeast.
- To account for uncertainty, we have applied stochastic programming. Our initial effort has focused on the cost of natural gas due to its volatility over the one-year time horizon of the test data set and in anticipation of extending the behavioral model to incorporate the natural gas market. When aggregate optimization results were compared with historical fuel usage, the deterministic solution had a higher proportion of electricity generated from coal rather than gas, but the solution to the stochastic model showed a fuel mix closer to actual experience.

Agent-Based Behavioral Model
- Our initial focus has been on the potential market inefficiency and exercise of market power that can arise in restructured wholesale power markets due to strategic trader learning, as induced or encouraged by various market design features.
- Initial experiments with 3-node, 5-node, and 30-node test cases taken from ISO/RTO training manuals and IEEE sources indicate that current ISO/RTO-managed market designs in operation in the U.S. encourage strategic supply offer reporting by generators that results in substantially higher market operational costs.
- These opportunities for the exercise of market power are quickly discovered over time by generators relying on simple reinforcement learning methods that use past own-profit outcomes to determine future supply offer selections for the Day-Ahead Market.

Challenges and Opportunities

- The structural and agent-based behavioral models still need to be linked within a single NEES software design permitting the passing of results back and forth between them.
- We also plan to further support this unified NEES software design by an organizational study of the energy industry that will depict information flows in the overall energy system. We are particularly interested in the strategies NEES participants use to handle risk and uncertainty, and the effects of ownership structure on their decision-making.

Project Title: Origins and Development of Tribal Social Identities and Territorial Behaviors in Ancient Southern Arabia

Proposal #: 0624368
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Joy McCorriston, Ohio State University
Co-PIs: Prem Goel and Dorota Brzezinska, Ohio State University
Collaborators: Michael Harrower, University of Toronto (Canada); Tara Steimer, Institut Francais d'Archeologie du Proche Orient (Damascus); Daniel Varisco, Hoftra University; Kimberly Williams, Wright State University; Frank Braemer, CNRS Valbonne (France); Eric Oches, University of South Florida

Research Goals:
1. To document and explain the long-term social dynamics in the emergence of territorial tribal social groups and their political integration into state societies. Historical evidence across the Near East—from the earliest written tradition to the Mongols of mediaeval history—suggests that tribal social identity is linked with physical territory and social systems that map onto physical terrain. Archaeology offers a unique perspective on tribal dynamics because the perspective is long-term and deals with the material culture of tribes people themselves rather than the texts that others write about them. This project will document the territorial manifestations of tribal identity through a long time-frame (about 7000 years) and will explain the dynamics of tribal behavior as affected by major climate and political changes.

2. To refine the uses of remotely sensed imagery in the analysis of ancient human landscape dynamics. Although satellite images record a static moment in time and the technologies to do so are ever better, landscapes are dynamic and imbued with social meaning and history that both affects the physical terrain and the ways that societies perceive and interact with it. These histories and human behaviors remain challenging to detect. This research collaboration involving social, physical and statistical scientists will integrate temporal and subjective aspects of landscape in the interpretation of remotely sensed images of the present-day physical terrain and archaeological monuments left by territorial tribes people in antiquity.

Thematic Areas:
1. Anthropological archaeology, including human behavioral ecology, social theory, culture history, and political economy
2. Spatial statistics and machine learning
3. Geodetic sciences, especially high-precision GPS, remote (aerial) sensing, Digital Elevation Modeling (DEM)
4. Arabia

Methodologies:
The project depends on the interplay of US-based analysis of remotely sensed images of Southern Arabia and the ground-truth work of field teams that will visit remote areas of the Arabian deserts to collect archaeological data and ground control points. We are building on prior knowledge collected both by NSF-funded members of this team over 9 years of fieldwork in Yemen and through collaboration with French archaeologists. We use pilot data to (i) Locate the exact locations of small-scale archaeological monuments ("cairns") on a remote-sensed image and (ii) Identify signature attributes on the image that may possibly characterize these monuments. These monuments were built in antiquity by tribes-people to mark their

territories and their social associations with each other and with available resources and terrain. Over the ages, nomadic pastoral people built such monuments in different styles that can be differentiated by shape, height, size, and on the ground, details of construction and associated artifacts. These differences correspond to cultural and temporal differences. We hypothesize that spatial patterns—whether association with particular land form and resources or distributions of particular "cairn" types—can be in related to social behavior (territories) and interpreted in terms of the major political and climate shifts known to take place in prehistory.

This year we have used pilot data from the 2005 fieldwork and previous archaeological survey in Southern Yemen to develop a localized understanding of the land cover and monument distributions detectable on satellite images. We have used an ASTER based (DEM) (5 m) and high resolution image (0.6 m pixel) on which the monuments visited can be seen and verified through GPS coordinates taken in the field. We have overseen the development of new "unsupervised" image classification techniques, using smoothing of two data sets (DEM and RGB) on image pixels. We smoothed the RGB raster data of the actual image by Fourier Transform and applying a low-pass filter. We identified feature clusters in 2-D and 3-D plots and noted that the data is mainly separated in one direction, by DEM, with a distinct number of divisions between clusters, denoted by several pronounced peaks of varying heights. The evident patterns may lead us to predict how many classes to expect when this technique is applied in an unknown area and a new image.

Recent Research Findings:
From previous ground observations, we anticipate that appropriately classified landforms will increase efficiency of cairn detection and contribute to models of human activity. Recently, we have added elevation and infrared band combinations and moved to a supervised context. This approach has yielded a 10% to 15% increase in accuracy (upwards of 75-78%) over the initial unsupervised RGB clustering (63-67%). When training classes with ground-truthed data, considering within-class variation has proven extremely critical. Our consultations confirm the value of frequent dialogue because archaeological and geological knowledge defines which features, parameter values, scales, and classes are appropriate for detecting cairns or segmenting landforms.

Challenges and Opportunities:
The Middle East is as geo-politically troubled as when we wrote our proposal. We have already made several trips to propose our project and engage local scholars and students in Yemen, Oman, and Saudi Arabia. This engagement will continue with fieldwork. Never has it been more important and more difficult for American scientists to remain engaged in cultural and scientific projects in the Middle East. We anticipate challenges in security and logistics as we organize our fieldwork for winter 2008. We have already received written assurances from both Oman and Yemen that the research permits will be issued, and we have substantial expressions of interest from Saudi scholars and authorities.

We also anticipate analytical challenges in developing software) for monument auto-detection, and there will be uncertainties about the preservation of the archaeological record—what proportion of the extant monuments have we detected and what proportion has been destroyed by subsequent natural and human events, so that the original monuments are undetectable? Finally, the fieldwork logistics of working in some of the world's most remote deserts offer both challenges (equipment failure, transport, security) and opportunities (extension of technologies to uncharted regions).

Project Title: A Computational Approach to Understanding the Dynamics of the Judicial System

                               Proposal #: 0624067
                               HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: Wayne McIntosh (University of Maryland)
Co-PIs: Cynthia Cates (Towson University), Jimmy Lin (University of Maryland)
Collaborators: Neil Fraistat, Matthew Kirschenbaum, Catherine Plaisant, Philip Resnik, and Ben Shneiderman (University of Maryland)

Research Goals:

1. Previous research of judicial systems has faced a trade-off between large scale quantitative inquiries focused on readily-counted behaviors and smaller studies that allow closer examination of legal texts. This project will apply automated content analysis techniques to the study of the US Supreme Court, thereby potentially obtaining "the best of both worlds".

2. By viewing the legal system as an intricate and complex web of communication, this project aims to better understand the role and influences of various actors through analysis of written records. Those records include, for example, briefs written by litigants and other stakeholders and opinions written by judges and justices. This goal will be accomplished by drawing upon methods from computational linguistics and information retrieval, coupled with visualization techniques.

3. To support research, we will compile, organize, and annotate a large collection of legal documents associated with cases heard by the US Supreme Court over the last half-century.

Thematic Areas:

A key part of our project is the creation of a free, publicly-accessible, online "United States Supreme Court Text Collection" (SCTC). This collection will consist of all available Supreme Court of the United States (SCOTUS) opinions (~12,000), briefs (~41,000), and oral argument transcripts (~8000) from all SCOTUS cases from the beginning of the Warren Court (1953) to present. We are designing our database to allow for (1) instant batch downloading of all queried documents (2) in a variety of formats (3) with full control over the inclusion or exclusion (and location) of such things as headings, footnotes, and citations and (4) the ability to associate available metadata to the text content in a variety of ways, such as tagged and imbedded within the document files themselves or in separate files with unique identifiers to link them. While the immediate reason for creating the collection in this manner is to enable rapid document acquisition, formatting, and pre-processing for the array of analyses we will conduct in the project, we anticipate that the collection will impact legal research more broadly by enabling and encouraging other judicial scholars to incorporate digital text processing technologies into their research.

Methodologies:

We are taking a three-pronged approach to accomplishing our research goals:
1. Database and other infrastructure development to provide a foundation for subsequent work.

2. Application of automated text processing algorithms to analyze collections and extract relevant features for human analysis.

3. Visualization of system output to facilitate rapid human comprehension of content analysis algorithms.

Recent Research Findings:

- We have been exploring the problem of visualizing "influence" within a text collection --- more generally, how the writings of different authors from different points in time are similar, and how "themes" or specific uses of language in particular contexts evolve over time. One simple example is the reuse of words from a previous document, with or without explicit citation, to convey a similar idea or to critique it. Together with Georg Apitz (Ph.D. student, Computer Science, UMD) and Ben Shneiderman (Professor, Computer Science, UMD), we have developed a prototype exploratory search interface that helps legal scholars detect, track, and analyze patterns of influence between actors in a text collection. In July 2007, Georg Apitz successfully defended a dissertation proposal on this topic. Components of his research include:
  - Creation of a visual language that describes how content propagates within text collections.
  - Development of general temporal patterns of influence, showing under what circumstances they work and do not work, and showing how they transfer between collections.
  - Empirical demonstration of how patterns of influence help experts understand text collections and find important information that is otherwise hidden or extremely tedious to find.
  - Design of an application that serves as a central workspace for scholarly research and elucidation of the underlying design principles.

- We have been applying automated linguistic analysis techniques to transcripts of Supreme Court oral arguments with Tim Hawes (Ph.D. student, Linguistics, UMD) and Phillip Resnik (Associate Professor, Linguistics, UMD). This work explores the hypothesis that justices' verbal behavior offer insight into their decision making processes (in the simplest form, their votes). Going beyond simple word-level features, we are examining rich syntactic and discourse-level cues that can give us insight into unobservable properties of justices. Preliminary findings:
  - Use of basic features, including word counts and document length, for document classification by each justice's vote appears to be insufficient to exceed the baseline established by a justice's bias for or against the petitioner.
  - However, the inclusion of linguistically-informed features for sentence complexity and stylistic choices has yielded preliminary results that are in excess of the baseline for the majority of the justices tested.

Challenges and Opportunities:

- We have established collaborative ties to other units on the Maryland campus that enhance our research. The Human-Computer Interaction Laboratory (HCIL) has expertise in the design of user interfaces, whose assistance has been valuable in guiding development of our prototype search tool. Maryland's Institute for Technology in the Humanities (MiTH) has a Mellon-funded project called MONK (Metadata Offer New Knowledge) that aims to help humanities scholars discover and analyze patterns in the text they study---the goals are quite compatible with our own and discussions have shaped our thinking in developing widely-applicable tools for different domains.

Project Title: Collaborative Research: Sustaining Cooperative Multinational Management of Marine Fisheries in the Face of Environmental Variability

                    Proposal #: SES-0323134
                    HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Robert McKelvey; (University of Montana); Kathleen Miller (NCAR)
Collaborators: Peter Golubtsov, Moscow State Lomonosov University, Moscow, Russia

Research Goals:

1. Understand challenges for management of multinational marine fisheries under conditions of imperfectly   predictable fluctuations in the location and productivity of targeted fish stocks;
2. Develop game theoretic models capable of capturing the main features of competition or cooperation in transboundary fisheries in which diverse actors (coastal states, national fleets, and a multinational fisheries management authority), play differing roles in the fishery;
3. Document challenges posed by environmental variability and related uncertainties for international
4. Regional Fishery Management Organizations (RFMOs) engaged in the management of tuna and related fisheries;
5. Provide insights on the design of fishery management regimes.

Thematic Areas:

1. Decision making under uncertainty
2. Institutional design

Methodologies:

Interview, literature review, model development and simulation.

Recent Research Findings:

This collaborative project draws upon game theory and historical evidence to examine the effectiveness of alternative multilateral treaty mechanisms for governing a trans-boundary marine fishery. It is well-established that competitive exploitation of a common property resource tends to be destructive, both of the resource base and of the economic rents derived from its utilization. In the context of transboundary marine fisheries, international cooperation is required to overcome this "common-property flaw."

Consequently, developments in international fisheries law have focused on creating multinational institutions whose role is to promote both sustainable management of the resources and an equitable division of fishery benefits among nations claiming a proprietary or harvesting interest in the resource.

For example, Regional Fishery Management Organizations (RFMOs) have been established to cover all of the world's major tuna fisheries. Management of these "highly-migratory" species is complicated by the fact that the migratory ranges of the harvested fish stocks intersect the extended economic zones (EEZs-- the "200 mile limits") of several or many coastal countries and may even extend out into the high seas area where fleets from all countries are free to harvest. The management task is further complicated by the fact that migratory patterns, recruitment, prey availability, and other fish population dynamics are sensitive to imperfectly predictable climate variability and change. Poorly anticipated changes in the fish stock's

density and distribution across its range, may lead to unexpected outcomes from allocation and management decisions. Resulting disappointments can lead to conflict among the managers and even disruption of the orderly cooperative management of the fishery. The historical analysis component of this project examined the effects of this type of uncertainty, together with pressures arising from the explosive recent growth of industrial commercial fisheries for highly migratory tunas and related species on the evolution and functioning of the set of RFMOs that attempt to govern tuna fisheries across the world.

The game theoretic part of the project has examined two situations by constructing two distinct models. The first phase of the project utilized the "*Stochastic Imperfect-Information Split Stream Fisheries Model*, which treats the case of a pair of adjacent coastal states, and focuses on the uncertainties imposed by stochastically varying oceanic conditions. The second phase of the project introduced the *Highly-Migratory Stock Management Model,* which treats multinational fisheries associated with wide-ranging fish stocks such as tuna and swordfish. It attempts to capture the complications associated with management of a highly migratory marine fish stock, such as tuna. This typically involves a large number of diverse actors (coastal states, national fleets, and a multinational fisheries management authority), all playing differing roles in the fishery.

In this multi-player harvest game, management authority is invested in a multinational *Regional Fisheries Management Organization (RFMO)*, whose members are all regional coastal states plus those nation-states whose fleets harvest this stock, within the extended stock range, including on the high seas. Thus the member states of the Commission interact competitively on the fishing grounds and cooperatively through the Commission.

Challenges and Opportunities:

Complexity of management settings allowed development of the game model for only a limited set of cases. Further model development would allow analysis of a broader array of policy options, and more complete assessment of relevance of specific features of the management setting.

Project Title: Agents of Change: Improvisation in Emergency Response: Linking Cognition, Behavior, and Social Interaction

Proposal #: CMMI-0624257
HSD Emphasis Area: AOC

Lead PI: David Mendonça, New Jersey Institute of Technology
Co-PIs: Carter Butts, University of California at Irvine and Gary Webb, Oklahoma State University

Research Goals:

Large-scale disasters—whether induced by human, technological or natural causes—require society to plan for and respond to substantial disruption. As agents of sometimes profound change, disasters require integrated planning and response at multiple levels, but they also demand flexibility and an ability to improvise. This project is the first large-scale study to investigate improvisation from a multi-disciplinary perspective at the nexus of cognitive, behavioral and social phenomena in emergency response. The three main goals of this work are
1. to explain the dynamics of improvisation in emergency response;
2. to represent and make publicly available machine-readable data and tools from the 1995 Oklahoma City bombing and the 2001 World Trade Center attacks; and
3. to develop and evaluate materials to support training and policy making regarding improvised response to disaster.

Both the Oklahoma City and World Trade Center disasters were emblematic of the sudden, unexpected crises arising from modern terrorist attacks, but also have characteristics in common with other minimal-warning hazards such as earthquakes. In particular, both disasters serve as natural laboratories for the study of improvisation in response to unexpected events.

Thematic Areas:

1. *Human behavior in disaster response*: the project explores cognitive, behavioral and interaction processes at individual through organizational levels.
2. *Multi-method analysis*: the project combines quantitative and qualitative approaches to the analysis of multi-level data.
3. *Data-driven policy*: the results of the project are expected to contribute to the ability of policy and procedures to shape response activities.

Methodologies:

The approach to addressing the *first goal* of this research is empirical: we seek to understand the dynamics of improvisation by drawing upon data from two prominent disasters of the recent past: the 1995 bombing of the Alfred P. Murrah Federal Building in Oklahoma City, OK; and the 2001 attack on the World Trade Center in New York, NY. Primary data sources consist of recordings and transcriptions of communication and dispatch logs, supplemented by maps, images and other first-hand documentation. Post-event interviews with response personnel provide additional perspective and detail. Secondary materials include after-action reports. The research is being driven by hypothesis which specify main and combined effects regarding cognitive, behavioral and interaction phenomena.

The approach to addressing the *second goal* is to create, document and disseminate data sets which consist of (i) digitized copies of raw materials (anonymized where appropriate) and (ii) an encoded version of these materials, identifying where cognitive, behavioral and interaction events have occurred. Because the primary source materials associated with this study are publicly available, the raw materials can be verified and supplemented by other researchers, in contrast to the confidential interview data on which disaster researchers must often rely. Materials such as these here have been underutilized in past work, yet their richness and quality—combined with their historical importance—make them excellent candidates for further analysis beyond the work in this project.

Recent Research Findings:

To support the *first goal*, data acquisition activities entailed (i) working with archivists at the Oklahoma City National Memorial to identify and attempt to fill gaps in original materials and (ii) attempting to secure other materials collected during the response to the World Trade Center attack that are not available through the sources discussed in the proposal.

To support the *second goal*, a systematic analysis of a random sample of after-action interviews with police personnel following each event was conducted. A coding scheme was developed that enabled research personnel to identify cognitive, behavioral and interaction events in the raw materials, as follows:
- *Cognitive Events* consisted of thinking about past, current or possible future events;
- *Behavioral Events* were classified as either conventional or improvised. If improvised, the event was further classified as involving alterations to standard operating procedures; expanding activities and/or authority of a role; placing restrictions on public mobility or engendering legal transgressions; involving the use of alternative tools in a role performance; or involving location or facility changes.
- *Interaction Events* correspond to first- or second-hand transfer of information from one person to another, and were classified either as orders (i.e., commands) or non-orders.
- Also assigned to each event was an estimated *Location* and *Time of Onset*.

The analysis yielded 3,271 cognitive, behavioral, and interactional (C/B/I) events, detailed in Tables 1 and 2. Approximately 55% of the events came from the OKC data, while 45% came from the WTC data.

Table 1. C/B/I Events (Counts)

CBS	Event	OKC	WTC	Total
C	Orient	568	510	1078
	Prosp	12	31	43
	Retro	101	107	208
B	Conv	50	69	119
	Imp	65	53	118
I	Order	723	322	1045
	Non-Order	288	372	660
Total		*1807*	*1464*	*3271*

Table 2. C/B/S Events (%)

CBS	Event	OKC	WTC
C	Orient	83%	79%
	Prosp	2%	5%
	Retro	15%	17%
B	Conv	43%	57%
	Imp	57%	43%
I	Order	72%	46%
	Non-Order	28%	54%

- The *cognitive* dimension shows close similarity between the events: orientation predominates, followed far behind by retrospection, and further still by prospection—suggesting an emphasis on thinking in the present.
- The *behavioral* dimension reveals some important similarities between this preliminary analysis and previous studies of other disasters. For example, conventionally performed behavioral components

outnumber those that were improvised—affirming a longstanding notion that response entails a blend of established and emergent behaviors.

- The *interaction* dimension reveals some differences between the events: for OKC, orders predominated, while for WTC orders and non-orders are fairly equally split.

While preliminary, these results underscore the potential for the OKC and WTC data sets to shed light on cognitive, behavioral and interaction dynamics amongst response personnel. They also provide an important test of the feasibility of this particular approach to describing these processes.

Finally, to support the *third goal*, discussions with practitioners have been held in the US and abroad, an article targeted towards practitioners has been published, and a panel at the 2007 Natural Hazards Workshop was organized. Numerous undergraduate and graduate students have been involved in all aspects of this project.

Challenges and Opportunities

Current work on this project is in three areas: further organization, preparation and cataloguing of raw materials and data to be analyzed; extension and refinement of the coding scheme described above, combined with methods for analyzing the data; and dissemination of results, including investigation of implications of this work for policy.

The raw materials for this project are extremely heterogeneous, and in some places sensitive. Our work is focused on developing a database schema that reflects the richness of the source materials, while allowing us to manage them effectively. The data for analysis are being created through a combined automatic and manual process of digitization, proofing and electronic publication.

Extension and refinement of the coding scheme presented above is leading to a two-level protocol. At the higher level (similar to that described above), human coders interpret the data to find meaning in it. This is perhaps the most common approach to content analysis. At the lower level, human coders are also employed, but instead are searching for finer-grained events, such as perceptual observations, simple actions and elementary communications. This is a highly labor-intensive process, but one that removes much of the subjectivity from the coding process. We expect to apply this technique to a subset of the data in order to determine a proof-of-concept for possible future work. Analytic methods being used in this work range from simple difference testing to event-driven models, where current event probabilities are conditioned on prior ones.

This project presents several exciting opportunities. First, it will advance our understanding of improvisation in emergency response by developing a novel conceptual framework that is multi-dimensional and multi-disciplinary. Second, the project is providing valuable educational opportunities for undergraduate and graduate students at three universities. Finally, the results of this project have the potential to improve policy making and to inform the design of training programs for first responders.

Project Title: The role of natural resources in mitigating political, environmental, and health shocks to extremely poor households in Southeastern Africa

Proposal #: BCS-0624168

HSD Emphasis Area: Agents of Change

Lead PI: Frank Merry, Woods Hole Research Center
Co-PIs: Gregory Amacher, Virginia Polytechnic Institute and State University
Paul Epstein, Harvard Medical School
Nadine Laporte, Woods Hole Research Center
Collaborators: Richard Howarth, Dartmouth College
Heidi Gengenbach, Harvard University
Andrew Plumtre, Wildlife Conservation Society

Research Goals:

Using a broad range of country and natural resource access conditions, we are analyzing the role of natural resources in poor household strategies during times of extreme stress.   We aim to provide a historical and ethnographical review of resource use by households during times of extreme stress. Special attention is being given to collecting oral histories of conditions and resources use while households are in forced migration, face unforeseen environmental or health setbacks, or are excluded from traditional access to resources.

We are developing subsistence household-based economic models of natural resource reliance that will quantify the relationship between households and natural resources and allow estimation of the effects of restricted or additional access to resources, as well as the effects of policies on revealed behavior and decisions. We will then, create alternative scenarios of governance, environmental stress, natural resource access that will simulate changing climate, health and natural resource conditions over time in the region. Finally, we will be able to develop land and resource use maps that identify where the highest pressure on natural resources will be felt in a predetermined set of environmental and governance scenarios.

We focus in two regions of the Rift Valley of Southeastern Africa: Central Mozambique and the border area of Uganda/Democratic Republic of Congo; where poverty is ubiquitous and where natural resources play a vital role in household subsistence and decision strategies.

Methodologies:

We are using a combination of the three levels of study: household, historical, and spatial to provide a complete understanding of household actions and their dependence on natural resources. Each part of the study relies importantly on and complements the others. The economic models of household behavior and decision making will allow us to quantify the responses of households to extreme events and poverty, and to changes in natural resource condition and access; we will, for example be able to estimate the reduction in hunting range due to sickness of the primary household hunter. Historical and ethnographic studies will help us understand why rural households make the decisions they do; how, for example, gender and generational relations shape labor-allocation strategies—within and across households—in changing political and/or economic circumstances, and how cultural ideologies and local knowledge of rural landscapes guide land-use practices in ways poorly understood by urban-based policy-makers.

These studies will also help us frame the important variables needed to assess the economic benefits and costs of shocks and changes in natural resource condition and access. The spatial analysis will integrate the economic household decisions and land use choices in order to pinpoint where important changes to natural resource condition, poverty and disease are occurring in response to shocks, and to predict the outcomes of alternative scenarios that imply either a decrease in natural resources (such as war) or an increase in natural resources (such as forest protection programs). The integration of all elements of this proposal are needed to bridge the gap between science and policy making that is so critical and often ignored in poor subsistence-based economy research.

Spatial, household and historical data collection is currently underway in Mozambique and will begin in Uganda in early 2008.

Recent Research Findings:

We are still in the data collection phase and so have no research finding to report.

Challenges and Opportunities:

We have broadened the list of collaborating institutions to include 2 local non-governmental organizations, 2 government research institutes, and one university. We have 11 Mozambican students who will be participate in data collection and use the results for senior theses. Data collection – spatial community resource use mapping and surveys application in 2,000 households – is to begin on September 5th in Mozambique and will conclude on October 5th.   The challenges are mainly logistical with a team that now includes more than 15 institutions.

Project Title: The Repression and Dissent Nexus in the Middle East

   Proposal #: 0527339
   HSD Emphasis Area: Agents of Change

Lead PI: Katherine Meyer, J. Craig Jenkins; Ohio State University
Co-PIs: Phil Schrodt – University of Kansas, Lawrence, KS; Mary Ann Tétreault – Trinity University, San Antonio, TX; Jillian Schwedler, Christian Davenport – University of Maryland, College Park, MD

Research Goals:

This project examines the interaction between dissent and repression in the Middle East to advance understanding of the prospects for democratization and globalization there. It focuses on several important nations -- Egypt, Israel/Palestine, Jordan, Kuwait, and Turkey -- during the 1990s, a particularly contentious decade. These locations make it possible to examine the process of transformational change and the implications of cultural variation for conflict.

Research goals of the project include: (1) the development of research models that include dynamic and interactive processes in sociopolitical systems affected by extensive and often violent dissent and repression; (2) the creation of a database that integrates data from both qualitative and quantitative sources; (3) interdisciplinary and international partnerships involving senior and junior faculty; (4) professional training of and collaborative work with graduate and undergraduate students; (5) demonstration of the power of interdisciplinary, multi-method social science research.

Using multiple research methods to study the dissent/repression nexus in the Middle East (event analysis, field research, and social surveys), this research goes beyond most previous research which utilized a single nation and/or a single methodology. It also considers more conceptual refinements of dissent and repression, a theoretical lack in existing research. Finally, it takes seriously the social, political and cultural contexts surrounding contentious activities in each nation, features which are often overlooked.   Research questions include:

1. How do dissent and repression influence one another and over what time period – e.g., quarterly, annually?
2. What kinds of repression produce what kinds of dissent and vice versa?
3. What are the social, political and cultural contexts that surround contentious activities?
4. What consistencies and inconsistencies exist in the region regarding the nature of dissent, its sources, and its contexts?

Thematic Areas:

The importance of context: The team has just completed the project's second year. The research integrated data from in-depth surveys in the six countries with survey and event data and content analysis of newswire and newspaper data. A conference at Mershon Center, highlighting the team's work was held on July 31st, following a five week workshop of intensive study. Essential to that was the work of graduate and undergraduate students who each worked in depth on one country, focusing on the mechanisms and explanatory theories of repression and dissent in the 1990s. From the country case studies, four overarching themes emerged that are critical to understanding patterns of repression and dissent across the region:

1. The importance of rentier status, both oil and foreign aid, that creates internationally dependent states
2. The size and out-migration of Palestinian and Kurdish populations creating highly mobilized diaspora communities
3. The significance of the 1990-1991 Gulf War, which transformed political opportunities and transnational networks among activists
4. The central role of technological and social networks that accompany globalization

The distinctiveness of issues: Although comparisons among the nations studied could be drawn, unique issues fueled conflict in each location. For example, in Turkey, regime changes during the 1990s were a trigger for state action, and civil dissent was fueled by the mobilization of resources within centralized groups, e.g., PKK and Dev Sol. In Israel/Palestine, state action was fragmented and piece-meal with frequent changes in leadership. A pattern of promises and broken promises was notable routinely spawned violent conflict between local tribal and informal groups as well as by larger bureaucratic organizations. In Kuwait, struggles at the times of parliamentary elections among secularists, Islamists and the ruling elite made transparent persistent cleavages within the Kuwaiti social system. Dissent erupted over the rights of women, foreign workers, the press, and stateless people.

The utility of multiple methodologies: The project utilizes multiple methodologies and sources of data. The latter include: (1) World Handbook of Political Indicators IV (http://www.sociology.ohio-state.edu/faculty/jcj.php), which provides event data from Reuters on relevant territories and is generated and utilized at The Ohio State University (OSU); (2) Kansas Event Data System (KEDS), which provides event data from Agence Francaise Presse; it resides at University of Kansas (KU); (3) Europa World Online Reports, Keesing, and Lexis-Nexus dissent and repression news stories, which have been consolidated at OSU; (4) Field work data which has been collected by American University in Cairo, KU, OSU, Trinity University, University of Maryland); (5) Kuwait General Social Surveys for the 1990s, country-specific demographic data and World Values Survey data merged at OSU; and the (6) Religion and State Data Set from Fox, 2006, merged at OSU. Using data from these sources in combination with each other has yielded a richly textured picture of contentious activity.

Challenges and Opportunities:
The project is replete with challenges and opportunities related to research goals 1 – 5 above. We mention three:
1. Attention to detailed patterns of state violence, state sanctions, and civil violence and protest in each country using multiple methods of data collection provided an opportunity to examine the utility of theories of repression and dissent for explaining conflict in the Middle East and a challenge to correct and modify models deriving from such theories. (research goals 1, 2, and 5.)
2. Attention to the social, political and cultural contexts of each nation using multiple methods made it possible to extract characteristics common to nations in the region, a significant move beyond generalizations based on case studies. (research goals 1, 2, and 5.)
3. The nature of the work and its social and political importance has facilitated cross-disciplinary and international opportunities for graduate and undergraduate students as well as faculty. (research goals 3 and 4.)

Project Title: Collaborative Research: Sustaining Cooperative Multinational Management of Marine
Fisheries in the Face of Environmental Variability

   Proposal #: SES-0323134
   HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Kathleen Miller (NCAR); Robert McKelvey; (University of Montana)
Collaborators: Peter Golubtsov, Moscow State Lomonosov University, Moscow, Russia

Research Goals:

1. Understand challenges for management of multinational marine fisheries under conditions of imperfectly
   predictable fluctuations in the location and productivity of targeted fish stocks;
2. Develop game theoretic models capable of capturing the main features of competition or cooperation in
   transboundary fisheries in which diverse actors (coastal states, national fleets, and a multinational
   fisheries management authority), play differing roles in the fishery;
3. Document challenges posed by environmental variability and related uncertainties for international
4. Regional Fishery Management Organizations (RFMOs) engaged in the management of tuna and related
   fisheries;
5. Provide insights on the design of fishery management regimes.

Thematic Areas:

1. Decision making under uncertainty
2. Institutional design

Methodologies:

Interview, literature review, model development and simulation.

Recent Research Findings:

This collaborative project draws upon game theory and historical evidence to examine the effectiveness of
alternative multilateral treaty mechanisms for governing a trans-boundary marine fishery. It is well-
established that competitive exploitation of a common property resource tends to be destructive, both of the
resource base and of the economic rents derived from its utilization. In the context of transboundary marine
fisheries, international cooperation is required to overcome this "common-property flaw."

Consequently, developments in international fisheries law have focused on creating multinational
institutions whose role is to promote both sustainable management of the resources and an equitable
division of fishery benefits among nations claiming a proprietary or harvesting interest in the resource.

For example, Regional Fishery Management Organizations (RFMOs) have been established to cover all of
the world's major tuna fisheries. Management of these "highly-migratory" species is complicated by the fact
that the migratory ranges of the harvested fish stocks intersect the extended economic zones (EEZs--the
"200 mile limits") of several or many coastal countries and may even extend out into the high seas area
where fleets from all countries are free to harvest. The management task is further complicated by the fact
that migratory patterns, recruitment, prey availability, and other fish population dynamics are sensitive to
imperfectly predictable climate variability and change. Poorly anticipated changes in the fish stock's density

and distribution across its range, may lead to unexpected outcomes from allocation and management decisions. Resulting disappointments can lead to conflict among the managers and even disruption of the orderly cooperative management of the fishery. The historical analysis component of this project examined the effects of this type of uncertainty, together with pressures arising from the explosive recent growth of industrial commercial fisheries for highly migratory tunas and related species on the evolution and functioning of the set of RFMOs that attempt to govern tuna fisheries across the world.

The game theoretic part of the project has examined two situations by constructing two distinct models. The first phase of the project utilized the "*Stochastic Imperfect-Information Split Stream Fisheries Model*, which treats the case of a pair of adjacent coastal states, and focuses on the uncertainties imposed by stochastically varying oceanic conditions. The second phase of the project introduced the *Highly-Migratory Stock Management Model,* which treats multinational fisheries associated with wide-ranging fish stocks such as tuna and swordfish. It attempts to capture the complications associated with management of a highly migratory marine fish stock, such as tuna. This typically involves a large number of diverse actors (coastal states, national fleets, and a multinational fisheries management authority), all playing differing roles in the fishery.

In this multi-player harvest game, management authority is invested in a multinational *Regional Fisheries Management Organization (RFMO)*, whose members are all regional coastal states plus those nation-states whose fleets harvest this stock, within the extended stock range, including on the high seas. Thus the member states of the Commission interact competitively on the fishing grounds and cooperatively through the Commission.

Challenges and Opportunities:

Complexity of management settings allowed development of the game model for only a limited set of cases. Further model development would allow analysis of a broader array of policy options, and more complete assessment of relevance of specific features of the management setting.

Project Title: Collaborative Research: Forced Migrants Living in Post-conflict Situations: Social Networks and Livelihood Strategies

Proposal #: 0624230
HSD Emphasis Area: AOC

Lead PI: Beth Mitchneck, University of Arizona
Co-PIs: Joanna Regulska, Rutgers University
Collaborators: Ronald Breiger (University of Arizona), Magda Grabowska (Rutgers University), Peter Kabachnik (Rutgers University), Ruth Mandel (University of London), Olga Mayorova (University of Arizona), Nana Sumbadze (Institute for Policy Studies, Tbilisi, Georgia), George Tarkhan-Mouravi (Institute for Policy Studies, Tbilisi, Georgia)

Research Goals:

1. Analysis of the ways in which forced migrants in post-conflict situations, in particular internally displaced persons (IDPs), use social networks in the construction of livelihood strategies.
2. Analysis of the extent to which social networks and livelihood strategies result directly or indirectly from interactions between IDPs and governmental and non-governmental organizations involved in the post-conflict governance environment.
3. Comparison of the social networks and livelihood strategies of in the general population and IDPs.
4. Centering the forced migrant or IDP in the analysis of the post-conflict governance environment.

Thematic Areas:

1. Forced migration (Internally Displaced Persons)
2. Governmentality in post-conflict communities (Caucasus, Georgia, Post-Soviet Societies)
3. Social networks, Gender, and Livelihood strategies

Methodologies:

Semi-structured interviews, narrative interviews, and formal social network analysis

Recent Research Findings:

Most IDPs in Georgia have been living in displacement for up to 15 years. While unemployment rates are relatively similar across the general population and IDPs, recent policy changes have created the possibility for dramatic shifts in the welfare of IDPs. Generally horrible living conditions are exacerbated by slow and limited state responses as well as a clear Georgian state policy of non-integration. IDPs became a tool in the political and economic process of Georgian nation-state building in both the domestic and international arenas. Throughout the 1990s, international humanitarian aid provided assistance to IDPs through both local and international non-governmental organizations. By the early 2000s, donors reduced spending and many left the country due to the protracted nature of the conflict and the lack of reception by the Georgian government to developing mechanisms for integration (i.e., donor fatigue). In the last few years, mounting pressure from the international community (now including the European Union) has finally led to the emergence of a collaboratively developed plan for integration - the National Strategy and Action Plan.

Our initial findings concerning the governance environment identified a set of clashing neoliberal agendas, where the non-Georgian (international) agenda emphasizes integration into society and into capitalist economic forms (emphasis on human security and human rights as well as privatization of collective centers) and the Georgian agenda emphasizes issues of sovereignty and the recognition of the power struggle with Russia. While the National Strategy discourse suggests widespread involvement of the IDPs, our site visits to many collective centers in our three case study sites (Zugdidi, Kutaisi, Tbilisi) found the IDPs generally ignorant of the basic premises of the plan yet very inquisitive. We have finished the field interviews with the general population and IDPs, however the data are not yet ready for analysis. We are in the process of coding and translating.

Challenges and Opportunities:

The political and economic situation in Georgia is highly dynamic. Even the description as a post-conflict situation is called into question nearly weekly as skirmishes occur around the Abkhaz conflict zone and between the Russian and Georgian governments. The shifting political and donor landscape provides both challenges and opportunities. For example, our survey has the opportunity to contribute to on-going and emergent political debates about forced migrant resettlement and integration; yet, the challenge is to get our results into the appropriate arenas in a timely fashion. We have the opportunity at this critical point in the changing relationship between IDPs and the Georgian government to provide insight from the unique combination of the qualitative and quantitative analysis to provide input into the policy debates. Yet, at the same time, the challenge is to make our findings much more broadly applicable to the continuously growing international forced migrant population and contribute to more theoretical and empirical debates about the nature of social networks.

An additional key challenge and opportunity is to maintain and develop communication of our key findings to non-governmental organizations, governmental agencies, and IDP groups concerning social networks and livelihood strategies. Through highlighting of critical elements in the narratives and social network analysis we can extract from the perspective of IDPs the most important elements to keep them intact and which policies and agencies are most helpful and harmful to livelihood and human security.

Project Title: Workshops on Surveillance and Society

Proposal #: 0623122
HSD Emphasis Area: AOC

Lead PI: Torin Monahan, Arizona State University
Co-PIs: Simon Cole, Jill A. Fisher, Gary T. Marx

Research Goals:

1. To foster interdisciplinary dialogue on contemporary surveillance issues
2. To map core areas of surveillance research to locate collaborative opportunities and existing research gaps
3. To facilitate graduate student training

Thematic Areas:

1. Power and inequality (differential surveillance along the lines of race, class, gender, and/or sexual orientation)
2. *Social sorting* and *crude categories* as conceptual responses to the challenges of researching contemporary electronic surveillance
3. Potentials for enabling or empowering environments through pervasive computing

Methodologies:

There will be two agenda setting workshops for this grant. The first international and interdisciplinary workshop was held in March, 2007, at Arizona State University. The second will be held in 2008. The first research goal is addressed by bringing together 23 scholars from the many disciplines currently studying surveillance and society issues who, because of existing disciplinary territories (of journals or conferences), may be unaware of each other's work. The second goal, of mapping core areas of research, is met through a combination of structured topical discussions by participants and open forums for guided conversation about the research needs of the field. The final goal, of training graduate students who are working on surveillance and society dissertation projects, is met in conjunction with the first two activities and by scheduling time for students to receive individualized feedback on their research in progress.

Recent Research Findings:

The first workshop brought together a multi-disciplinary and international array of scholars studying the social implications of contemporary surveillance with a particular interest in questions of the public sphere, equality, civil liberties, privacy, and fairness. The academic disciplines represented were Anthropology, Business / Management, Communications, Criminology, Geography, Information Studies, Justice Studies, Philosophy, Political Science, Sociology, Science and Technology Studies, and Women and Gender Studies. In total, there were 23 participants (including the PIs) from 5 different countries.

Preliminary findings included an in-depth discussion of the different forms inequality that might be aggravated by surveillance and the proper role of scholarship in studying such phenomena (e.g., neutral, interested, activist, intervention-focused, etc.). One dimension that was especially productive was trying to figure out what "good" surveillance systems might look like -- whether for elderly care or those with

different mobilities or for environmental monitoring of toxics. We're currently editing a special issue of the journal *Surveillance and Society* based on the workshop, which will be a more formal synthesis and representation of the workshop outcomes.

In terms of outreach, we circulated a press release which garnered media attention for the event. The PI participated in several radio and newspaper interviews. One newspaper article mentioned the workshop specifically. In the wake of this publicity, the PI answered numerous email queries from members of the public who wanted further information on issues of surveillance and society. Additionally, a website was designed to disseminate information about the event and publications that arise from it: www.publicsurveillance.com/workshop.html.

Challenges and Opportunities:

The primary challenge for the first workshop was negotiating different disciplinary perspectives about the role of scholarship in addressing issues of power and inequality. While this created some tension among participants, it also led to a generative discussion about the strengths and weaknesses of different methodologies and sparked several collaborative projects among participants, which was one key objective of the workshop.   The second challenge was trying to move beyond critical stances either for or against surveillance to identify criteria for (and examples of) *enabling* surveillance environments. This challenge also serves as an opportunity, or a provocative invitation, for moving the field of surveillance studies beyond reactionary stances and toward productive, collaborative engagements with science and engineering practices. The greatest opportunity, at this point, is for redirecting research toward areas where there are huge gaps in empirical data or theoretical knowledge concerning surveillance: toward studies of differential surveillance (based on population), enabling (pervasive) surveillance, automated surveillance, and passive surveillance through ubiquitous information systems and devices.

Project Title: The Dynamics of Political Rhetoric and Political Representation

Proposal #: 0527513
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Burt L. Monroe (Pennsylvania State University)
Co-PIs: Kevin Quinn (Harvard University), Michael Colaresi (Michigan State University), Dragomir Radev (University of Michigan), Steven Abney (University of Michigan)
Collaborators: Michael Crespin (University of Georgia), Yael Shomer (Washington University), Akitaka Matsuo (Rice University), Sarah Hobolt (University of Oxford)

Research Goals:

1. Develop databases from electronic records of legislative speech around the world.
2. Develop and implement statistical models of language use in politics.
3. Use these data and models to provide insight into fundamental questions in political science about the nature of democratic competition and representation.
4. Use these unique data to provide insight into the dynamics of language.

Thematic Areas:

1. Democratic representation.
2. Political communication and language.
3. Computational linguistics / natural language processing.

Methodologies:

The data are being created through a variety of web spidering / scraping and natural language processing techniques. The analyses have been conducted using statistical andmodels that are novel large-scale Bayesian statistical learning approaches developed by the PIs and designed specifically to address the questions brought up in these data.

Recent Research Findings:

Our most recent work addresses the nature of changing language use over time by parties and other identifiable groups. This is of fundamental importance to political science concerns with democratic representation and political competition.

For example, a long-running debate addresses the issue of whether parties remain essentially constant in their party positioning or whether they have or take the opportunity to shift positions for strategic advantage. Our approach allows, for the first time, to track in minute detail the appeals and positions that parties take on a wide variety of political topics. We find, generally, that partisan competition is in fact stable in many ways, but also is subject to surprising volatility under certain conditions.

Challenges and Opportunities:

The most challenging aspects of the project have been (1) bridging social science and computational disciplines, (2) the highly multilingual nature of the project, and (3) the sheer size of the datasets, and subsequent analysis results, being developed.

The last is also the primary opportunity. These datasets will be a unique resource to corpus linguistics and will be among the very largest ever assembled in social science. They should prove to be a rich source for analysts well after the completion of this specific project.

Project Title: Social Network Dynamics of Youth

 Proposal #: 0624158
 HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: James Moody - Duke University
Co-PIs: Daniel McFarland - Stanford University, Scott Gest – Pennsylvania State University

Research Goals:

While youth networks shape social identity, influence behavior and provide resources for action, most empirical treatments study static networks focused on a limited range of relational types. We seek to build a richer portrait of youth networks by modeling networks across both an interactive and temporal dimension. With respect to social interaction, at the most micro-level we have face-to-face communications bounded within classrooms. We then extend to less-bounded within grade friendships and then finally to relations that cross multiple contexts. The second dimension focuses on the temporal expansiveness of relations. Face-to-face communications result in immediate networks bounded in time to the current moment. These expand in friendship to much longer time-scales. Movement across these two dimensions can be thought of as a general progression from strongly "bounded" to "unbounded" networks. We are thus building new software for analyzing networks, compiling data for public use, and modeling these data substantively. Our three main goals are thus:

1.   Provide a new vision of the networked life of youth that captures the endogenous developmental trajectories of social relations and their intersection with life-course development.
2. Build new tools and provide sample data for mapping, measuring and modeling dynamic networks.
3. Provide plug-in points for network models that can extend network evolution to peer influence models of youth behavior and ideational diffusion.

Methodologies:

We first build dynamic representations of youth networks then model these networks statistically. To cover all scales, we build similar models on multiple data sources that, combined, will form a pastiche portrait of the evolutionary sequence of youth networks.

Our methods include exploratory visualizations, particularly network "movies" that allow us to watch a network evolve over time. We also cluster networks to find peer groups, build local-network sequences of local relational patterns and then fit exponential random graph models (ERGMs) for each setting.

Recent Research Findings:

Our funding was finalized in Feb of this year, so we are starting by focusing on data collection and tool building. We have updated the Social Network Image Animator (SoNIA) to work with the R statistical package, making linking estimation of ERGM models in STATNET and visualization of dynamic networks in SoNIA simpler (Bender-deMoll et al, 2007). We describe the challenges involved in making meaningful network movies in two recent publications (McFarland and Bender-deMoll 2007; Moody, McFarland and Bender-deMoll 2006), and submitted recent visualizations from the SoNIA tool to the NetSci 2007 conference. We have similarly been building tools for clustering networks, exploring the relative performance of tools commonly used in different disciplines. In (Gest, Moody & Rullison 2007), for

example, we show that there is reasonable concordance with different methods applied to similar data, but that different data collection techniques hamper comparability across studies. We have extended some of this work in recent papers aimed at bringing traditional social-network approaches to relational data to a developmental psychology audience (Gest et. al, 2007; Kindermann and Gest 2007). We have also been working on developing tools for real-time analysis of dyadic interaction sequences (McFarland, 2007) and analyzing flows of individuals through settings, as a way to help identify latent cluster evolution in networks (McFarland, 2006). Looking forward to building peer influence and diffusion models across evolving networks, Moody has identified a number of analytic tools for tracking the limits of diffusion in dynamic networks (Moody, forthcoming).

Challenges and Opportunities:

We see 4 challenges as the project moves forward. First, estimation of ERGM models on fully dynamic data across multiple waves is currently just becoming feasible. We thus focus on modeling current networks with functional summaries of past networks. We are looking forward to fully dynamic models that can incorporate relational trajectories more completely. Second, combining model results across data sources and waves is currently cumbersome and largely unprecedented within the ERGM framework. Our current approach is to treat the studies in a meta-analytic frame, then use network simulation tools to compare models with reality. Third, the theoretical time-scales for social processes are difficult to specify. Moreover, we suspect that the temporal unfolding is heterogeneous across actors and relations, making it difficult to specify the "tempo" for network evolution. Finally, multiple sources for social action have been specified, which imply only partially overlapping model terms. While we can obviously follow standard practice and include terms for each, we'd rather find a parsimonious unifying theoretical story for the unfolding of these relations. Our future analytic work on dynamic networks aims at accommodating these last two issues.

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Project Title: Collaborative Research: Decision-making, Risk & Uncertainty (DRU): Understanding mental models of expertise in construction management using interactive adaptive simulations

                       Proposal #: SES-0624118
                       HSD Emphasis Area: HSD - Dec, Risk & Uncertainty

Lead PI: Amlan Mukherjee, Michigan Technological University
Co-PIs: Norbert Seel, Amy Baylor, Florida State University
Collaborators: Nilufer Onder, Michigan Technological University

Research Goals:

1. Develop a mathematical framework to represent construction process information and design algorithms that simulate possible project futures to estimate associated risk.
2. Develop interactive adaptive simulations based on the mathematical framework and construction management field data and use it to capture data on expert and novice decision-making.
3. Develop mental models of construction management decision-making under uncertainty, specifically highlighting differences between experts and novices in knowledge organization, information processing, and risk assessment.

Thematic Areas:

1. Artificial intelligence in decision support systems
2. Construction management simulations
3. Expert/novice cognition

Methodologies:

1. Representation and agent based reasoning about construction information using temporal constraint networks
2. Collection and organization of field data through structured surveys and interviews of practicing construction managers
3. Using interactive simulations to collect human decision-making data
4. Analysis of collected data using statistical and graphical methods

Recent Research Findings:

The primary research outcomes of this project have been the design of a framework that can be used to encode construction project management information including costs, schedule constraints, and uncertainty associated with possible external events, and variability in productivity and market costs. The framework uses a temporal constraint network, called TONAE, to represent the information and reason about probable future scenarios. The theoretical significance of this framework is that it estimates risk from a Monte Carlo sample of possible project futures, instead of studying defined models of specific crisis scenarios that are anticipated during the planning process. The space of possible futures consists of all the paths that the TONAE can traverse in time. Each such path can be simulated by tracking the cascading impacts of different combinations of constraint violations that drive the construction project schedule and cost. The sample space thus covers all possible scenarios that may arise – some of which may be entirely

unanticipated, but quite possible. The size of the sample space grows exponentially given the number of constraints. Hence, to reduce the complexity of analysis, and increase the accuracy of the estimate, the space is sampled for a very large number of times.

The framework and associated algorithms has lead to the implementation of an interactive simulation of the construction of a steel framed office building. The construction project data used in the simulation comes from a real project that was completed in the Mid-West and documented by the American Institute of Steel Construction. The simulation can be used to identify the probability of the sampled project scenarios and their impacts. In addition, for an identified parameter (such as a cost overrun indicator) the simulation can track changes in the distribution of possible future outcomes at each point during the execution of the construction project. The direct implication of this research is that it will help construction managers (and planners in general) identify and assess the risks involved with low/high impact and low/high probability scenarios and assign contingencies accordingly. The specific scenarios that are of primary concern are the ones that are identified by the simulation to be of high impact and low probability. In addition, the simulation will help managers interactively assess risk and uncertainty during the construction project as it evolves under rapidly changing conditions.

This research was conducted as part of a MS research thesis in Computer Science by a graduate student (co-advised by the PI and Dr. Nilufer Onder) who was supported by the grant. The work has been accepted for presentation at the Winter Simulation Conference 2007 (Anderson et al. 2007) and has been submitted for review to the Journal of Computing in Civil Engineering, published by the American Society of Civil Engineers (ASCE).

Anderson, G. R., Onder, N. and Mukherjee, A. (2007) "Expecting the Unexpected: Representing and Reasoning About Crisis Scenarios," In the Proceedings of the 2007 Winter Simulation Conference, December 9 -12th.Washington D.C.

Challenges and Opportunities

The next phase of the research will be to collect data regarding human decision making in complex construction projects. A two-pronged approach will be used to collect and analyze the data in collaboration with our co-PIs at Florida State. We will use structured interviews and surveys to collect data directly from practicing construction managers. The surveys will provide subjects with specific crisis scenarios and elicit their responses to managing uncertainty with an emphasis on cost, schedule, and relevant constraint considerations. In addition, we will collect construction decision-making data in crisis scenarios that are dynamically unfolding by subjecting construction managers to the interactive simulation. Specifically, the focus of the data collection will be to capture statistically significant patterns (if any) in decision-making among construction managers with different levels of expertise.

The developed simulation can estimate risk during the execution of a construction project by sampling possible futures. The behavior of critical parameters, such as cost overrun and schedule delay indicators, over the sampled futures can be used to generate distribution functions that reflect probable project outcomes. These functions provide us with an opportunity to quantitatively identify, analyze, cluster, and map the project futures anticipated by human subjects. However, it also poses the challenge of developing models that will encode human decisions in the simulation environment and calculate comparable values of the above indicators. These models will be a function of cost, schedule and event variables that define the simulation. The relationships between these variables (independence or conditional dependence) will allow

us to develop graphical models that can be used to analyze the collected data and query statistically significant patterns that we refer to as ***situation models*** of decision-making.

The simulation also provides the opportunity to improve undergraduate construction education. Students will get an opportunity to participate in the simulation to explore impacts of decision-making in complex **crisis scenarios.**

Project Title: Developing a Measure of Voluntary Consent for Protocol-based Treatment Decisions

                      Proposal #: SES-0527618
                      HSD Emphasis Area: Decision Making, Risk, and Uncertainty (DRU)

Lead PI: Robert M. Nelson, MD, PhD, The Children's Hospital of Philadelphia
Co-PIs: Mary Frances Luce, PhD, Duke University; Tom Beauchamp, PhD, Georgetown University
Collaborators: William Reynolds, PhD, The Children's Hospital of Philadelphia; Victoria A. Miller, PhD, The Children's Hospital of Philadelphia; Richard Ittenbach, PhD, Cincinnati Children's Hospital Medical Center; Diana Harris, MBe, The Children's Hospital of Philadelphia

Research Goals:

1. To create an item pool that assesses all major dimensions of decision making control for this sample of parents.
2. To construct a voluntary consent scale (DMCI) appropriate for use with these parents.
3. To examine the relationship between DMCI total score and selected measures of decision-making preference, coping style and affect.

Thematic Areas:

1. Risk perception
2. Decision making
3. Voluntary choice

Methodologies:

1. Qualitative: Focus groups and semi-structured interviews with parents, physician-researchers, and other research professionals to elicit their views of voluntary decision making to ensure that all aspects of voluntariness are included in the DMCI item pool.
2. Quantitative: a) Common statistical techniques for scale development including, principal components analysis, exploratory factor analysis, and confirmatory factor analysis. b) Linear regression to establish causal relationships between DMCI and measures of affect, decision making and information preference, and other variables.

Recent Research Findings:

All participants are biological parents or legal guardians of children participating in protocol-based treatments for cancer (85 percent) and other medical disorders (primarily cardiology and pulmonary). Ninety percent were undergoing treatment as inpatients and ten percent as outpatients. Sixty-eight percent are women and 32 percent are men. Seventy-two percent are white, 14 percent are African-American, six percent are Asian, and eight percent are other. Four percent of these identify as Hispanic or Latino. Overall, participants are well-educated, with 78 percent reporting at least some college, a college degree, or a higher degree. Seventy-five percent are married or living with a partner, and 70 percent report annual income of $40,000 or above, with a substantial minority of these (24 percent) earning greater than $100,000 annually. Eighty-one percent report making the protocol participation decision with at least one other individual

(multiple responses were possible), typically one's spouse/partner (70 percent), but also including a physician (30 percent), the child (13 percent), another family member (six percent), and the researcher (three percent). Seven percent of the participants reported delegating the decision to at least one other individual including a spouse, a physician, or the child. Only two percent of participants report that the outcome of their decision to participate in the protocol is negative; otherwise their response indicated a positive (83 percent) or neutral (15 percent) outcome. At the time of survey completion, the mean number of days since participants made the decision to enroll their child in a protocol was 4.7 (SD= 3.9). Sixty-seven participants completed the survey within five days of making the decision, 27 completed it between six and ten days, and four participants completed the survey more than ten days after the decision. Only five parents who were approached refused participation.

We don't yet have enough data to conduct the exploratory and confirmatory factor analyses necessary for final scale construction, which will require approximately 200 cases, a number we should reach by December, 2007. However, as a first step in the scale construction process, we conducted a principal components analysis to reduce the number of items and establish a preliminary factor structure. We began by running solutions for one through six factors using the 28 items specified to measure voluntariness (i.e., decision making control). Over several iterations, we eliminated items if they loaded poorly on a factor or had multiple factor loadings. As we experimented with the item pool, including item analysis and item selection, to get the pool down to a manageable set of items for closer inspection, the number of consistently interpretable factors fell to between three and five. Several criteria were used in this process, including eigenvalues > 1, screen plots, as well as number and interpretation of item subsets. In general, our four most interpretable factors accounted for approximately 70% of the total variance. Analyses done thus far were considered to be interim in nature and were done primarily to begin introducing us to the data's many underlying attributes. Once subject recruitment in complete and all data have been collected we will rerun the analyses as outlined in our application and in our statistical analysis plan.

Challenges and Opportunities:

An early challenge of this project involved recruitment of parents who had recently made decisions about enrolling children in protocol-based treatments. Participants are recruited from a number of different locations and departments within the hospital, necessitating the development of an extensive network of relationships with investigators, study coordinators, and other clinical and research personnel. As our numbers indicate, we have successfully met this challenge by spending considerable time with our referral sources, over time developing trusting relationships that have resulted in a steady supply of subject referrals. Meeting this recruitment challenge has also provided us with a unique opportunity: to interview parents within a very short time (i.e., one to 10 days) of their having made what for many is a difficult and emotion-laden decision. Much of the empirical research on informed consent and research participation decision making involves small numbers of subjects who are reflecting upon decisions made well in the past. Upon completion of recruitment, we will have a large data set with measures completed during a period when the participation decision was quite fresh. Finally, when the scale construction phase of the project (Aim 2) is complete, we will have the opportunity to assess the association between voluntary decision making and a number of variables related to affect and decision making (Aim 3). Variables such as affect, coping, trust in physicians and researchers, information and decision making preference, and self-efficacy have rarely been evaluated in studies related to research participation (or clinical) decision making.

Project Title: Creating a Multi-factor Performance Assessment Model to test Governance Performance in Multi-Scalar Large Institutional Networks (MSLIN)

Proposal #: 0623135
HSD Emphasis Area: AOC

Lead PI: Michael Neuman, Texas A&M University
Collaborators: Roger Smith, Texas A&M University; Elizabeth Deakin, University of California at Berkeley; Charles Hoch, University of Illinois at Chicago; Jan Whittington, University of Washington; Franziska Hasselmann, ETH Zurich; Willem Salet, University of Amsterdam; Louis Albrechts, Leuven Catholic University; Allesandro Balducci, Milan Polytechnic University

Research Goals:

1. develop an analytical model to measure institutional performance
2. test model on one or two metropolitan planning institutions
3. publish edited book on theory supporting the analytical model

Thematic Areas:

1. institutional analysis
2. governance performance
3. metropolitan infrastructure planning

Methodologies:

Network analysis, comparative institutional analysis, econometric modeling, surveys of key stakeholders, statistical analyses.

Recent Research Findings:

We held a two day research symposium in College Station, Texas (Texas A&M campus) for the researcher team members. They presented their theoretical frameworks for the proposed analytical model, and preliminary research on several of the case study metropolitan areas (Milan, Brussels, Seattle, Munich). We discussed the obstacles to model development: how big an "N" or sample size for both the independent variable (metropolitan areas in USA and Europe) and dependent variable (institutional performance). We found that no rigorous quantitative comparative work has been done on metropolitan governance institutions, which indicates we are exploring new ground.

Challenges and Opportunities:

To create a new analytical model for institutional comparisons in a multiscalar large institutional networks (MSLIN) environment. We believe it will open up new terrain in network analysis.

Project Title: DHB Collaborative Research: Human Decision Making Dynamics and its Impact on Infrastructure Systems

                     Proposal #:0624361
                     HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: David Newman, University of Alaska - Fairbanks
Co-PIs: Kara Nance (University of Alaska, Fairbanks), Ian Dobson (University of Wisconsin), Matthew Zeidenberg, Ben Carreras (BACV Solutions)

Research Goals:

1. To investigate the dynamics of an integrated system comprised of infrastructure systems such as power networks, communication networks, with a dynamic model of the social interaction with these. This will build on previous work on the complex system dynamics of power transmission networks and of communication networks,

2. To develop a hierarchy of simple models to represent the key human reaction and decision-making dynamics identified in the observations of the real systems, and coupled to models of the complex engineering infrastructure. These models will also allow the investigation of the effects of the topology of human networks on the overall system dynamics.

3. To develop analytical tools to quantify and predict regimes of behavior.

Thematic Areas:

1. Complex system dynamics
2. Agent based decision-making
3. Infrastructure dynamics

Methodologies:

A hierarchy of simple agent based models to represent the key human reaction and decision-making dynamics coupled to a hierarchy of models of complex engineered infrastructure systems is used to investigate the impact of the human interactions with the complex infrastructure systems. This interaction dynamics can then be used to look for feedbacks and vulnerabilities in the coupled systems

Recent Research Findings:

Using a simple dynamic Cascade model representing the operation of an infrastructure system we have begun investigations of the impact of different classes of decision making on the infrastructure dynamics.. The dynamical evolution of the system in the long time scale is governed by a daily increase on consumer demand that raises the overall load on the system and the engineering response to failures that involves the upgrading of the components. The system is controlled through two parameters and two agents who operate the system by selecting those parameters control those two parameters. The utility functions used by the agents to optimize performance incorporate some perception of the events that affect the decision making of the agents. In this preliminary work we look at three social aspects characterizing the agents:

1. Risk averse and risk taking attitudes in the operation of the system.
2. The response to large events triggering a change in behavior on the part of the agents
3. The effect of the learning time in adapting to new conditions.

These three social characteristics have an impact on the performance of the infrastructure system. In going from risk-taking operation to risk-averse operation there is a reduction in the frequency of failures and in the number of failures per unit time. However, risk aversion brings an increase in the probability of extreme events. During risk-averse operation, the PDF falls off with a lower power than in normal operation. When risk-averse operation is triggered in response to extreme events, we obtain similar results as in the case of continuous risk-averse operation, but the probability of extreme events can be higher than the continuous operation if this reaction is triggered too often, that is if the threshold for jumping into risk averse operation is relatively low.

Challenges and Opportunities:

Connecting the hierarchy of infrastructure models with a standard agent system (the Repast agent system) presents both a challenge (making the coupled system efficient enough to do the needed investigations) and a great opportunity (the flexibility to explore a wider range of agent behavior with an accepted standard agent system

Project Title: Ecological Boundary-Setting in Mental and Geophysical Models
Proposal #:0433165
HSD Emphasis Area: Decision Making, Risk and Uncertainty

Lead PI: Bryan G. Norton, School of Public Policy, Georgia Institute of Technology, PI
Co-PI (s): Douglas S. Noonan, School of Public Policy, Georgia Institute of Technology, Co-PI and Asim Zia, Environmental Studies, San Jose State University, Co-PI
Collaborators: Bruce Hannon, Geography, University of Illinois, PI of Illinois sub-contract; Sara Metcalf, Geography, University at Buffalo (SUNY) Co-PI; Paul Hirsch, Ph.D. Candidate, Public Policy, Georgia Institute of Technology; Carolyn Fonseca, Ph.D. Candidate, Public Policy, Georgia Institute of Technology

The project, *Ecological Boundary-Setting in Mental and Geophysical Models*, includes several research streams, and researchers are developing and analyzing data and writing papers in each of these streams. The streams of research are unified by a shared focus on spatiality; in particular, we are all concerned with how people - whether members of the public, government administrators, or scientists - "bound" the systems to which they attribute environmental problems. The process of bounding is often implicit, hidden in definitions of terms or in unspoken assumptions. To complicate the matter (and make it interesting), problem bounding is also a dynamic process, changing according to new scientific discoveries, political changes, and shifts in values and perceptions. In our individual and small-group research projects, we have pursued various aspects and perspectives on spatial behavior and related attitudes.

In addition to these varied projects, we have also considered how these research streams feed into one another. As we worked on our own projects, we sought to combine our work to make a contribution to general theory in the area of behavior and decision making. We therefore challenged ourselves in group meetings to concentrate on the precursors and the effects of spatial modeling in understanding environmental problems.

We have, accordingly, begun working on a book-length manuscript on scale and environmental policy, tentatively titled: *Scale Matters: Where We Are; Who We Are; and Why We Care.* This book will develop a multi-disciplinary theory about the role of scale in policy formation, and it will do this by building upon, and generalizing from, the findings and speculations of individual studies and streams of small-group research. The research streams respond to three unifying questions, which will begin to illustrate how the various parts will contribute to the larger book project.

The following three questions summarize the shared interests that guide our research, and these questions will form the structure for the three-part book.

1. The Descriptive Question- How do people (including scientists and other stakeholders in environmental problem debates) "bound" the systems to which they attribute a problem?

Activities Include:
A. Content analysis of regional newspapers concerning pollution in the Chesapeake Bay (Hirsch and Zia)
B. Survey of Georgia Water Planning Process (Hirsch)
C. Atlanta residents' valuation of Coral Reefs (Fonseca)
D. Mental Models and Problem Bounding (Metcalf, Zia, Hirsch, Norton, Hannon)
E. Spatial bounding of systems in environmental justice studies (Noonan)

2. *The Dynamic Question*- How do these temporarily stable decisions regarding the "scale" of a problem change?
Activities Include:
A. Sense of Place and Landmark District Designations (Noonan)
B. Discourse analysis - eliciting cultural models from social science research of pollution in the Chesapeake (Zia, Hirsch, Norton)
C. Hedonics of Industrial Corridors, Landmarks and Disamenities (Noonan)
D. Neighborhood Networks (Metcalf)
E. Contagion of Impact Fees (Noonan and Fonseca)
F. Sense of Place Theories and the Operationalization of Ambit (Zia, Norton, Hirsch, Hannon)

3. *The Normative Question* - Can we articulate criteria to guide the "scaling" of environmental problems?
Activities Include:
A. Environmental Justice Meta-analysis (Noonan and Fonseca)
B. Macro-scoping, Social Learning, and Choice of Scale (Norton, Zia, Hirsch)
C. Spatial Policy Analysis (Zia)
D. Analysis of place commitments as exemplifying social values (Norton, Zia, Metcalf, Hirsch, Hannon)
We are currently consolidating our findings in the particular research streams, in anticipation of the grant's end in May, 08. We are now working on individual and collaborative publications that will disseminate our findings in several fields; and we are also working on a draft of an overview book that will propose a general theory of space, place, and their effect on environmental problem formulation.

Project Title: Safeguarding the Future against HIV/AIDS: Change Agents in Malawi's Education Sector

                    Proposal No. SES-0623100
                    HSD Emphasis Area: Agents of Change

Lead PI(s):   Dr. Chloe O'Gara and Dr. Linda Sussman
Lead Organization: Save the Children Federation, Inc.
Collaborators: Jodie Fonseca, Lester Namathaka and Frances Mabeti/ Save the Children/US; Other Participating Institution: The University of Malawi, Centre for Education Research and Training, Ms. Elizabeth Meke

Research Objectives:

Using the Positive Deviance Inquiry approach, the research will:

▪ Identify positive deviant individuals and groups in the education sector who are proactively adapting to the HIV/AIDS epidemic and explore the specific characteristics that make them positive deviants.
▪ Identify the factors that support those individuals and groups, as well as the barriers they face, in their attempts to catalyze action in the context of a decentralized education sector.
▪ Develop recommendations to policymakers and practitioners for supporting positive deviant teachers, school management committees, and any other education-based actors in the fight against HIV/AIDS.

Thematic Areas

Education and HIV/AIDS

Methodologies:

In this research, the positive deviance approach (called Positive Deviance Inquiry, or PDI) is used to identify the strategies and characteristics of teachers and education officials whose actions positively deviate from the norm of stigmatization and silence with regard to HIV and AIDS in Malawi's education system. In the early 1990's this approach was initially used to conduct research to decrease childhood malnutrition. Though positive deviance has been applied in 41 countries by various organizations in the fields of health and nutrition, it has rarely been used in the education sector. For the purpose of this study, positive deviants have been defined as individuals or groups who overcome the many barriers – the norm of silence, shame and stigmatization, the lack of access to services, the low level of social capital for confronting the epidemic, etc. – that surround HIV and AIDS. In the context of the Malawian education system, these are individuals and groups who exhibit deliberate positive and proactive behavior.

The *first* step of the research involved exploratory discussions with representative groups of education stakeholders to gather information on the context as well as to identify examples of positive deviance within the education sector. In the *second* step, the research team used criteria generated through these consultations to identify specific positive deviant individuals and groups. In-depth interviews and focus groups were conducted with teachers, head teachers, school management committee members, primary education advisors, members of parent-teacher associations, district education and district HIV/AIDS

officials, community based organization (CBO) and non-governmental organization (NGO) representatives. In the process of conducting these qualitative interviews, a group of teachers who had formed a support group, called T'LIPO, and another group of people living with HIV and AIDS were identified. Members of these groups were also interviewed individually and as part of focus groups. In addition, officials from the Ministry of Education were interviewed, as well as representatives from the education divisions of UNICEF and USAID. The *third* step, which is scheduled to begin the second week of the upcoming school term (mid-September), will involve quantitative data collection, using questionnaires that have been developed as a result of the extensive qualitative information collected during the second step of the research. These questionnaires will be administered to teachers, head teachers, District education managers (DEMs), and members of the support groups of teachers living with HIV and AIDS. The collection and analysis of this data adapts the traditional format of PDI by adding a quantitative step to build upon information gathered through the in-depth interviews and focus groups, to more systematically examine positive deviant activities, as well as factors that act as barriers and facilitators of positive action.

Recent Research Findings:

With an adult HIV prevalence of 14.2 percent, Malawi is one of the countries most heavily affected by the pandemic. As a result of the pandemic, the sector is losing teachers to AIDS-related and other deaths faster than replacements can be trained.[i] This contributes to ever-increasing teacher-pupil ratios and a growing burden on the other teachers who must compensate during their colleagues' prolonged illness. Quality of education has further declined as illness and funeral attendance have grown to account for over 60 percent of all cases of teacher absenteeism.[ii] The availability of testing for HIV has increased significantly in the districts that were the main focus of this research. Even in many of the rural areas, treatment is available to those who are HIV-positive. Yet, as is the case with the general public, teachers are reluctant to get tested for HIV. The norm in the schools visited by the researchers is for teachers who are ill not to get tested and if they have been tested, not to disclose their HIV status to others within the school. Therefore, by the time they have been tested and have access to appropriate treatment - both for opportunistic infections and for AIDS through ARV treatment - they are often quite ill.

On the other hand, teachers have the opportunity to influence the way that pupils and members of the community respond to people living with HIV/AIDS. The potential of teachers to act as change agents in the community has been exemplified by a small group of positive deviants. In each of the districts visited, HIV-positive teachers have joined together to provide support to each other. Some have begun to disclose their HIV status in public and to speak to other teachers and even visit other schools to reduce the stigma associated with HIV and AIDS and encourage others to be tested. While the researchers were in Blantyre, they joined a large group of teachers marching through the streets chanting "Keep the Teachers Alive!", along with representatives from the Ministry and the media.

As explained by the T'LIPO president: "...*The problem is that it is secret. People don't want to say the truth. AIDS is like a taboo. People don't want to recognize that it is a problem. We teachers want to be a role model for people to recognize this as a disease… To me, I just feel time is up. It's not time for people to be fearing , they should be happy to go to VCT [voluntary counseling and testing for HIV]. Little by little people will be used to go to VCT. …We want to attract more and more to come and get tested and live positively. The fear itself and keeping it secret makes people to die faster.*"

Challenges and Opportunities:

Challenge: The application of a positive deviance approach to decreasing the impact of HIV and AIDS in the education sector is not clear-cut. Many of the positive deviant actions identified in this research rely on expensive and often unavailable external forces, whereas research on positive deviant behavior related to nutrition generally uncovers simple behavior that is within the control and the resources of the target population. For example, in the two districts that were the original focus of this research, there was extensive and increasing access to VCT, ARV, nutritional support, and psychosocial support through existing networks of people living with HIV/AIDS. The research revealed that information is lacking or people are misinformed or fearful of accessing these services. However, in this case, positive deviants can rectify gaps in information and can encourage attitudinal change to access the services that are available in their districts. On the other hand, in areas where there is no access - or very limited access - to these expensive and rare external resources, the incentives to learn one's HIV status are limited. Potential positive deviants in that situation would face a very different set of challenges.

Opportunity: The use of survey questionnaires to quantify the factors revealed by the qualitative data collection is expected to provide an estimate of the extent of the HIV/AIDS-related positive deviance and contribute to the PDI methodology by quantifying those factors identified through in-depth interviews and focus groups. Meetings with representatives from the Ministry of Education resulted in other potential opportunities, in that the Ministry officials have been supportive of the research and are anxious to learn from the results. In fact, they encouraged the researchers to collect data from the Central and Northern regions of Malawi, expanding beyond the original intention to collect data only in the Southern region.

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1 Government of Malawi, "National HIV/AIDS Policy: A Call for Renewed Action." Lilongwe, Malawi: Government of Malawi, 2003, 1.

[1] Harris, Abigail M. and Schubert, Jane G. "Defining 'Quality' in the Midst of HIV/AIDS: Ripple Effects in the Classroom," 7

Project Title: Human and Social Dynamics in Myvatnssveit, Iceland, from the Settlement to the Present

Proposal #: 0527732
HSD Emphasis Area: (AOC)

Lead PI: Astrid E.J. Ogilvie, INSTAAR, University of Colorado.
Co-PIs: Thomas H. McGovern, Hunter College, CUNY; Ian A. Simpson, University of Stirling, Scotland; Jon Haukur Ingimundarson, Stefansson Arctic Institute, Akureyri.
Collaborators: Arni Einarsson, Institute of Biology, University of Iceland, and Myvatn Research Station; Orri Vesteinsson, University of Iceland and Icelandic Institute of Archaeology; Jennifer Brown, University of Stirling, Scotland.

Research Goals:

In line with primary HSD aims, the main goal of the project is to foster breakthroughs in understanding the dynamics of human action and development, as well as knowledge about organizational, cultural, and societal adaptation and change. Further specific goals are to:

1. Investigate the human and social dynamics of natural resource use and economic practice in Myvatnssveit, northern Iceland, in the context of environmental and climatic change over time, specifically the last $\cong 1100$ years.
2. Use this information to evaluate decision-making and the management of change in order to develop sound long-term economic options and strategies for residents, educators, and other stakeholders.
3. A third, overarching goal is to facilitate the understanding of the complex consequences of how societies and cultures evolve and change over time from a global as well as an Arctic and sub-Arctic viewpoint.

Thematic Areas:

1. Reasons for the millennium-scale success or failure of farms and districts in surviving rapid and profound environmental change and climate fluctuation.
2. The relationship of major transformations in landscapes (e.g. near total deforestation, widespread but not universal soil erosion, fresh-water ecosystem changes) to several key changes in stock-raising strategy from the past to the present.
3. Placing modern shifts in land use in a broader environmental perspective while relating them to their local geographic, temporal and human and social contexts.
4. Connecting local knowledge of farmers and stakeholders to scientific data sets through the use of enhanced and accessible computer models used as interview tools and bridges to research partnerships.
5. Producing integrative modeling and syntheses of patterns of adaptive resilience to global and local changes with wide relevance beyond the circumpolar zone.

Methodologies:

The project draws on systems theory in order to focus on agents of change (AOC) in social-ecological systems (SES). Resilience may be "measured" in relation to the magnitude of disturbance that can be tolerated by a SES before it relocates, adopts a different set of processes, or fails. The project also makes use of the concepts and methods of panarchy to explore transformations in human-ecological systems. Panarchy provides a theoretical framework for understanding sustainability that integrates SES with economic, ecological and social aspects at various time scales. Temporal and spatial modeling is being used to explore

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. Land-use and agronomic studies are also of relevance, and the project is compiling quantitative data bases of time series of grass and hay yields and fertilizer usage to extend and update previous agronomic and regression studies. Simulation modeling is being used to investigate the interactions between farm management, vegetation, climate, and land degradation, through the examination of spatial and temporal patterns of vegetation production and utilization. Historical and archaeological data are subject to the analyses appropriate to these disciplines.

Recent Research Findings: It has been noted that scheduling of communal use of the highland pastures (now largely eroded deserts) was more critical than total number of sheep maintained. While biomass productivity was sufficient to sustain very large grazing populations of sheep, keeping sheep in the highlands past the (climatically varying) end of the growing season could trigger local erosion hot spots. Changing inter-annual predictability thus seems to be at least as important as gradual climate cooling in defeating what appear to have been sophisticated and generally effective traditional strategies for communal grazing management. Further, major destabilization of the Kráká river valley (flowing into the lake basin area from the eroded highlands to the south) occurs in the early eighteenth century, rather than in the medieval period as once thought. Loss of human labor due to eighteenth century smallpox epidemics, and the "famine of the mist" due to the Lakagígar volcanic eruption, may have been critical factors in this destabilization, as human landscape management strategies were starved of workers, just as cooling climate and "inherited" small-scale erosion (begun in earlier periods) began to accelerate. Interviews and archival work focusing upon human inputs to landscape stabilization are thus switching from a "population as problem" to "population as resource" perspective.

Challenges and Opportunities:

During the summer 2006 and 2007 field seasons, excavations in the Narfastadir location confirmed that a significant portion of the sixteenth- to eighteenth-century farm remains intact, despite the archaeological challenge of the development of a modern farm and hotel complex in the immediate vicinity. Conditions of organic preservation are good, and the potential for further investigations combining selective excavation with ongoing survey work on boundary walls and larger cultural landscapes is high. The Narfastadir site is highly suitable for an outreach program, and this proved very successful during the 2007 field season. The Grænavatn site nearby is a large, still occupied, medieval chieftains' farm which represents a major archaeological resource with a standing turf farm house. Discussions with the modern farm family are producing a set of test investigations which it is hoped will lead to a long sequence connecting the recent period with first settlement. In August 2007, a Viking-age boat burial was discovered at Litli-Nupur near Narfastadir. This is an unusual find for Iceland and, in addition to a number of interesting artifacts which will illuminate economic and cultural practices, the remains of at least 2 humans will provide the opportunity for radiocarbon dating and dietary isotopic analysis.

Project Title: The dynamics of civil war outcomes: Bosnia and the North Caucasus

        Proposal #: 0433927
        HSD Emphasis Area: AOC

Lead PI: John O'Loughlin, University of Colorado at Boulder
Co-PIs: Gerard Toal (Virginia Polytechnic Institute and State University); Michael Ward (University of Washington); Jeremy Mennis (Temple University); Kristian Gleditsch (University of Essex, UK)
Collaborators: Vladimir Kolossov and Olga Vendina (Russian Academy of Sciences) and 9 other Russian scientists or public opinion pollsters. Graduate and undergraduate assistants at the US instititions.

Research Goals:

1. Examine the effects of war experiences on attitudes towards other ethnic groups and evaluate the prospects for reconciliation (e.g. willingness to live in mixed communities)
2. Estimate the levels of inter-ethnic interaction and the state of separatist beliefs
3. Develop and pilot test the use of an integrated suite of tools (GPS, GIS, remote sensing, survey data, field interviews) to measure the effects of conflicts on local communities in different cultural settings

Thematic Areas:

1. Inter-ethnic relations (social diastances) in the former war zones of Bosnia and the North Caucasus
2. Spatial analysis of the localized distribution of violence (terrorism, assassinations, military actions, etc)
3. Remote sensing of landuse/landcover changes as a result of conflict, especially minefields and ethnic c leansing

Methodologies:

We use an integrated methodology of individual and aggregate data that relies on opinion survey, census, governmental, and remote sensing data collection to operationalize a spatial analysis across a variety of scales. We focus on localized outcomes (village-level) of previous conflicts as well as contemporary distributions of small-scale violence. We mostly use the suite of geographic analytical tools (GPS, remote sensing imagery analysis, GIS, spatial analytical methods) complete the work.

Recent Research Findings:

Recent research on this grant has moved forward on three fronts. First, on the question of interethnic trust, we have shown that conventional wisdom that tells us that societies that have experienced violent struggles in which individuals of different ethnic groups have (been) mobilized against each other are likely to become ossified along ethnic lines is misguided. Using multidimensional scaling in the analysis of 4000 responses, we do not find patterns of clear attitudinal cleavages among members of different ethnic groups in Bosnia nor the North Caucasus. Further, in another paper, we show that there is a substantial belief in the possibility of inter-ethnic co-operation both in Bosnia and the North Caucasus, in spite of substantial inter-ethnic violence in each location. In both regions, the respondents who believe that things are getting better and who experience higher levels of material well being are more optimistic about co-operation. Other attitudinal variables and war experiences do not seem to play a large role in these evaluations of ethnic

relations. In a third paper, we show that the tenet of modern studies of nationalism, that mobilized nations will want to live separately from members of other groups to achieve ethno-territorial goals, is inaccurate for the study regions. When examining sub-categories of the ethnic groups in each region, traditional social science factors, like religiosity, perceived income and levels of pride yielded significant differences but more so for Bosnia-Herzegovina than for the North Caucasus. Intuitive factors, such as experience with violence during the wars, were not consistently revealing and significant. The best explanations for separatist sentiment in both locations were geographical location (individual towns and counties) and respondents' levels of general trust.

The second focus is the spatial analysis of violence. Examining the localized occurrence of all violent events from August 1999 to August 2007 in the North Caucasus shows a dramatic diffusion of the conflict from Chechnya to the adjoining republics of Ingushetia and Dagestan. The spatial analysis combined both geostatistical analysis of static patterns (all events in a month categorized by the type of actor – guerrillas, military, police) and dynamic analysis of the changing pattern. Both the nature and scale of violence is changing as the Federal authorities in Moscow entrust 'peace maintenance" to the local Chechen leadership, but the region as a whole is becoming 'infected' with the spillover from the Chechen wars.

The third focus of the project is the migration and economic changes in the war zones as the local economies remain stagnant, a process begun with the coincidence of the collapse of the two states (Yugoslavia and the Soviet Union) and the beginning of local conflicts. Extensive field work to collect demographic and economic data for the smallest units (county equivalents) has been able to document the uneven pattern of out-migration, economic disparities and political (in)action. We have attempted to estimate the prospects for further unrest as a result of the unequal benefits/losses, frequently correlated with nationality and locality, over the past 15 years in both study sites.

Challenges and Opportunities:

Continuing a couple of the themes that I elaborated last year, managing a five university, two country, two study sites and multidisciplinary project is much more time-consuming than anticipated. While I knew all the co-PIs well, I had only worked closely with two of them before. Learning the styles, work calendars, proclivities and emphases of the others and trying to meld them into the team has been more difficult than expected. Whilst there have been no conflicts, preferences vary significantly and styles often clash. For example, one co-PI wants to immediately share all data collected while another wants to embargo it till the end of the project. Similarly, in the choice of publication outlets for a multidisciplinary project, naturally, individuals vary in their preferences for journals.

Another continuing challenge that emerged again in the past year in two extended trips to the North Caucasus was the secrecy and unwillingness to assist in providing data to foreign researchers that is endemic in the region, ridden with many kinds of ethnic, religious, national, and political cleavages. Working with local academics is the only way to access these data but that in turn has significant difficulties since their academic traditions, styles, norms and ethics are hugely different than one normally sees in Western social science.

Project Title: Analyzing the Flow of Network-Embedded Expertise in Schools: A Longitudinal Study of Individual and Organizational Change

Proposal #: Collaborative Proposal: BCS-0624307 and BCS-0624284
HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: William R. Penuel, SRI International
Kenneth A. Frank, Michigan State University
Co-PIs: Christopher Hoadley, Pennsylvania State University
Dale Belman, Michigan State University
Collaborators: Jay Lemke, University of Michigan
Carol Edwards, NEA Foundation
Lia DiBello, Workplace Learning Research, Inc.
James P. Spillane, Northwestern University
Brian Rowan, University of Michigan
Gary Sykes, Michigan State University

Research Goals:

The primary goal of this research study is to study change processes linked to new institutional pressures on schools brought about by the threat of sanctions under the federal *No Child Left Behind Act (NCLB).* In particular, the research seeks to develop and test models that integrate accounts of individual and organizational change in response to *NCLB.*

In this study, our principal question is "How do social processes and structures formed during the implementation of previous reforms and innovations enable and constrain teachers' responses to new institutional forces?" This question calls for attention to organizational level factors that affect interactions, the formation of interactions in response institutional pressure and how those interactions affect teachers' behaviors. Therefore, we ask:

- How do formal opportunities for shared decision-making and informal opportunities for collaboration carry over or shift as a wave of pressure begins to take hold?
- How do interactions teachers draw on to respond to new institutional forces emerge from interactions regarding previous reforms?
- Which interactions, experiences and attributes that emerged through prior reforms are most strongly related to teachers' responses to new institutional forces?

Thematic Areas:

Linking individual and organizational change
Institutional theory
Network change
Educational reform

Methodologies:

The study team is collecting longitudinal data on teachers' classroom teaching practices, principal and other administrative leadership behaviors, and on teachers' social networks using questionnaires and interviews. We are using a combination of case analyses of schools' leadership practice's effects on organizational

functioning, social network analyses to model selection of ties and change in networks over time, and multi-level models to test the influence of network ties and individual characteristics on teacher change.

Recent Research Findings:

How do formal opportunities for shared decision-making and informal opportunities for collaboration carry over or shift as a wave of pressure begins to take hold?

➢ Organizational forms that emerged from an earlier school restructuring movement in the 1980s and 1990s are being used now to discuss NCLB-related concerns, including how to raise test scores of low-performing students.

Beginning in the 1980s, schools developed organizational structures designed to reduce the isolation of teachers and promote greater teacher involvement in school-level decision-making. Despite the fact these efforts had limited impacts on teaching and learning, these forms have persisted. They include the creation of grade-level and "vertical" teams that meet regularly to discuss curricular matters, the creation of common planning periods for teachers, and protocols and processes for structuring collaboration. Today, schools have appropriated these organizational forms to discuss strategies for improving the achievement of low-performing students, including underrepresented groups in the school.

➢ Relative to earlier reforms studied for schools in the sample, interactions concerning reading and math are less frequent.

The average teacher received help from 0.6 others concerning implementation of the reform whereas the average teacher received help from 0.32 others to increase STAR reading test scores and 0.35 others to implement STAR math test scores. Thus, in sum, there is as much interaction concerning STAR testing for both reading and math as there was about the reform. We also note that the differences could be a function of our instrument: school rosters were used to elicit names concerning help with the reform whereas responses to help regarding the STAR test were based on free recall. The differences in amount of help received for STAR testing for reading and math were not statistically different, although many of the interactions concerning reading and math were between the same teachers. Teachers received help from about 0.5 colleagues for a total of about 36 days in the school year for each subject.

Which interactions, experiences and attributes that emerged through prior reforms are most strongly related to teachers' responses to new institutional forces?

➢ Perceived pressure to change is linked to receipt of federal funds. Teachers in the aggregate perceive less pressure when they teach in schools not receiving Title I funds.

Principals and teachers in more economically advantaged schools reported little to know influence of NCLB on their individual or organizational behavior, relative to schools that received Title I funding for serving low-income children. This fact is not surprising, since the sanctions of NCLB apply only to Title I schools. Nonetheless, it is important, because NCLB is part of a larger set of institutional forces related to accountability in education, to which all schools are subject.

➢ Many teachers and principals do not distinguish NCLB pressures from state and local pressures associated with a larger set of institutional forces: accountability-based reforms. Even specific

requirements regarding teacher quality, which ostensibly affect their job status, are not distinguished by teachers.

This finding was surprising in that NCLB was "new" in its demand that schools be held accountable for performance of all subgroups and that all teachers hold a degree in the subject matter they taught. Before NCLB, California did not hold its schools accountable for high levels of achievement for each subgroup in a school. At the same time, accountability pressures on schools had been mounting for several years prior to passage of NCLB. Teachers had already adjusted in some ways to a tighter coupling between their classroom practice and organizational practice.

Challenges and Opportunities:

➢ A key challenge in struggling schools is high teacher turnover. This challenge creates practical problems for schools but also methodological ones, when studying network change. At least some aspects of network change are a function of levels of turnover, not responses to institutional pressure. This has implications for building school capacity and teacher induction.

Approximately 35% of the people on our rosters in 2005 were not on our rosters in 2007, and approximately 28% of the people on our rosters in 2007 were not on our rosters in 2005. This suggests about a 33% turnover in 2 years.

Project Title: Infrastructure Change, Human Agency, and Resilience in Social-Ecological Systems

                       Proposal #: 0527511
                       HSD Emphasis Area: Agents of Change

Lead PI: Stephen G. Perz, University of Florida
Co-PIs: Grenville Barnes, University of Florida; Jane Southworth, University of Florida; Graeme Cumming, University of Cape Town
Collaborators: Universidade Federal do Acre (Brazil): Veronica Passos, Karla Rocha, Lucas Araujo Carvalho, Marcos Silveira; Universidad Nacional Amazonica de Madre de Dios (Peru): Augusto Montes, Bertha Ikeda, Hugo Duenas Linares, Jorge Castillo, Americo Quevedo; Universidad Amazonica de Pando: Daniel Rojas, Androncles Puerta, Dean Kenji, Liliana Cabrera, Floridia Saavedra;
Other universities: Jackie Vadjunec (Oklahoma State), Angelica Almeyda (Stanford University)
Other organizations: Elsa Mendoza (Instituto de Pesquisa Ambiental da Amazonia), Julio Rojas, Frank Paul de la Barra (Centro de Investigacion y Preservacion de la Amazonia), Juan Fernando Reyes (Herencia)

Research Goals:

1. Conduct satellite remote sensing of land cover
2. Conduct community-level interviews about local livelihoods
3. Establish botanical plots to observe and monitor plant diversity

Thematic Areas:

1. Environmental Dynamics
2. Societal, Organizational, and Cultural Dynamics
3. Social, Political, and Economic Dynamics

Methodologies:

1. Processing of Landsat images

➢ Landsat data were acquired for the tri-national region, spanning eight Landsat scenes (paths 1-3, rows 67-69) and included data from 1986, 1991, 1995 and 2000-2006

➢ Fifty-six of the 77 datasets comprising the 20 year time series have been calibrated, georectified and mosaicked by year

2. Initial remote sensing on LS imagery

➢ Created land cover classifications for the 20 year time period using Landsat data. The artifact-free data were combined with derived data such as band ratios, vegetation indices, elevation, slope, and distance to roads. These data were classified into water, bare/built, pasture/grassland and forest using a rule-based, decision-tree methodology. These initial classifications were completed for

1986, 1991, 1996, 2000 and 2005. The classification accuracies were verified as adequate against a set of approximately 200 training samples (ground truth) collected during prior field research.

3. **Community socioeconomic questionnaire**

   ➢ Initial community-level questionnaire, which will be followed up in a subset of sites with individual-level questionnaires.
   ➢ Designed community level questionnaire to capture data on infrastructure, market connectivity, resource use and social organizations
   ➢ Initial data gathered and multi-criteria site selection completed in Peru and Bolivia. Geographic range of samples extended in Bolivia.
   ➢ Field tested in Peru and Bolivia with project personnel feedback

4. **Botanical protocol**

   ➢ Objective is to investigate the relationship between a series of dependent variables describing forest structure and natural resources, and independent variables describing 'connectivity'
   ➢ Dependent variables include indices of biodiversity of woody plants (Fishers alpha), floristic composition (matrices of species in key functional or economic use groups), and carbon stocks (derived from aboveground biomass estimates)
   ➢ Created a database of permanent plots in the region to establish collaborations with other research groups investigating complementary questions
   ➢ Modified Gentry transects employed to meet our sampling objectives and to promote regional collaborations
   ➢ Initial training on methods was conducted in all three countries in July-August 2007, with a total of 18 students and the three country coordinators participating

5. **Remote Sensing Protocol**

   ➢ Potential training sample locations were randomly stratified across land cover type and country using the land cover classifications as a guide
   ➢ Field teams of UF researchers and regional partner institutions collected samples using the CIPEC protocol tailored for use in Brazil, Bolivia and Peru.

Recent Research Findings:

1. **Processing of Landsat images**

   ➢ Detected striping artifacts in Landsat and ASTER imagery during calibration. This severly limited use for initial land cover classifications. Statistical, semi-automated method was developed to minimize striping artifacts for the affected data.
   ➢ Automated cloud masking methodology was also developed for the exclusion of cloud and shadow from the data.

2. **Initial remote sensing on LS imagery**

   ➢ Conducted preliminary land cover change trajectories and landscape configuration analyses using the land cover classifications. Change trajectories showed variation in land cover conversion across the region by country and can be associated with distance to roads. Land cover classifications were

also buffered to distances of one, three, five, eight and ten kilometers from roads and were compared with various landscape- and patch-level metrics. Though preliminary, results from these analyses provide insight and guidance for ongoing research with more refined land cover classifications.

3. Community socioeconomic questionnaire

➢ Interviews completed in over 20 communities in Peru and 30 communities in Bolivia.
➢ Initial findings indicate considerable diversity among communities in terms of many other questionnaire items (livelihood strategies, importance of market connections, perspectives about road paving, etc.)

4. Botanical protocol

➢ Initial training on methods was conducted in all three countries in July-August 2007, with a total of 18 students and the three country coordinators participating
➢ Field campaigns planned for the dry season of 2007 include visits to 10 sites each in Peru and Bolivia, resulting in a total of 40-50 plots
➢ Processing of samples for identification is on-going; we anticipate considerable plant diversity and for species to vary substantially among transects

5. Remote Sensing Protocol

➢ Approximately 80 non-forest training sample points were collected within 1.5 km of the road from Cobija, Bolivia to the Rio Madre de Dios. Forty points of non-forest land cover were sampled in Acre, Brazil, along the BR-317 highway from Rio Branco to Assis. Data collection in Peru is ongoing from the border of Brazil to Puerto Maldonado. Forest training samples are also being collected by botanical field teams in each country.

Challenges and Opportunities:

1. Permission to undertake fieldwork in Brazil

➢ Brazil's CNPq (the National Research Council) requires submission of project proposals for approval before any fieldwork can be carried out
➢ We worked with our Brazilian partner university in Acre, UFAC, to submit the required documents. Approval is anticipated in September 2007
➢ We have met with our Brazilian counterparts to plan the fieldwork (identify sites, line up field teams, etc.) and anticipate starting in the fall of 2007
➢ The project PI (Perz) has taken research leave from UF this fall in order to facilitate the fall fieldwork

2. Networking among US researchers and partners

➢ UF and UFAC (Brazil) organized a cooperative seminar to exchange ideas about research activities and further develop our institutional relationship
➢ UF has recently signed cooperative agreements with UNAMAD and UAP; these agreements formalize and facilitate collaboration for research on this project and others

3. Remote sensing workshop in Bolivia

➢ Attended by approximately 40 remote sensing experts from around the southwestern Amazon including project personnel and partners from Bolivia (UAP) and Peru (UNAMAD)
➢ UF remote sensing researchers conducted training and capacity building with members of partner institutions. Partner members, such as the botanical research teams, were trained to use the modified CIPEC protocol and to collect data for ongoing research.

Project Title: Emergent social behaviors in sensorimotor control

                             Proposal #: ECS-0433948
                             HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Michael Peshkin, Northwestern University
Co-PIs: Mitra Hartmann, James Patton, Peter Vishton
Collaborators: Kyle Reed

Research Goals:

A most basic form of human social interaction is the physical cooperation necessary to perform a manual task in pairs (dyads) or groups. Our research explores how the human sensorimotor control system implements cooperative motor control. The project team has demonstrated that when a dyad embarks on a repeated simple manual task requiring speed and accuracy, motor strategies quickly arise that not only differ significantly from individual strategies on the same task, but also provide better performance. This result runs counter to conventional wisdom that high accuracy tasks are best performed by one individual alone. Nevertheless, the result is reasonable: humans are social animals and have developed sophisticated ways of working together physically. Motor interactions represent a social communication mechanism distinct from facial expression, gesture, and spoken language. By taking the new strategy of two humans cooperating, the project team has recently been able to study how humans can interact more naturally with robots. The project team and its approach are interdisciplinary: the work encompasses cognitive science, neurobiology, robotics, and sensorimotor control.

Experimental Methodologies:

To gain insight into this physical communication channel, we interpose a robotic mechanism between two subjects as they engage in a shared motion task. The robotic interposition allows us to both monitor the forces exerted by the each individual, and to selectively perturb the interaction between them (by adding or subtracting forces and/or noise).

We used several capabilities of our custom built 1-DOF crank: (1) The crank has strain gauges that allow us to monitor the torque exerted about its axis of rotation by each subject independently. These torques will be acquired at a high sampling rate for off-line analysis. (2) Two separate video feeds can provide different visual displays to the two subjects. This allows us to control the timing and goal positions of the task for the two subjects independently. (3) Computer-generated torques can be injected about the crank's rotation axis, via a direct-drive DC brushless servomotor located under the table. This will allow us to selectively perturb the interaction between the subjects by adding or subtracting forces and/or noise.


Experimental setup with two-handled crank. A projector displays the targets from above. A curtain hangs between the two participants to prevent visual communication. A motor is mounted below the table.

Recent Research Findings:

We investigated physical interaction between two people and a human and a robot using the simplest task we could conceive: rotating a two-handled crank to bring a cursor into a target region. Based on the specialization found in dyadic tasks, we programmed a robotic partner to simulate one of the human partners. Each subjects' partner was hidden behind a curtain, so we could make half the subjects believe the partner was a human and half know a human was not present, thus that they were interacting with a robot.

When two people work together, the dyad performs faster than the average of the subjects working individually. When a person works with a simulated partner, yet believes the robotic partner is a human, the human-robot performs the same speed as the subject working alone. When the subject knows they are not working with a human, the human-robot performs slower than working alone. The perceived origin of the robotic partner causes the subjects to perform differently: worse when they thought their partner was a robot and better when they thought their partner was a human.
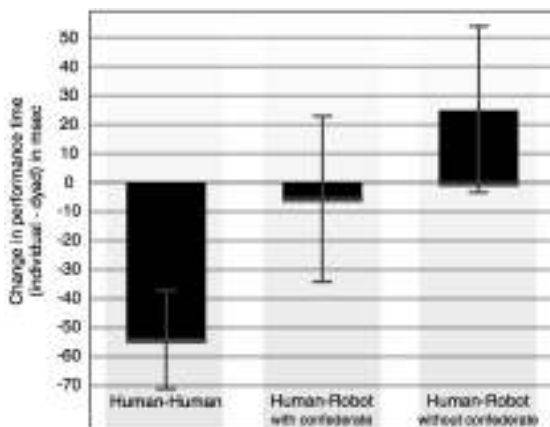
Subjects in the Human-Robot group knew they were working with a robotic agent while subjects in the H-R-Confederate group believed they were working with a human. A negative value means the two people (or human-robot pair) worked faster together than the individual. Two humans working together are significantly faster than an individual working with a motor simulating a partner. When working with the robotic partner, subjects with a confederate present are faster than subjects without a confederate present, but not significantly.

A more complete description of our results to date may be obtained in these publications:

- Kyle B. Reed. "Understanding the Haptic Interactions of Working Together," Ph.D. Thesis, Northwestern University, June 2007
- Kyle Reed, Mitra J. Hartmann, James Patton, Michael Peshkin. "Replicating Human-Human Physical Interaction," Proc. of IEEE International Conference on Robotics and Automation (ICRA), Rome, April 2007
- Kyle B. Reed, Mitra J. Hartmann, James Patton, Peter M. Vishton, Marcia Grabowecky, and Michael Peshkin. "Haptic cooperation between people, and between people and machines," Proc. of IEEE International Conference on Intelligent Robots and Systems (IROS), Beijing, October 2006
- Kyle Reed, Michael Peshkin, Mitra J. Hartmann, Marcia Grabowecky, James Patton, and Peter M. Vishton. "Haptically Linked Dyads: Are Two Motor-Control Systems Better Than One?" Psychological Science, Vol. 17, Num 5, pp.365-366, May, 2006
- Kinesthetic Interaction, Kyle B. Reed, Michael Peshkin, Mitra J. Hartmann, J. Edward Colgate, and James Patton. Proc. of the 9th Int. Conf. on Rehabilitation Robotics (ICORR '05), Chicago, IL, June, 2005
- Initial Studies in Human-Robot-Human Interaction: Fitts' Law for Two People, Kyle Reed, Michael Peshkin, J. Edward Colgate, and James Patton. Proc. of IEEE International Conference on Robotics and Automation (ICRA), New Orleans, April 2004

Broader Impacts: Preliminary results arose from efforts in rehabilitation engineering, and the broader impacts of the work include improving our fundamental understanding of therapist/patient interactions during physical or occupational therapy, many aspects of which are repetitive dyadic physical interaction. The work may also lead to better ways to make use of the social dynamics between individuals in physical interaction, which would be relevant to shared-control situations in which cooperation is currently a limiting factor. These include hands-on teaching/learning as in sports training or helicopter flight training, shared control of teleoperators or of unmanned aerial or underwater vehicles, and shared control of minimally invasive surgery or telesurgery.

Project Website: http://lims.mech.northwestern.edu/projects/humanr

Project Title: Global markets, regional landscapes, and household decisions: Modeling the history of transformation of the Amazon estuary

Proposal #: 0527578
HSD Emphasis Area: BCS

Lead PI: Miguel Pinedo-Vasquez, Columbia University
Co-PIs: Peter Deadman, Christine Padoch, Eduardo Brondizio and Robin Sears
Collaborators: Núcleo de Altos Estudos Amazõnicos – NAEA

Research Goals

- Demonstrate the complexity of social dynamics and environmental change associated with historical economic transformations as they affect and are affected by socio-demographic change
- Reconstruct the history of biophysical change in regional landscapes associated with economic and demographic shifts
- Identify the functions of local institutions, rules and norms in rural and urban areas in light of changing conditions
- Develop an agent based model 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.

Thematic Areas

- Land use and demographic changes, historical perspective
- Urbanization and land cover changes

Methodologies:

- Archival data collection
- Ethnographic
- Ecological
- Remote sensing
- Agent based modeling

Recent Research Findings

1. Brazilian government welfare programs, including the relatively new program that allows farmers to apply for retirement benefits, are the most important reasons why rural folk of the Amazon estuary visit and maintain long-term contacts with urban areas. While the programs are designed to make rural life more secure and allow rural people to stay in their communities, payments are delivered in the cities. Farmers travel to cities to collect pensions and other benefits on average twice per month and the great majority have closed relatives or their own houses in the city. Government pensions represent more than 50% of the household income of the estuarine households.

2. Land diversification is allowing the estuarine residents to engage in commercial agroforestry and forest management activities and reduce their dependency on cash crop production. Our data show that sale of forest and agroforestry products, notably açaí palm fruit and fast-growing timbers managed in housegardens, fallows and forests, has become the second (after government benefit programs) most

important source of income for estuarine households. Demand for non-agricultural products is transforming land use and land cover in the estuarine area and is even increasing the abundance of aquatic resources including fish and shrimp.

3. Municipalities (and municipal government) do not seem to be benefiting from an active and growing economy of forest products. Commercialization tends to take place informally and between families and a variety of brokers and buyers, and usually at the regional capital. Municipalities do not benefit from tributes and taxation, thus continue to depend on federal assistance funds to provide basic services.

4. The pattern of declining annual crop production and increasing emphasis on tree products is notably changing forest cover trends in the Amazon estuary. Remote sensing data show that the estuarine region is experiencing a process of net afforestation rather than deforestation. In a 10 km radius around the town of Ponta de Pedras, the area of intensive açaí agroforestry has increased from around 1,100 ha in 1985 to around 2,150 ha by the year 2000. The latter represents close to 75% of the total area of floodplain forest for the area analyzed. This process of afforestation includes ongoing "açaization" of the estuary (i.e., increased planting and management of the highly-valued açaí palm while maintaining floodplain forest cover) but also features growing diverse secondary forests, woody fallows and house gardens and fewer fields and pastures.

Challenges and Opportunities

We are examining the compatibility or congruence of our data and the model we are constructing with theoretical constructs that have sought to explain other earlier instances of "forest resurgence" including theories of forest transition based on European experiences. We have been fortunate to collaborate with Dr. Sandra Costa, an Urban Geography from Brazil, who received a post-doctoral fellowship from the Brazilian government to spend a year at Indiana University working in collaboration with this project. Dr. Costa is working on the urban components of the project, such as analyzing long term changes in urban areas as related to migration of rural families and economic phases

Project Title: The Global Logistics Chain: A 21st Century Change Agent
      Proposal #: 0624251
      HSD Emphasis Area: Agents of Change

Lead PI: William M. Rodgers III, Rutgers University
Co-PIs: David Bensman, Rutgers University
      Maria Boile, Rutgers University
Collaborators: William Kramer, Rutgers University
      Charles Rawlings, Past President of United Nations Association-New Jersey
      Sotirios Theofanis, Rutgers University

Global logistics chains are systems of suppliers, manufacturers, distributors, retailers, and customers where physical, financial, and information flows connect stakeholders in both directions. The IT revolution transformed global logistics chains, making them major agents of change. The transformation redefined how seaports function and gave rise to a new global commerce business model. This project studies how employers, employees, and institutions are responding to the transformation. We test three hypotheses:

- Retailers now control not only what they will produce, when and where it will be delivered, but they also dictate price and thereby the labor standards of production. As a result, wages and working conditions throughout the supply chain have deteriorated.
- The knowledge intensity of the logistics system itself is part and parcel of a growing need for economic actors to be able to collect, process, and use diverse sources of information. This dynamic assures that highly educated workers will remain in short supply, and in a position to demand high wages and desirable working conditions.
- Public policy can play a role in influencing employer choices as to whether they take the "high" or "low" road to competitive success.

As a precursor to testing these hypotheses, we are performing a comparative study of United States to foreign ports, with the Port of New Jersey-New York serving as our focal port. Our primary goal is to provide researchers and policy analysts with a framework of the global logistics chain that can be used to analyze the industry and develop policy.

Currently, we are describing the Port of New Jersey-New York. We have conducted a pilot survey of port truck drivers. Most port truck drivers work on contract to small trucking companies, which receive contracts from shipping lines, freight forwarders, and logistics services providers. Low capital costs, ease of entry, and intense competition characterize the market for port trucking services. Port truck drivers find themselves competing with new entrants who are often desperate to find the means to pay the leases and maintenance expenses on their used trucks. As a result, rates have been stagnant while the cost of operations has been rising; many drivers leave the market monthly, and employers report a chronic shortage of drivers, as well as problems of reliability and service quality.

Longshoring used to be the port's dominant labor force. Since containerization employment has fallen from 50,000 to 5,500. Unlike displaced longshoremen, recently hired longshoremen have lower levels of wages and benefits, and less access to overtime. Yet, employers still view labor costs as a growth constraint on freight through the port. Longshoremen complain of less employment certainty and deteriorating pay. As a result, dockworkers accept all the work they can when it is offered, leading to long work hours and lack of sleep, followed by periods of idleness.

Warehouse workers comprise a third type of logistics workers. We have interviewed warehouse and distribution center operators, shipping line executives, and logistics services providers, in order to learn where freight unloaded from ships is brought on the first and second stop. While in the past most freight was unloaded from ships directly into warehouses on the docks, those warehouses are now being torn down to provide room for ship unloading, and warehouses are moving to locations outside the port, sometimes even 75 miles away.

During our interviews with warehouse operators and third-party logistics operators, we learned that there is a substantial labor force of customer service agents booking freight in offices scattered throughout the metropolitan region. These agents work at a desk with a telephone and computer; potentially never visiting the port. Little is known about these workers.

Efforts to test hypothesis #1 are underway. Using the Current Population Survey, we have replicated and updated the work of Black and Brainard, who estimated the relationship between "trade openness" and the gender wage gap. We expand and extend their study to measure the link between "trade openness" and wage inequality (e.g, overall and within categories of educational attainment). Our preliminary evidence indicates that the link between "trade openness" and U.S. earnings inequality has a strong cyclical component with its biggest effects occurring during the 1990s recession.

During the next six months we will formally test hypotheses #1 and #2. Prior to conducting these tests we will compare labor market outcomes in port economies to metropolitan areas that do not have seaports. This will enable us to identify whether globalization has had a differential impact on "gateway" labor markets.
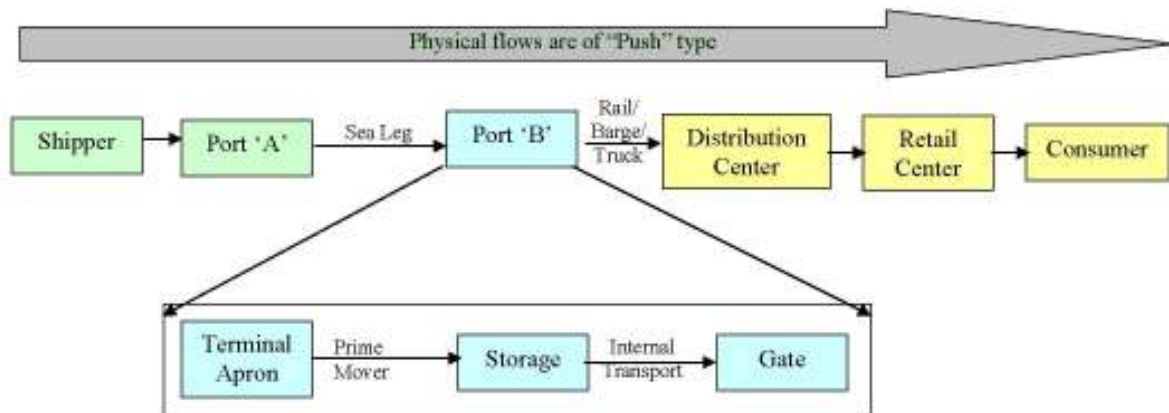
From a series of pilot/exploratory interviews with industry and public agency officials, we developed a framework of the Asia to the Port of New York-New Jersey logistics chain. Figures 1 and 2 show the movement of container traffic (i.e., physical entities or units of goods). Figures 3 and 4 illustrate how transportation systems involve both the flow of information and physical entities. The following summarizes these systems.

Inbound, outbound, and trans-shipment logistic processes comprise physical flow activities. They include all value-adding and movement activities from the supplier to the final consumer. Physical flow is the most visible piece of the supply chain. It is the distinct path by which goods move to customers. However, information flow is an information exchange among different links. Information flows can be either electronic or paper-based: system-to-system, system-to-person, person-to-system, or person-to-person. Regardless of the information flow's type, an effective supply chain is hard to achieve without integrating customer demand to the production and manufacturing processes.
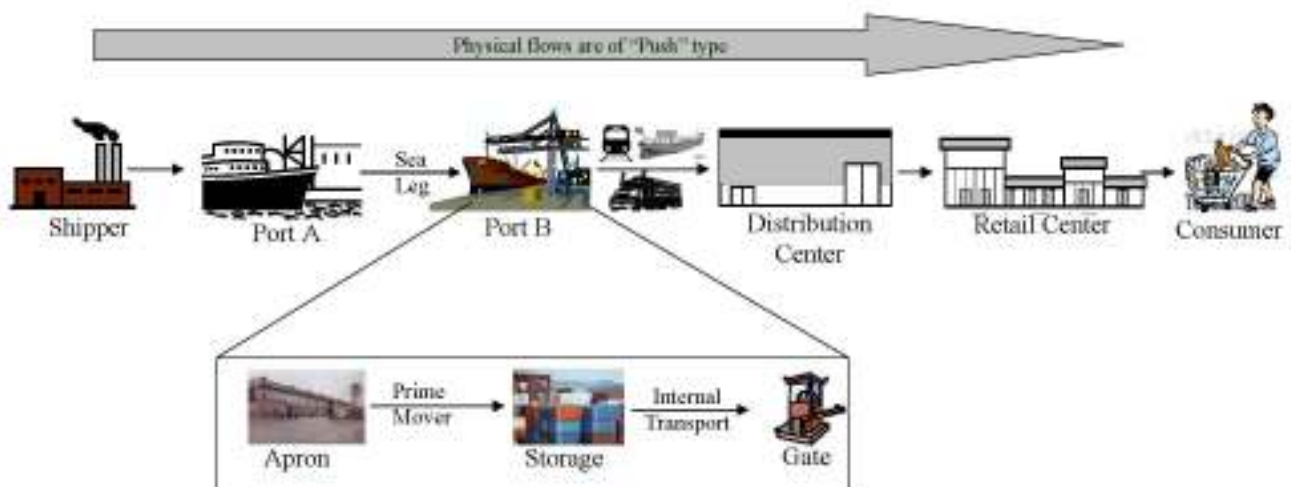
We have faced two major challenges. The biggest challenge has been developing a framework that is general, yet captures the logistics chain's richness. Another challenge is balancing academic rigor with the immediate needs of policymakers. We have developed a dialogue with officials from the Newark Mayor's office and the staff of New Jersey's Governor. At the city level, officials are seeking advice on how to better link Newark residents to port employment opportunities. At the state level, the Governor's staff is seeking advice on how to ensure the port's continued international competitiveness.

Figure 1: Maritime Supply Chain Management — Physical, Information, and Institutional Flows
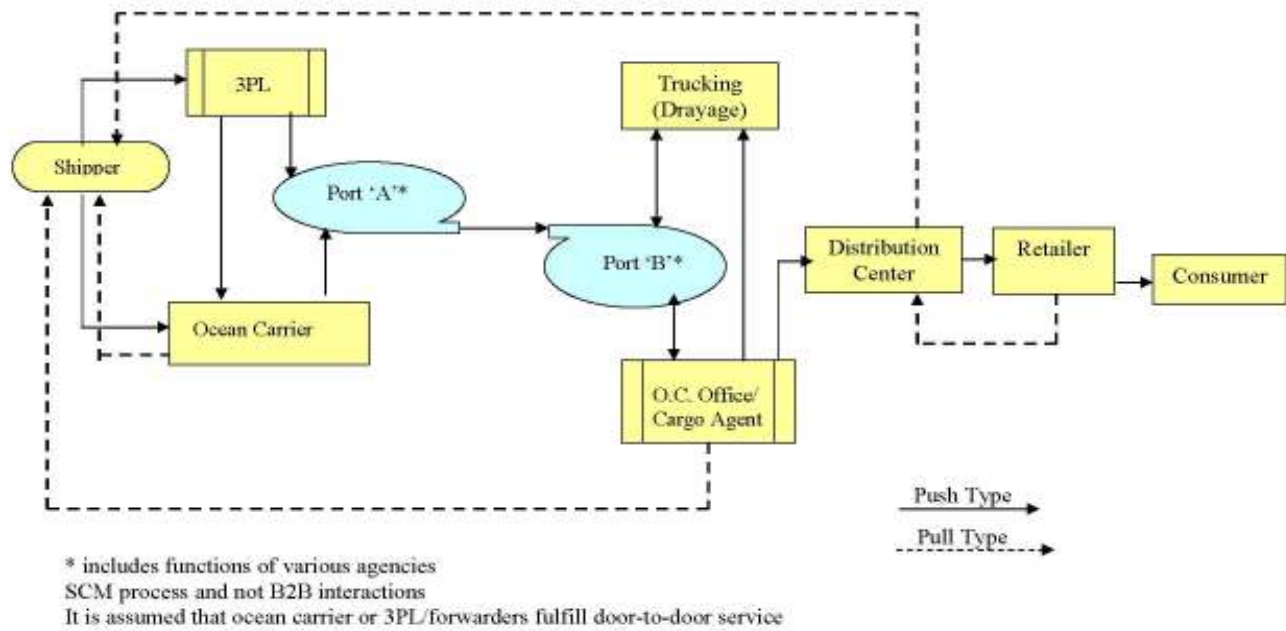
Physical Flow in Maritime Supply Chain:

Physical flows are of "Push" type

Shipper → Port 'A' → Sea Leg → Port 'B' → Rail/Barge/Truck → Distribution Center → Retail Center → Consumer

Terminal Apron → Prime Mover → Storage → Internal Transport → Gate

Figure 2: Physical Flow (Graphical Version):

Physical flows are of "Push" type

Shipper — Port A — Sea Leg — Port B — Distribution Center — Retail Center — Consumer
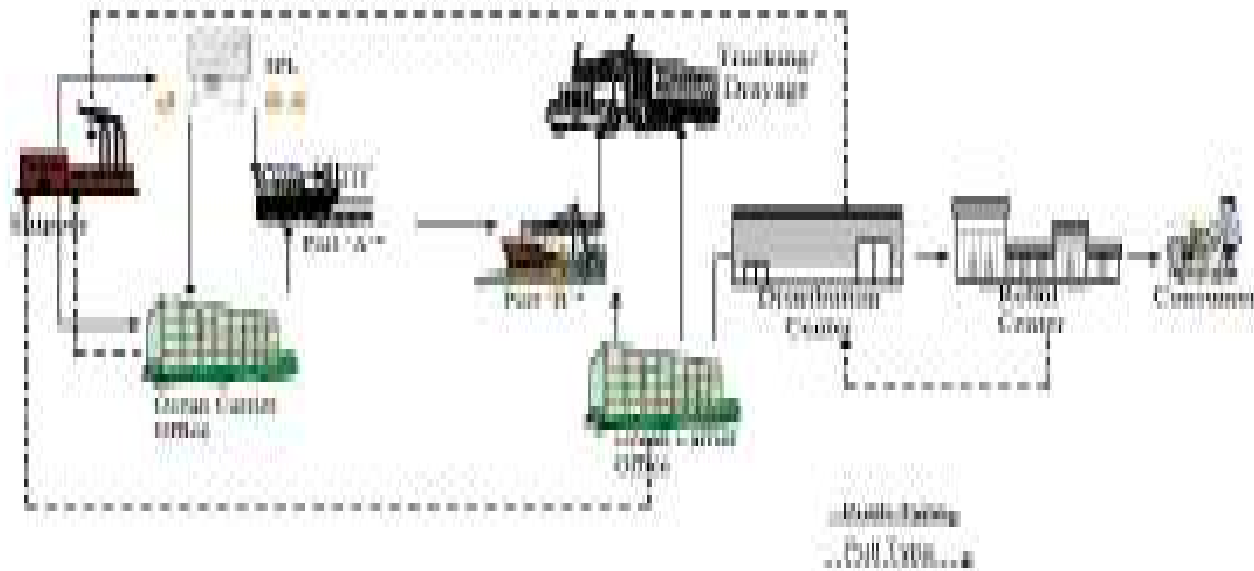
Apron — Prime Mover — Storage — Internal Transport — Gate

Figure 3: Information Flow in Maritime Supply Chain:
Relays information from the end consumer to the shipper; information precedes cargo.

* includes functions of various agencies
SCM process and not B2B interactions
It is assumed that ocean carrier or 3PL/forwarders fulfill door-to-door service

Figure 4: Information Flow (Graphical Version)

* includes functions of various agencies
SCM process and not B2B interactions
It is assumed that ocean carrier or 3PL/forwarders fulfill door-to-door service

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

Proposal #: 0753079
HSD Emphasis Area: DHB- Dynamics of parent-child interactions

Lead PI: Michael J. Rovine, Penn State University
Co-PIs: David A. Nembhard, Cynthia A. Stifter, Eric Loken, Peter C.M. Molenaar
Collaborators: Ingmar Visser, Katerina O. Sinclair, Kelly Yip, Beau Abar, Siwei Liu

Research Goals:

1. Extend and develop Hidden Markov Models for parent-infant interactions
2. Apply Association Rule Mining to parent-child interactions
3. Apply State-Space Modeling and Optimal Control techniques to infant emotional self-regulation

Thematic Areas:

1. Statistical modeling of multivariate time series
2. Parent-infant interactions
3. Infant self –regulation

Methodologies:

Hidden Markov Models; Association Rule Mining; Extended Kalman Filtering; LGQ Control

Recent Research Findings:
Association Rule Mining techniques based on time windows, durations, and time zones were applied to two mother-infant interaction data sets that resulted when a mother attempted to sooth a child distressed by either an inoculation or a mild arm restraint. These model free methods yielded profiles of material behaviors which are currently being compared to model-based methods such as Yule's Q and Contingency Table Models.

Hidden Markov Models were applied to the same data to derive patterns of successful and unsuccessful soothing on the part of the mother. States were defined by the proportion of particular behaviors utilized. The number of observation periods spent in each state represented a measure of individual differences. Comparisons between an aggregated model (common definition of states with individual differences in durations) are currently be compared to an individual differences model (individual differences in definitions of states and in durations).

Challenges and Opportunities:
These include: extending the Hidden Markov Model to include multiple covariates; testing ergodicity assumptions related to the agreement between aggregated and individual results; develop methods for clustering the individual results to create relatively homogeneous subgroups; improving the extended Kalman filtering algorithm.

Project Title: International Integrated Microdata Series

Proposal #: 0433654
HSD Emphasis Area: AOC, IDR

Lead PI: Steven Ruggles, University of Minnesota
Co-PIs: Dennis Ahlburg, Miriam King, Deborah Levison, Robert McCaa, Matthew Sobek

Collaborators: Over 70 international and national organizations are collaborating on this project; a list is available at http://international.ipums.org/international/international_partners.html.

Research Goals:

The Integrated Public Use Microdata Series project is compiling the world's largest public use census database at the University of Minnesota. With funding from NSF, the research team headed by Prof. Ruggles has so far processed 80 census datasets from 26 countries, containing the individual-level census responses of 202 million persons. The data span the period from 1960 to the present. In all, 73 countries representing over 60% of the world's population have signed agreements authorizing the IPUMS-International project to distribute their census data. Most of these data would be inaccessible to researchers without the efforts of the project.

The project does much more than just archive the data: it translates all documentation into English, fully documents comparability issues regarding census questions, and codes the data consistently across samples to facilitate international comparisons. An interactive data system lets users select only the variables and censuses that they need for their research. To help users manage the vast quantity of information, the web dissemination system filters the documentation to display only the censuses that users specify. The data and web system are available to qualified researchers anywhere in the world completely free of charge.

2006-2007 Progress:

During the past year, we greatly expanded the number of samples in the data series. In November 2006, we added 16 samples from 7 European and developing countries. Six months later, we added 17 more samples from Argentina, Hungary, Israel, Palestinian Territories, Portugal, and Rwanda. In addition, we have added thousands of additional variables to the data series. We have also made strides in the implementation of new metadata technology, improved the website functionality, added thousands of additional variables, and improved geographic coding of the data. We have stepped up our efforts at outreach and training, and the number of IPUMS-International researchers has more than doubled in the past year. Over 2,500 researchers have registered to use the database, making IPUMS-International one of the most widely-used new data sources in the social and behavioral sciences.

Project Title: Collaborative Research: A Study in the Dynamics of Human Behavior in Institutional Innovation and Learning

Proposal #: 0624177
HSD Emphasis Area: Agents of Change

Lead PI: Sassan Saatchi, UCLA Institute of the Environment, JPL/NASA
Co-PIs: S. Pincetl, Institute of the Environment, UCLA,; CO-PIs: ; D Pataki the Dept. of Earth System Science, School of Physical Sciences /Dept. of Ecology and Evolutionary Biology, School of Biological Sciences, University of California, Irvine; J.D. Saphores, Planning, Policy and Design, School of Social Ecology, University of California, Irvine

Research Goals:

1. Understanding how complex systems involving urban ecosystems, social organizations and individuals grow, learn, and change in reaction to climate change threats, local air pollution, or water scarcity.
2. Understanding how trees function in urban environments and the effects of afforestation in a Mediterranean climate.

Thematic Areas:

1. Urban Ecology.
2. Institutional learning.
3. Institutional change.

Methodologies:

Interviews and institutional analysis. Literature review, participant observation.
Tree sap flow monitoring.
Air pollution monitoring.
Satellite imaging.

Recent Research Findings:

1. Program interviewees have different interpretations of events.
2. Program implementation has change significantly since its inception.
3. Sap flow monitors detect no difference in street tree function between native planatus and non native planatus, and no significant difference in water use during hot dry spells and cooler weather implying great availability of water in the urban environment.

Challenges and Opportunities:

The program we are studying has changed in unanticipated ways, including its management. This has made our access to decision makers more difficult, and has also meant that the group implementing the program is not meeting on a regular basis. For us to present our results to the implementers we will have to create new communication venues that do not exist currently. It also means that decision making has become far more centralized, leading us to have to change our social science research methods to a more network based approach.

Finding sites to deploy our sensing equipment has also taken time, though we have – as of July – all the sites we can handle. Next growing season we will want to move the sensors to different locations and tree species to get more information.

Opportunities include being able to couple our research with another project that is looking at urban parks in the city, so we are going to be able to use the data gleaned from that project to complement our hedonic analysis of property values and greening. We also have been able to add researchers from the Pacific Southwest Research Station of the US Forest Service to our team, and this has brought greater monitoring capacity and local knowledge.

Project Title: HSD: Enhancing Control and Empowerment for the Elderly through Assistive Technology

                       Proposal #: SES-0527648
                       HSD Emphasis Area: Dynamics of Human Behavior

Lead PI's: Phebe Sessions, Smith College School for Social Work; Allen Hanson, University of Massachusetts, Amherst, Department of Computer Science

Co-PI's: Smith College: Julie Abramson, David Burton
                       UMass Computer Science: Roderick Grupen

Collaborators: Highland Valley Elder Services; Mitsubishi Electric Research Laboratory

Research Goals:

1. To obtain and use feedback from elders, family caregivers of elders, and professionals who serve elders about the potential benefits and challenges of some computer-based assistive technologies for elders;
2. To enable such feedback to affect the design of a reconfigurable experimental system, or "Sandbox system", based on existing component technologies;
3. To understand the influence of recursive feedback from exploratory focus groups, implementation of an integrated system of technologies in a senior center, and interdisciplinary collaboration between computer scientists and behavioral scientists on the design of technologies;
4. To assess the experience of elders with these technologies and their potential to contribute to enhanced functioning in elders;
5. To prepare current and future practitioners in computer science and social work for collaborative research efforts which are based on an appreciation of elders' perspectives and priorities, and which integrate an understanding of human behavior with an understanding of various applications of assistive technology.

Thematic Areas:

1. Use by elders of computer-based assistive technology;
2. Adaptation and reconfiguration of technologies that would make them more functional for use by elders;
3. Learning and training issues affecting elders' competence with these technologies;
4. Perceptions of capacity of technologies for enhancing quality of life, increasing sense of mastery and control, and prolonging ability to remain living at home;
5. Expectations of variations in utility for elders with different cognitive and physical capacities and impairments;
6. Cross-disciplinary collaboration and integration of perspectives from behavioral and computer sciences;
7. Issues in education for cross-disciplinary research and practice.

Methodologies:

Behavioral science: Design of research methods has been influenced by an Advisory Group of elder citizens committed to the project in collaboration with the Research Team. The first phase of research has used focus group methodology, a semi-structured interview design, audio recording of interviews and verbatim transcription of data, interview notes from computer science research team members, qualitative data analysis with three levels of thematic coding by three members of the research team, and independent review of data by four other members of the team. The second phase of research involves implementation of

designated "Sandbox" technologies, now named ASSIST, into a senior center with elder subjects. A mix of quantitative and qualitative measures will be employed.

Computer science: The computer science team provides reconfigurable experimental systems supporting field tests designed to provide empirical data that can be used as dynamic feedback to the behavioral science team. This development cycle links technological innovation with principled methods for testing and evaluating the technology, which in turn drives further development.

The computer science team has developed:
4. a distributed sensor network infrastructure embedded in a small smart space for research, development and testing;
5. the ASSIST user system according to interface recommendations for elderly users. The system is composed of the five applications described below, an operating interface for the system, as well an email system, an internet portal, and access to games for the elderly;
6. five technology demonstrations as part of ASSIST, including:
    f. a daily event planning calendar that reminds users of important events, such as appointments and medication times;
    g. an address book containing information about friends, relatives and caregivers;
    h. an easy to use videophone application for face-to-face communication with family and friends;
    i. a fall detection system based on a distributed sensor network within the home;
    j. a system for finding specific "lost" objects such as keys, cell phones, coffee cups, and remote controls.

The ASSIST system will now be implemented in the Amherst Senior Center.

Recent Research Findings:

Focus group findings: Elders, family caregivers, and professionals who serve elders reported that they perceive great potential for computerized, assistive technology and the particular applications being developed by the Computer Science team to empower elders and contribute to their well-being. At the same time, their enthusiasm is tempered by some significant ambivalence about the increasing importance of technology in every area of their lives. Though focus group participants are for the most part eager to see the technologies that were presented become available to them, they would like to see their concerns recognized and considered in choices about design and application of technology.

The positive responses to technologies, in descending order of significance, included:
7. Potential for improved family and other long distance relationships through enriched (video) communication;
8. Potential uses in health care through increased monitoring of health status and communication with health care providers through video communication;
9. Enhanced management of multiple tasks, access to information, and opportunities for leisure;
10. Increased communication about falls and other threats to safety;
11. Increased sense of competence and power when technical skills are mastered;
12. Reduced caregivers' burdens, enabling alternative means of monitoring safety.

The concerns about the technologies, in descending order of significance, included:

5. Compromised privacy;
6. Potential for augmenting negative family and other long distance interactions with increased visual information;
7. Compromised quality of health care, substituting preferred "face to face" interactions with health care providers with communication "through machines"; "high tech over high touch";
8. Potential for increasing social divisions, between those who are computer literate, have access to high speed communication capacity, and can afford to keep upgrading technical capability, and those who cannot; experience of shame, of being "left behind" without this capacity.

Suggestions to influence design and implementation of technologies for elders:
8. Attend to sensory needs of elders, including reduced visual and auditory abilities and adapt interface technology to a range of capacities;
9. Compare the proposed technologies to those already available and implement easiest to use and most cost effective;
10. Consider the relative advantages and disadvantages of RFID and computer-based technologies at different stages of elders' life cycle and with different degrees of impairment;
11. Recognize the tensions between privacy and safety and develop balanced solutions for a range of problems;
12. Attend to the learning styles of elders in training and need for relationally based, ongoing support to acquire and maintain these skills;
13. Increase social networking, by elders for elders, and cross-generationally, around these technologies;
14. Make these technologies available as quickly as possible!

Project Title: The Causes and Consequences of Urban Expansion

Proposal #: SES-0433278
HSD Emphasis Area: Agents of Change, Dynamics of Human Behavior

Lead PI: Stephen C. Sheppard, Williams College
Co-PIs: Shlomo Angel, New York University
Daniel Civco, University of Connecticut

Research Goals:

This project is designed to investigate the causes and the consequences of the expansion of urban land use around the world. The investigation proceeds through modeling, data collection and field research in a global sample of 120 cities stratified so as to represent the global urban population by size, geographic region, and level of economic development. This investigation is of central scientific and policy importance particularly for cities in developing countries, where the urbanized population is expected to double, from 2 billion to 4 billion in the next 30–35 years. With increasing incomes in the developing countries, the consumption of land by their cities will likely double in the next 25 to 30 years. These growth rates imply that in the developing world a new city with more than 1 million inhabitants must be built **every week** for the next four decades. Confronting and managing this massive expansion in an efficient, equitable, and sustainable manner is a serious global challenge. The research will identify the relative importance of the factors that contribute to urban expansion, the potential effectiveness of policies in altering the nature and form of urban expansion, and some of the consequences for economic and social welfare of the expansion.

Thematic Areas:

Agents of Change
Dynamics of Human Behavior
Spatial Social Science
Modeling human and social dynamics

Methodologies:

The research uses a combination of several methodologies, contributed by the variety of disciplinary approaches applied in the study. **Classification of remotely sensed satellite data** (Landsat Thematic Mapper) is used to measure the amount and extent of urban land cover at two points in time for each city in our sample. These results are then combined with population and economic data for specific jurisdictions using **geographic information systems** to measure the change in urban land cover in each jurisdiction, and to further identify whether these changes take place in areas that are already completely surrounded by urban land use or, alternatively, take place at the urban periphery. The resulting remotely sensed and geographically analyzed data are then augmented by data collected via **survey by field researchers** identified in or dispatched to each of the 120 cities in the sample. These data are then combined and used to **estimate the parameters of econometric models** to determine the relative contributions of policy, economic, physical and social factors towards urban expansion, and to test hypotheses about the qualitative impact of these factors.

Recent Research Findings:

The research has produced several findings which have been or will be presented at professional meetings or is forthcoming in publications.

1. The Impacts of Terrorism on Urban Form
By combining data collected in our research with data from the Memorial Institute for the Prevention of Terrorism's (MIPT) Terrorism Knowledge Base, we are able to precisely identify the intensity, target and type of terrorism in urban centers. This permits us to explore the impacts of terrorism with greater precision, and potentially to distinguish between different types of terrorist incidents. We find that an increase in the number of terrorist incidents is associated with reduced levels of urban expansion – holding population and income growth constant. That is, increasing terror is associated with delaying or foregoing urban development and increasing urban density. This in contrast to a variety of claims post-9/11 suggesting that terrorism would act as a dispersing force in cities. We employ an instrumental variables strategy using geographic and environmental structure as instruments to address the endogeneity of terrorist attacks.

(Presented at Brookings Institution, October 2006 and forthcoming in *Brookings-Wharton Papers on Urban Affairs,* 2007)

2. Measuring and Modeling Global Urban Expansion
This paper reports some results from analysis of data collected from our sample of 120 cities, chosen to be globally representative of the urban population in places having population of at least 100,000. Satellite images have been used to estimate total urban land use at two points in time for each city, and these data have been matched to population, income, and many other economic variables collected both from public sources and by field researchers in each city. We describe the process of measurement and summarize the patterns of expansion (both within the urban area and in the peri-urban zone), population density, and other information for the sample. We then present a series of estimates that examine the relationship between observed urban land use and other variables. From this we draw some preliminary lessons that can serve to usefully inform policy discussions concerning urban expansion. We conclude with a discussion of research problems whose solution may be available via enhanced data collection and global collaboration between scholars and policy makers.

(Presented at Bellagio Global Urban Summit, July 2007 and forthcoming in *Global Urbanization in the 21st Century*, University of Pennsylvania Press, 2008.)

3. Gender and Urban Form
An important characteristic shared by most modernizing economies is a change in the economic role of women. As the economy develops, women find increasing labor market opportunities open to them and they begin to take advantage of these opportunities. This increase in skilled labor, in turn, helps to encourage and drive the process of economic development and modernization. Urbanization and urban growth are also widely associated with economic development and modernization. There have been some studies that have considered the role of urban form in constraining or shaping the economic opportunities available to women. Conversely, however, there appear to have been no studies that considered the impact of changing economic roles for women on emerging urban form. This paper provides a first evaluation of this important issue. We find that increasing the labor force participation rate for women is associated generally with a more compact urban form. The presumed causal mechanism is that households with working women face increased transportation costs for commuting from home to workplace, along with potential demands

associated with child care. This leads to an increased willingness to substitute locations close to the workplace and to schools in exchange for reduced private land consumption. This would lead to more compact urban form.

(To be presented October 2007 at the Workshop on Residential Sprawl and Segregation at the *Institut National de la Recherche Agronomique*, Dijon, France).

4. Infill versus Outspill: the microstructure of urban expansion

The continuing pace of urbanization around the world has generated an ongoing process of expanding urban land use. Several factors contribute to the growth in urban land use: for example increasing population and income, falling transportation costs, and changing values of agricultural land surrounding the city. In this paper we investigate how the local structure of urban expansion is affected by these factors. Do these forces encourage increasing urban land use at the periphery, or encourage infill of vacant areas within the city, or both? It is difficult to empirically test our understanding of these processes using data from a single city or even a single country because the data do not offer sufficient independent variation in the relevant factors to reliably distinguish their separate impacts. This paper makes use the data collected from our global sample of cities with land use data classified from satellite imagery in all cities. The analysis distinguishes increasing urban land use at the periphery from increasing urban land use through infill of built up areas, and examines the extent to which this process differs around the world. There are tremendous variations in the extent to which new urban expansion is taking place at the periphery – which we call "outspill" and define as on open land that is not surrounded by other developed land, or on land that is surrounded by other developed land and is generally referred to as "infill." We estimate the extent to which population, income, transportation costs, and other factors contribute to infill and to outspill.

(Presented at the meetings of the North American section of the Regional Science Association in Toronto, November 2006.)

Data collected, presentation slides, and working papers are available from the project web site: http://www.williams.edu/Economics/UrbanGrowth/HomePage.htm

Challenges and Opportunities:

The research faces several challenges as we move towards completion, but also several opportunities for further development and continuation.

Challenge 1: Field research has been essentially completed in 117 cities. We face some challenges in coordinating, motivating and completing the data collection in the final 3.

Challenge 2: Taking advantage of some of the opportunities (discussed below) would be greatly facilitated if we could maintain contact with and hope for assistance from our global network of field researchers. For perhaps 60 to 90 cities in our sample, this will be possible. For the remaining 30 to 60 cities we would need to identify new field researchers to assist in any follow on research.

Challenge 3: Maintaining collaboration of our research team and generation of research output that speaks to (and generates rewards for) researchers from three different disciplines is a serious challenge.

Opportunity: There is considerable interest from both an international policy community, foundations, and scholars in the data we have collected and the results we are obtaining. The data are essentially unique (although others have collected similar – even more detailed – data for specific regions or the cities of selected countries). We look forward to developing collaborative relationships for further analysis of our data and for extending the research to consider other important policy problems.

Project Title: Collaborative Proposal: Self-Control in the Life Course

Proposal #: 0624305
HSD Emphasis Area: Dynamics of human behavior

Lead PI: Yuichi Shoda, University of Washington
Co-PIs: Ozlem Ayduk, University of California, Berkeley; B. J. Casey, Sackler Institute; John Jonides, University of Michigan; Walter Mischel, Columbia University.
Collaborators: Ethan Kross, Columbia University; Ed Smith, Columbia University; Vivian Zayas, Cornell University

Research Goals:

Longitudinal studies from our laboratory have shown a strong relationship between delaying gratification early in childhood and various behavioral consequences later in life. Preschool children's ability to delay immediate gratification for the sake of more desirable but delayed outcomes has been shown to predict such long-term outcomes as academic achievement in adolescence and cocaine use, as well as aggression, and body-mass index in adulthood. These studies have also identified distinct trajectories of stability and change. This project asks: What might underlie these patterns of stability and change? What cognitive and neural processes are associated with each type of trajectory?

Specifically, our goals are as follows:

Goal 1. To test neural correlates of life-long individual differences in self-control. We hypothesize that individuals with life trajectories characterized by consistently low versus consistently high levels of self-control throughout development will differ predictably in their brain connectivity and function. Specifically, we predict that those with consistently low levels of self-control in their trajectory will be characterized by less activity and less refined connectivity (e.g., less myelination and orientation regularity) in the frontostriatal and frontoparietal regions during performance of cognitive control tasks. We will test this prediction by performing diffusion tensor imaging (DTI) MRI, and functional MRI.

Goal 2. To test the hypothesized links between measures of cognitive control and life trajectories of self-control. We will test the hypothesis that trajectories of self-control over the life course are systematically related to individual differences in cognitive control in perceptual, working memory, and response processing. Specifically, we predict that those with a consistently low self-control trajectory will be characterized by significantly less effective behavioral cognitive control mechanisms at each stage of processing. Those with a declining trajectory and those with an improving trajectory are characterized by distinct configurations of deficits in perceptual, working memory, and/or response production processes.

Secondary Goals. The project has three secondary goals that, while admittedly exploratory, seem worth pursuing given the unique opportunities provided by the present longitudinal sample. First, we shall examine the role of basic cognitive-control mechanisms as a potential buffer against the effect of stressful life events (e.g., divorce, job loss, illness) as well as chronic dispositional vulnerabilities (e.g., anxious over-sensitivity to interpersonal rejection) on individuals' social-cognitive functioning over the life course. Second, many participants in the ongoing, long-term longitudinal study now have young children, making it possible to examine the potential transmission of their self-control ability to their children. Further, some of the cognitive tasks that we shall use to study cognitive control mechanisms also are appropriate both for adults and young children, allowing us to examine inter-generational continuity in cognitive control on these

measures as well. Third, we plan to explore genetic bases of delay of gratification ability and cognitive control, both for adult participants and their children. This goal is motivated by recent gene association studies that suggest that polymorphisms affecting dopamine pathways may underlie brain anatomical and brain activity correlates of cognitive control. Given currently available knowledge and methods, this component may not yield conclusive findings now, but it is a low-cost, exploratory step for obtaining unique data that ultimately may have considerable utility.

Thematic Areas:

1. Ability to delay gratification in order to obtain more desirable rewards
2. Behavioral assessment of processes underlying cognitive control; control of attention, working memory, and prepotent responses
3. Function and connectivity structure of frontostriatal and frontoparietal regions during performance of cognitive control tasks
4. Polymorphisms in the genes involved in the dopamine pathway

Methodologies:

1. Reaction time and error analysis of performance on cognitive tasks
2. Life outcome data
3. Diffusion tensor imaging (DTI) MRI, and functional MRI of frontostriatal and frontoparietal regions of the brain
4. PCR and TaqMan-based genotyping of genes involved in the dopamine pathway, specifically MAOA promoter VNTR, COMT Val-Met SNP, DAT1 3'UTR VNTR, 5HTT LPR , and BDNF Val-Met SNPDAT1.

Recent Research Findings:

As a pilot study for the current project we examined the relationship between children's ability to delay gratification at age 4 and their performance, four decades later, on a task assessing impulsivity in planning. Of particular interest was performance on the Dog-Cat-Mouse (DCM) planning game that consists of three animals, a dog, a cat and a mouse, arranged on an undirected network of four vertices. A final configuration of animals is marked by the position of food items (a bone, a fish, and a piece of cheese). The goal of the game is to take the animals and rearrange them along a lattice of interconnected nodes to the vertices containing their respective food items without violating several constraints. This game was designed to present players with a temptation to engage in a short-sighted strategy called hill-climbing. More specifically, the game opens with a configuration that tempts players into making erroneous moves because these moves change the current configuration to superficially resemble the goal configuration. When players opt for these moves, they are launched down a less than optimum route towards solving the puzzle. We thought that resistance to hill-climbing on the DCM and ability to delay gratification may recruit common regulatory mechanisms or skills as both involve being able to tolerate short-term frustration, and take into account long-term goals. Preliminary findings support this expectation in both the Bing adults and in their children. Therefore, this task is now being considered for inclusion in the fMRI component of the project.

An exploratory goal of the current project was to examine genetic correlates of delay ability. Towards this end, a small group of Bing participants (approximately 40 participants residing in or around CA) and their children (between the ages of 4 and 11) completed various cognitive control tasks and provided cheek

samples for DNA analyses. This pilot study was primarily ran under the Hellman Family Faculty Fund awarded to Dr. Ayduk at UC-Berkeley as described in our original application. However, the analysis of the cheek cells at the University of Washington is being supported by the present grant. Cheek cells were collected by a soft cotton swab (similar to a Q-tip) previously packaged in a sealed container, by rubbing it on the inside of the cheek of the participants. The DNA samples contained in these swabs are being extracted and genotyped at the Functional Genomics Laboratory at the University of Washington.

Challenges and Opportunities:

To achieve the project objectives we must carefully select, develop, and refine measures of cognitive control that can be used to collect performance data from our participants, now residing throughout the U.S. and abroad. Thus far, we have focused our efforts on selecting an appropriate battery of measures to be administered to participants. In addition, we have been developing web-based versions of these measures that will aid in the data collection process.

Project Title: Flows of Information and Influence in Social Networks

       Proposal #: BCS-0527249
       HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Eliot R. Smith, Indiana University, Bloomington
Co-PIs: Robert Goldstone, Luis Rocha, Indiana University, Bloomington
Collaborators: Elizabeth C. Collins, Winter A. Mason, Frederica R. Conrey, John K. Kruschke, Peter M. Todd

Research Goals:

This project investigates flows of information and influence in social networks, using multi-agent modeling and studies with human participants. There are two sub-projects.

Social Influence: Social influence occurs when one person's attitude or behavior has an impact on the attitude or behavior of a second person. For example, if person B sees A purchase a particular product or brand, B may be influenced to make a similar purchase. The goal of this project is to explore the outcomes of influence examined over time when each individual is both a source and recipient of influence, using up-to-date theoretical models of the details of social networks and social influence processes.

Social flows of information about people: It is estimated that as much as 50% of the information that we exchange in daily conversation is information about other people. Thus, social information can strongly affect our impressions of other people, and our behaviors toward them. This project aims to understand when and how people exchange information about others, and the conditions under which the social flow of information allows individuals to make better decisions about who to cooperate or compete with, etc.

As an important special case, people often socially transmit information about potential dates or mates. Existing theory of mate search 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.

Thematic Areas:

When people draw on information from their individual experiences and use it to make a decision or judgment, some individuals may obtain biased or inadequate samples of information. Pooling informational resources may help the group as a whole arrive at a better decision. This process is dynamic, for each individual's decisions in turn provide additional information to the network. Our research considers the relationships of variables at several levels, from individual agents' decision rules, to inter-agent interactions, to the overall structures of social networks, as individuals share information and influence each others' attitudes and behaviors, or assess each other as potential cooperators or mates.

Methodologies:

Our research uses laboratory experimentation (the typical research methods of social and cognitive psychology) as well as survey questionnaires and the collection of data from the web (e.g., in our Facebook study). We also apply agent-based modeling techniques. We have written a paper introducing and

advocating the use of agent-based modeling (ABM) techniques for social psychological issues.
Smith, E. R., & Conrey, F. R. (2007). Agent-based modeling: A new approach for theory-building in social psychology. *Personality and Social Psychology Review, 11*, 87-104.

Recent Research Findings:

In the Social Influence project: We have published a review of models of social influence drawn from disciplines ranging from sociology and economics to cognitive science and physics. We will build on this review to construct models incorporating the detailed, micro-level understanding of influence processes derived from laboratory studies, but contextualized in ways that recognize how multidirectional, dynamic influences are situated in people's social networks and relationships.
 Mason, W. A., Conrey, F. R., & Smith, E. R. (2007). Situating social influence processes: Dynamic, multidirectional flows of influence within social networks. *Personality and Social Psychology Review, 11,* 279-300.

We have also conducted three studies examining potential social influence from implicit attitudes, which are automatic evaluations that occur spontaneously and are difficult or impossible to control.
Mason, W. A. (2007). *Implicit social influence*. Unpublished doctoral dissertation, Indiana University, Bloomington.

In the Social Flows of Information about People project: We have drafted a paper arguing that social perceivers, instead of passively receiving pre-packaged information, are active in eliciting and creating the information on which they base their impressions and judgments. We describe a theoretical model of processes of active social cognition, and present results of a multi-agent simulation of selected processes. Our model assumes that perceivers can actively decide whether to obtain information about a social target; that they elicit as well as interpret impression-relevant information; that social targets as well as perceivers are active (for example, in strategically shaping the impressions they create); that perceivers can solicit information from third-party sources who are linked to perceivers and targets in social networks; and that perceivers may actively attempt to correct biases stemming from impression formation processes.
Smith, E. R., & Collins, E. C. (2007). *Active social cognition.* Unpublished manuscript, Indiana University, Bloomington.

With Luis Rocha, we are conducting a study of users of the Facebook social networking website, examining both friendship networks and dating patterns in a group of college students.

Challenges and Opportunities:

The studies by Winter Mason on social influence from implicit attitudes (noted above) produced unexpected results. In the first study, the sources' implicit attitudes led to a reverse effect on the recipients' explicit attitudes. In the second and third study the manipulation of the sources' attitudes did not work as expected, and there was no influence of the sources' implicit attitudes on the recipient. Theory and some experimental results do suggest that a person's implicit attitudes can influence another person's attitudes, but the conditions in which implicit attitudes lead to influence deserve further research.

The Facebook study noted above suffered about a 6-month delay due to IRB concerns about protection of human subjects, and our planned design had to be significantly limited in scope. In our opinion, under Federal regulations, the study should have been exempt from review (as it involved the collection of publicly available data without retention of individually identifying information), and should not have been delayed or limited.

Opportunity: Overall, this work promises to make major conceptual contributions to the field of social psychology by showing how to embed its theories about micro-level processes of social influence, person perception, etc. within the context of social networks over an extended time course.

Project Title: Niches and Networks: Studying the Co-evolution of Voluntary Groups and Social Networks

Proposal #: BCS 0527671
HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: Lynn Smith-Lovin, Duke University
Co-PIs: Miller McPherson, Alexander Rosenberg, Stephen Teitsworth
Collaborators: Michael Reynolds, National Opinion Research Center

Research Goals:

1. This project is the first test with national data of the dynamic hypotheses about networks and groups from McPherson's evolutionary ecological theory of affiliation
2. The analyses significantly expands that theory by adding features of bottom-up self-organization of social systems and of the relationship of internal complexity to environmental features.
3. The data set collected under the grant will provide panel and life history calendar on network, voluntary association and other major life activities (work, family, geographic moves, etc.) for a sample of individuals originally studied in the 2004 General Social Survey. Another data set will represent a national sample of voluntary groups, generated through a hypernetwork sample of the individuals' affiliation and measured through interviews with both members and leaders.

Methodologies:

The cornerstone of this project is the collection of over time data on the co-evolution of personal networks and voluntary association memberships, through a sample survey of individuals from the non-institutionalized US adult population. Until two weeks ago, only cross-sectional data (from the first wave of data collection—the 2004 General Social Survey—were available. This fact has limited our modeling of social dynamics to equilibrium models. However, when we can use the new life history calendar data to create an event history data set, we will be able to explicitly model the dynamics of movement in and out of relationships and memberships, based on contextual and timing variables.

In the new data, we have re-interviews (panel and life history calendar information) on 851 respondents, for a response rate of 58 percent. We have interviews with 221 of the 341 voluntary association leaders for whom information was provided by respondents in the 2004 General Social Survey, for a response rate of 66 percent. Combining the leader interviews with member reports of small groups that had no formal leaders, we have reports on 661 voluntary organizations (with measures from both leaders and the respondent member for 149 groups).

Recent Research Findings:

The data from the re-interview and the hypernetwork sample have just arrived from NORC (our subcontractor). Current results are from the first wave of data (publicly released as the 2004 General Social Survey Networks and Voluntary Association modules.

In a first paper, published in the June 2006 American Sociological Review, we asked: Have the core discussion networks of Americans changed in the last two decades? In 1985, the General Social Survey

collected the first nationally representative data on the confidants with whom Americans discuss matters that are important to them. In the 2004 General Social Survey, we replicated those questions to assess social change in core network structures. Discussion networks are strikingly smaller in 2004 than in 1985, with nearly triple the number of people saying that there is no one with whom they discuss important matters. The mean network size drops roughly a third (one confidant), from 2.94 in 1985 to 2.08 in 2004. The modal respondent now reports having no one with whom he or she discusses important matters; the modal response in 1985 was three confidants. Both kin and non-kin confidants were lost in the past two decades, but the greater shrinkage of non-kin ties leads to a core confidant network more centered on spouses and parents, with fewer contacts through voluntary associations and neighborhoods. Other structural features of personal discussion networks remain relatively stable. Most people have densely interconnected confidants who are like them in most respects. However, some changes reflect the changing demographics of the U.S. population. Educational heterogeneity of core networks has decreased, while racial heterogeneity of ties has increased. While the data may overestimate the number of social isolates, the declining discussion network size is an important social change in American's interpersonal environments.

In a new series of papers, we explore the structure of the networks. Here, we ask whether the strengths of five key social dimensions– sex, race, religious preference, age and education– have changed over the past two decades in these close confidant networks. Racial homophily, the most salient dimension among these five, has remained relatively constant over the two decades. However, the social distances between racial groups have shifted somewhat. Hispanics have become more similar to African Americans in their patterns of out-group confidants, while other-race respondents (mostly Asians) have become more similar to Anglo whites. Gender homophily has declined substantially, especially among kin, as both men and women embrace spouses as confidants. In-group association has increased by age and, among non-kin, by education. Religious homophily has increased for Protestants, Catholics and Jews, but decreased for those who report no religious preference or are members of other faiths.

Challenges and Opportunities:

We are currently negotiating with NORC to obtain detailed information on the neighborhood context of the original respondents. Since Census tracts level data would allow respondents to be identified in many cases, we are working out extensive procedural protections through the IRB at NORC and Duke to assure that the project's assurances to the research participants will be honored.

After these issues are resolved, we will have a remarkable data set for public use and for the analysis of our original theoretical questions. We will have dynamic data on networks and voluntary associations on a national scale, with extensive context information about the social situation surrounding the respondent. In addition, we will have the first nationally representative sample of voluntary groups which does not depend on a population list (which necessarily over-represents large, formal groups).

Project Title: Epistemology and Indexicality in Navajo, Tibetan and English

Proposal #: BCS0527509
HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: Margaret Speas, University of Massachusetts
Co-PIs: Jill de Villiers, Smith College, Jay Garfield, Smith College, Tom Roeper, University of Massachusetts, Evangeline Parsons-Yazzie, Northern Arizona University
Collaborators: Tsering Topgyal and Namgyal Norbu, Central Institute of Higher Tibetan Studies, Edward Garrett, Eastern Michigan University, Leah Bateman, Catherine Burgin, Chris Davis, Tanya Heizmann, Liane Jeschull, Andrew MacKenzie, Keir Moulton, Alison O☐Connor, Barbara Pearson, Helen Stickney, Anna Verbuk, Elyse Waite, Anna White-Nockleby, Youri Zabbal.

Research Goals:

1. Develop a synthesis between linguistic field work and language acquisition studies within which we explore the relationship between human cognition about knowledge and belief and the grammar that language makes available for communicating about beliefs and mental processes.
2. Establish the path of development of children's knowledge of language expressing mental processes and their understanding of false beliefs and other minds.
3. Collect and analyze data from languages that differ widely from English in the way that they encode the link between mental processes and human behavior.
4. Develop materials that a) allow the extension of experiments designed initially for children to be used as a basis for fieldwork with adults, ideally in a way that makes comparison possible and b) make use of new data about adult grammar to improve pedagogy for endangered languages.

Thematic Areas:

Dynamics of Human Behavior

Methodologies:

1. Experiments on child language acquisition in English and Tibetan.
2. Field work techniques on Navajo and Tibetan using techniques that allow people to make more subtle judgments than in other studies, that in turn lead to improved pedagogical materials.
3. Theoretical research in syntax and semantics.

Recent Research Findings:

1. Syntax and semantics of evidential morphemes
In Tibetan, all sentences that convey information must include a morpheme indicating how the speaker came to know the information.

Tibetan a. nga 'bras za-gi-**yod**   'I eat rice' (I just know from personal experience)
         b. kho 'bras za-gi-**'dug**   'He's eating rice' (I see/saw him)
         c. kho 'bras za-gi-**yod.red**   'He (must be) eating rice' (I infer)(Garrett 2001:211)

We have been studying the differences and parallels between the evidential morphemes and the English expressions used to translate them, such as "must", "looks like" etc.We have discovered that there are systematic differences in the way that evidentials and English modals (e.g. must) behave. We have found interesting ways that evidentials interact with other parts of the grammar such as tense.

2. Child acquisition of Tibetan Evidentials
We have discovered that the child's mastery of evidentials is linked to their capacity for inference and not specifically to their ability to understand false beliefs of others. We have begun to establish an order of acquisition of the different evidential morphemes. The difficulties Tibetan children have with evidentials resemble the difficulties English-speaking children have with modals (must, might)

3. Deixis and complex sentences
Our experiments on the acquisition of pronouns and spatial terms in English suggest that English speaking children have difficulty integrating point of view across several of these terms, and might go through a stage where their grammar resembles the grammar of Navajo.

4. Application of results to field work and language pedagogy
The Navajo textbook co-authored by PIs Speas and Parsons-Yazzie is in press, out in October.

Challenges and Opportunities:

1. The challenge is to organize coordinated experimentation across different languages and cultures. There are significant hurdles and learning opportunities.
2. An additional challenge is to make the right connections between the style of fieldwork investigation and the controlled circumstances of experimentation.
3. Finally, we need to understand the special pragmatics of each language and culture to allow us to ask the right questions and elicit informative answers.

Project Title: From Where to What: The Dynamics of Spatial Cognition

Proposal #: 0527698
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: John P. Spencer, University of Iowa
Co-PIs: Gregor Schöner, Ruhr University, Bochum, Germany; Steve Luck, University of Calivornia, Davis

Research Goals:
1. To explain how the brain integrates 'what' and 'where' information to form a unified map of objects in a local workspace
2. To develop a theoretical framework for understanding how visuo-spatial cognition evolves in real time and over learning in a task-specifc manner
3. To empirically test our new theory using behavioral experiments with adults

Thematic Areas:
1. Spatial Cognition
2. Working Memory
3. Theoretical Neuroscience

Methodologies:
We combine behavioral research with adult participants with dynamical systems/neural network modeling.

Recent Research Findings:
We have shown a counterintuitive finding: people are actually BETTER at remembering the details of similar objects. Most theories predict that the more similar objects are, the more they will interfere with one another in memory.
We have also shown that the representations of similar objects can "drift" in memory such that people exaggerate the difference between the two objects after a short delay.
Finally, we have shown that spatial working memory is attracted toward the focus of attention in simple spatial cueing tasks.

Challenges and Opportunities:
We have implemented a new neural network model that is quite complex. Thus, we need more computational power to make simulations of this model more reasonable. The bottleneck appears to be the speed of the convolutions in the equations we are simulating.
Interpersonally, the main challenge has been the distance. Dr. Steve Luck moved to UC Davis this past year. Thus, we have been communicating via video conference. Our collaborative work was greatly facilitated by Dr. Luck's visit to Iowa this past summer.
In addition, Dr. Schöner's robotics group and my lab at Iowa have started having joint lab meetings every other week via video conference. We expect this will be a huge boost to our collaboration.

Finally, a new opportunity recently developed to open up a collaboration with colleagues at the Spatial Intelligence and Learning Center (SILC) through supplemental funds via the SLC program. We are excited about potentially pursuing the proposed collaborative project.

Project Title: The Living Environment and Human Health Over the Millennia

                              Proposal #: 0527658 & 0527494

                              HSD Emphasis Area: AOC

Lead PI: Richard Steckel, Ohio State University

Collaborators: Larsen, Clark, Ohio State University; Thompson, Lonnie, Ohio State University; Merry, Carolyn, Ohio State University; Sciulli, Paul, Ohio State University; Phillip Walker, University of California, Santa Barbara

Research Goals:
This project creates three large databases, which will allow researchers to reinterpret the history of human health in Europe from the late Paleolithic era to the early twentieth century. During this period, human health and welfare were transformed enormously by the transition from foraging to farming, the rise of cities and complex forms of social and political organization, European colonization, and industrialization. With a trans-Atlantic network of collaborators, we will undertake large-scale comparative studies of the causes and health consequences of these and other dramatic changes in arrangements for work, living, and human interaction.

Thematic Areas:
Agents of change

Methodologies:
We are making extensive use of geographic information system data bases to explore correlations between local environmental conditions and the health status of local populations. We have also developed and tested a data collection protocol that allows direct comparisons of observations made by different observers. We are also developing an inter-observer error quiz to quantify the comparability of data collected through this project with that of an earlier project that focused on skeletal collections from the Western Hemisphere.

The project involves over 20 lead investigators and their students in institutions throughout Europe and relies heavily on laptop-based data collection software we have developed for efficient data collection. Data are transmitted to a server at Ohio State University for cleaning and analysis. Our website operates as the nerve and communications center for the project. It is password protected and is the vehicle for uploading and analyzing skeletal data as well as collecting and distributing information about particular sites. From this webpage, we also operate an interobserver error quiz, provide the codebook, and operate a chat room that allows project participants to exchange and post information.

Recent Research Findings:
Health-related data have been collected on approximately 5,000 skeletons over the past year. Our research is currently focused on sites dating to the Medieval period.

Challenges and Opportunities:
We have identified over 150,000 skeletons from more than 500 sites that could potentially be included in our study. We are currently developing a sampling strategy will allow us to exploit the scientific potential of this massive bioculturally diverse sample.

Project Title: Collaborative Research for Data-Driven Analysis of Interdisciplinary Research Teams
Proposal #: 0623119
HSD Emphasis Area: Dynamics of Human Behavior

Lead PIs: Debra Street, University at Buffalo, State University of New York and Lisa Freeman, Kansas State University

Co-PIs: Sharmistha Bagchi-Sen, University at Buffalo, State University of New York; Michael Farrell, University at Buffalo, State University of New York; Justin Kastner, Kansas State University; Abbey Nutsch, Kansas State University

Research Goals:

1. to extend theoretical models of group development at different stages in their 'life courses' (teams in formation, established teams and teams in decline) and varying group composition
2. to develop standardized data instruments to study social dynamics of IDR teams
3. to inculcate interdisciplinary research (IDR) for students working on the project

Thematic Areas:

1. Social/cultural dynamics: internal social roles, norms, practices and trust, that is, a socially dynamic team culture, are necessary for IDR teams to become established and to thrive.
2. Organizational dynamics: evolution of social networks, as collaborations attempt to form (some never do) and mature, social expectations, processes, and roles of members are transformed as the organizational life course of IDR teams progress (regress) over time.

Methodologies:

Subjects are academic researchers at University at Buffalo, SUNY (UB) and Kansas State University (K-State) who previously or currently collaborate with at least two researchers outside their discipline to seek research funding support and/or to publish research findings as a product of IDR collaboration. IDR researchers were recruited through outreach workshops (K-State in fall 2006, UB in spring 2007) and lists generated using advice from knowledgeable faculty colleagues and administrators (e.g., the Office of the Vice-President for Research). We included (i) scientists who had tried IDR but the team failed to gel, (ii) researchers who are members of new or established IDR teams and (iii) those who are members of IDR teams that are winding down or inactive. We also began intensive ethnographic research on an 'IDR group in formation' at KState (summer 2007) from its inception and are in the process of staging a UB counterpart.

We are using multiple Delphi rounds of online survey data collection (Phase 1 open-ended exploratory survey complete, 33.5 percent response rate at K-State, 35 percent response rate at UB) to develop and refine standardized data collection instruments, intensive interviews with IDR investigators, and ethnographic observation of IDR teams in various organizational life course stages.

Recent Research Findings:

Open-ended responses from the Phase 1 online survey have been open coded using grounded theory techniques for the analysis of qualitative data. Among the social, organizational, and cultural concepts central to this exploratory work include key social relations, structural elements of the team social milieu

and social dynamics relating to power structures, norms of group behavior, and role expectations. The demographic characteristics of IDR teams (size and composition in terms of rank, gender, disciplinary background among others), the power structures implied by group dynamics and institutional relations, and the differences among teams in formation versus established or dying (active and inactive) teams were topics identified as important by respondents to the first round survey.

Some subjects defined the key to successful IDR teams in terms of process and the quality of social interactions, including mutual respect, equivalent efforts, trust, and satisfaction. Other researchers emphasized products, including funding, conference papers and publications, and scientific breakthroughs/new discoveries impossible within a single discipline. Themes relating to social dynamics of successful teams included mutual respect, open-mindedness, liking/compatibility, perseverance/commitment, shared decision-making, sharing (data/credit), enlightened leadership, choosing to work together, shared humor, good communication, and passion. Themes relating to the social dynamics that undermine team success include overbearing individuals, data/credit hogs, arrogance/large egos, lack of respect based on status/disciplines, teams composed 'top down,' communications breakdown, insufficient leadership, selfishness/greed, competition, and suppression of dissent. In terms of IDR team social dynamics that affect individuals positively, themes emerging from analysis of subject responses include opportunities for networking, generosity of individuals teaching about other disciplines, respect and encouragement, others valuing contribution, colleagues who share work and credit, mentorship and friendship. Aspects of IDR team social dynamics affecting individuals negatively include perceived status hierarchies (disciplines/ranks), competitiveness, lack of clear expectations, bullying, slackers, fear and hostility between ranks/disciplines, turf wars, critics who don't contribute, domineering individuals and weak leaders. These and other dimensions of social dynamics are being refined and explicated for use in a standardized closed-ended survey in Phase 2 (beginning 11/07).

Rolling recruitment for Phase 2 (accepting all eligible volunteers) will generate the highest possible participation rates for the next online survey asking respondents to rank order the importance of key conceptual categories tapping the social, cultural and organizational dynamics of IDR teams. Continuing expansion and refinement of lists of eligible researchers will maximize variation on key subject attributes (e.g., rank, tenure, gender). Beyond demographic diversity, future recruitment will also focus on maximizing the variation among "types" and "roles" of individual IDR team members (leadership, alliances, discipline, roles on projects). While the Phase 2 online survey is in the field, UB researchers will conduct interviews at UB and travel to KState for intensive interviews with IDR scientists there.

With regard to Research Goal 3, two Graduate Assistants have been hired. They are engaged with both survey data collection as well as observational research of the 'IDR group in formation,' and have pursued other interdisciplinary activities including preparing new curriculum materials for the graduate course Multidisciplinary Thought and Presentation (K-State).

Challenges and Opportunities:

Challenges: Persuading busy academic researchers to respond to online surveys and identifying sufficient researchers for the sample who have attempted to launch IDR teams but failed to do so. Opportunities: On both campuses, researchers have been able to identify and will have opportunities to observe 'new' IDR teams in formation, using ethnographic techniques for data collection. Observation of new team has begun at K-State (08/07) and will begin in Buffalo (10/07). In response to the recruitment workshops held at Kansas State and University at Buffalo, and their exposure to the first round of data collection, a number of researchers have volunteered for in-depth interviews, which will be started in fall 2007.

Project Title: Safeguarding the Future against HIV/AIDS: Change Agents in Malawi's Education Sector

       Proposal No. SES-0623100
       HSD Emphasis Area: Agents of Change

Lead PI(s):   Dr. Linda Sussman and Dr. Chloe O'Gara
Lead Organization: Save the Children Federation, Inc.
Collaborators: Jodie Fonseca, Lester Namathaka and Frances Mabeti/ Save the Children/US; Other Participating Institution: The University of Malawi, Centre for Education Research and Training, Ms. Elizabeth Meke

Research Objectives:

Using the Positive Deviance Inquiry approach, the research will:

- Identify positive deviant individuals and groups in the education sector who are proactively adapting to the HIV/AIDS epidemic and explore the specific characteristics that make them positive deviants.
- Identify the factors that support those individuals and groups, as well as the barriers they face, in their attempts to catalyze action in the context of a decentralized education sector.
- Develop recommendations to policymakers and practitioners for supporting positive deviant teachers, school management committees, and any other education-based actors in the fight against HIV/AIDS.

Thematic Areas

Education and HIV/AIDS

Methodologies:

In this research, the positive deviance approach (called Positive Deviance Inquiry, or PDI) is used to identify the strategies and characteristics of teachers and education officials whose actions positively deviate from the norm of stigmatization and silence with regard to HIV and AIDS in Malawi's education system. In the early 1990's this approach was initially used to conduct research to decrease childhood malnutrition. Though positive deviance has been applied in 41 countries by various organizations in the fields of health and nutrition, it has rarely been used in the education sector. For the purpose of this study, positive deviants have been defined as individuals or groups who overcome the many barriers – the norm of silence, shame and stigmatization, the lack of access to services, the low level of social capital for confronting the epidemic, etc. – that surround HIV and AIDS. In the context of the Malawian education system, these are individuals and groups who exhibit deliberate positive and proactive behavior.

The *first* step of the research involved exploratory discussions with representative groups of education stakeholders to gather information on the context as well as to identify examples of positive deviance within the education sector. In the *second* step, the research team used criteria generated through these consultations to identify specific positive deviant individuals and groups. In-depth interviews and focus groups were conducted with teachers, head teachers, school management committee members, primary education advisors, members of parent-teacher associations, district education and district HIV/AIDS

officials, community based organization (CBO) and non-governmental organization (NGO) representatives. In the process of conducting these qualitative interviews, a group of teachers who had formed a support group, called T'LIPO, and another group of people living with HIV and AIDS were identified. Members of these groups were also interviewed individually and as part of focus groups. In addition, officials from the Ministry of Education were interviewed, as well as representatives from the education divisions of UNICEF and USAID. The *third* step, which is scheduled to begin the second week of the upcoming school term (mid-September), will involve quantitative data collection, using questionnaires that have been developed as a result of the extensive qualitative information collected during the second step of the research. These questionnaires will be administered to teachers, head teachers, District education managers (DEMs), and members of the support groups of teachers living with HIV and AIDS. The collection and analysis of this data adapts the traditional format of PDI by adding a quantitative step to build upon information gathered through the in-depth interviews and focus groups, to more systematically examine positive deviant activities, as well as factors that act as barriers and facilitators of positive action.

Recent Research Findings:

With an adult HIV prevalence of 14.2 percent, Malawi is one of the countries most heavily affected by the pandemic. As a result of the pandemic, the sector is losing teachers to AIDS-related and other deaths faster than replacements can be trained.[iii] This contributes to ever-increasing teacher-pupil ratios and a growing burden on the other teachers who must compensate during their colleagues' prolonged illness. Quality of education has further declined as illness and funeral attendance have grown to account for over 60 percent of all cases of teacher absenteeism.[iv] The availability of testing for HIV has increased significantly in the districts that were the main focus of this research. Even in many of the rural areas, treatment is available to those who are HIV-positive. Yet, as is the case with the general public, teachers are reluctant to get tested for HIV. The norm in the schools visited by the researchers is for teachers who are ill not to get tested and if they have been tested, not to disclose their HIV status to others within the school. Therefore, by the time they have been tested and have access to appropriate treatment - both for opportunistic infections and for AIDS through ARV treatment - they are often quite ill.

On the other hand, teachers have the opportunity to influence the way that pupils and members of the community respond to people living with HIV/AIDS. The potential of teachers to act as change agents in the community has been exemplified by a small group of positive deviants. In each of the districts visited, HIV-positive teachers have joined together to provide support to each other. Some have begun to disclose their HIV status in public and to speak to other teachers and even visit other schools to reduce the stigma associated with HIV and AIDS and encourage others to be tested. While the researchers were in Blantyre, they joined a large group of teachers marching through the streets chanting "Keep the Teachers Alive!", along with representatives from the Ministry and the media.

As explained by the T'LIPO president: "*...The problem is that it is secret. People don't want to say the truth. AIDS is like a taboo. People don't want to recognize that it is a problem. We teachers want to be a role model for people to recognize this as a disease… To me, I just feel time is up. It's not time for people to be fearing , they should be happy to go to VCT [voluntary counseling and testing for HIV]. Little by little people will be used to go to VCT. …We want to attract more and more to come and get tested and live positively. The fear itself and keeping it secret makes people to die faster.*"

Challenges and Opportunities:

Challenge: The application of a positive deviance approach to decreasing the impact of HIV and AIDS in the education sector is not clear-cut. Many of the positive deviant actions identified in this research rely on expensive and often unavailable external forces, whereas research on positive deviant behavior related to nutrition generally uncovers simple behavior that is within the control and the resources of the target population. For example, in the two districts that were the original focus of this research, there was extensive and increasing access to VCT, ARV, nutritional support, and psychosocial support through existing networks of people living with HIV/AIDS. The research revealed that information is lacking or people are misinformed or fearful of accessing these services. However, in this case, positive deviants can rectify gaps in information and can encourage attitudinal change to access the services that are available in their districts. On the other hand, in areas where there is no access - or very limited access - to these expensive and rare external resources, the incentives to learn one's HIV status are limited. Potential positive deviants in that situation would face a very different set of challenges.

Opportunity: The use of survey questionnaires to quantify the factors revealed by the qualitative data collection is expected to provide an estimate of the extent of the HIV/AIDS-related positive deviance and contribute to the PDI methodology by quantifying those factors identified through in-depth interviews and focus groups. Meetings with representatives from the Ministry of Education resulted in other potential opportunities, in that the Ministry officials have been supportive of the research and are anxious to learn from the results. In fact, they encouraged the researchers to collect data from the Central and Northern regions of Malawi, expanding beyond the original intention to collect data only in the Southern region.

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1 Government of Malawi, "National HIV/AIDS Policy: A Call for Renewed Action." Lilongwe, Malawi: Government of Malawi, 2003, 1.

[1] Harris, Abigail M. and Schubert, Jane G. "Defining 'Quality' in the Midst of HIV/AIDS: Ripple Effects in the Classroom," 7

Project Title: Ecosystem Services from Low-input Cropping Systems: Incentives to Produce Them and Value of Consuming Them

　　　　　　　　Proposal #: 0527587
　　　　　　　　HSD Emphasis Area: Agents Of Change

Lead PI:　　　Scott M. Swinton, Michigan State University
Co-PIs:　　　Frank Lupi and. Philip Robertson
Collaborators:　Natalie Rector, Robert Shupp

Research Goals:
1: Evaluate feasibility of scaling up from experimental plots to farm fields.
2: Investigate farmers' awareness and perceptions of low-input cropping practices.
3: Estimate farmers' willingness to change to low-input practices in exchange for payments.
4: Estimate citizens' willingness to pay for environmental services from agriculture.

Thematic area:
Agents of Change: Social, Political, and Economic Dynamics

Methodologies (by objective):
1: Scaling up – Farming of 27 farm fields on Kellogg Biological Station (3 rotation entry crops (corn, soybean & wheat) X 3 treatments X 3 field sizes over 3 years).
2: Farmer focus groups (3 groups in each of 2 regions; 39 participants total).
3: Farmer focus groups and mail survey of Michigan corn and soybean farmers (scheduled for 2007-08).
4: Mail survey of Michigan taxpayers (scheduled for 2008-09).

Recent research findings:
The 2007 focus group study found that farmers 1) are already adopting low-input cropping practices that save labor and/or input costs without reducing revenues, 2) are open to soil testing, pest scouting, and other information-based technologies that can reduce agrochemical input use, and 3) are reluctant to adopt practices that are perceived as having a significant risk of reducing incomes. This last category includes planting low-value crops (such as wheat in a rotation), planting cover crops that can interfere with spring planting of major crops, and reducing agrochemical input levels below currently recommended norms for profitable farming. The farmers believed that the environmental benefits of certain low-input cropping practices, such as reduced global warming, were of greater value to society at large than to themselves. They also doubted whether the proposed changes in their farming practices would affect be as beneficial as scientists believed (notably the global warming mitigation effect). But the farmers believed that certain practices – reduced phosphorus runoff, especially – would have greater benefits than scientists claimed.

Challenges and opportunities:
In addition to revealing farmer attitudes and awareness about low-input cropping practices, the focus group meetings provided opportunities both a) to elicit willingness-to-accept payment information through experimental auctions, and b) to refine questionnaire design for next year's contingent valuation mail survey of farmers.

Project Title: Culture, Social Support, and Managing Stress

                      Proposal #: BCS-0338631
                      HSD Emphasis Area: Dynamics of Human Behavior

Lead PI: Dr. Shelley E. Taylor, University of California, Los Angeles
Co-PIs: Drs. David Sherman and Heejung Kim, University of California, Santa Barbara

Research Goals:

1. To examine the different ways in which Asians/ Asian-Americans and European-Americans seek and use social support for coping with stress.
2. To develop the distinction between implicit and explicit social support, validate the distinction, and show its empirical relations to psychological and biological stress responses.
3. To document how Asians/Asian-Americans are well served by implicit support, and European-Americans are well served by explicit support.

Thematic Areas:

1. Culture
2. Social Support
3. Stress

Methodologies:

Questionnaire and experimental investigations that draw on self reports of stressful experiences and/or laboratory stress tasks to examine the impact of different modes of social support on psychological and biological stress responses.

Recent Research Findings:

Social support is believed to be a universally valuable resource for combating stress, yet Asians/Asian Americans report that social support is not helpful to them, they resist seeking it, and they are underrepresented among recipients of supportive services. We distinguish between explicit social support (seeking and use of advice, emotional solace) and implicit social support (focusing on valued relationships) and show that Asians/Asian Americans are psychologically and biologically benefited more by implicit social support than by explicit social support; the reverse is true for European Americans.

Challenges and Opportunities:

Coming up with meaningfully translated materials for use in foreign countries that represent appropriate counterparts to materials in English.

Project Title: **Traffic Congestion: Actions and Reactions**

Proposal #: 0527252
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: K. Triantis, Virginia Polytechnic Institute and State University
Co-PI: D. Teodorovic
Collaborators: S. Sarangi, Louisiana State University and L. Razzolini, Virginia Commonwealth University

Research Goals:

1. To assess dynamic demand based strategies as an important approach for mitigating traffic congestion.
2. To understand and validate dynamic hypotheses about current and future structures of the social and transportation networks, and about their performance.
3. To assess whether the level of traffic congestion depends on the individual social interactions of drivers/co-drivers/passengers, as well as on the policy choices made by the traffic authorities.

Thematic Areas:

1. Downtown Space Inventory Control System (Y. Zhao, K. Triantis, D. Teodorović, P. Edara)
The fundamental rationale when applying reservation concepts is that individual choices in terms of reserving spaces in a cordon-based urban area would create dynamic variations in the utilization of the transportation network. In this case two questions are targeted: (1) how the cordon is defined; (2) what is the appropriate charging scheme.

2. Intelligent Parking Systems and Their Potential Impact on Urban Congestion (Marti Roper, K. Triantis, D. Teodorovic, P. Edara)
During the past two decades, traffic authorities in several cities have begun to inform and guide drivers to parking facilities with real-time variable message signs. This parking guidance is often part of a comprehensive urban congestion mitigation policy. This research focuses on designing a parking reservation and a parking revenue management system for multiple parking garages in the downtown area.

3. Evaluation of the Impacts of a Cordon-Based Dynamic Traffic Congestion Pricing Policy-A System Dynamics Approach (S. Liu, K. Triantis, S. Sarangi)
The objective of this research is to build a dynamic modeling framework by which policy makers can understand the dynamic and complex nature of transportation-socioeconomic systems within a downtown area. This framework provides policy makers with an assessment platform which demonstrates the long-term dynamic behaviors caused by a cordon-based congestion dynamic pricing policy.

4. Trip Reservations for Highway Travel (P. Edara, D. Teodorović, K. Triantis)
The basic idea of Highway Space Inventory Control System (HSICS) is that all road users have to make reservations in advance to enter the highway. In this research, highway is treated as an inventory of perishable spaces. Hence a system that allocates the highway spaces temporally and spatially over time is needed to optimize the system performance. Implementation issues and policy considerations relevant to the HSICS are addressed.

5.   *Traffic Experiments (L. Razzolini, S. Sarangi)*

Having surveyed the existing literature in economics on traffic flows and experiments we decided to focus on two main issues: (a) toll roads and, (b) the choice between public and private modes of transportation. In the context of toll roads we examine two possibilities. The first task is to investigate traffic flows when one of the two possible routes has a toll. Next we introduce two toll roads with different travel times and examine how tolls on the two roads affect traffic flows and travel times. The second set of experiments focuses on the role of incentives in determining the choice of mode of transport by commuters.

6.   *Heterogeneity in Networks (P. Billand, C. Bravard, S. Sarangi)*

In order to study the interaction between social networks and traffic flows, it is first necessary to understand the interaction between different parameters of a network model and their stability in the presence of heterogeneity. The initial research examines the issue of existence of Nash networks followed by their characterization. We then examine efficiency issues. This provides us with an understanding of the role of heterogeneity which is crucial for modeling the interaction between the two networks.

Methodologies:

Artificial intelligence (neural networks, fuzzy set theory), optimization, dynamic modeling, economic experiments, game-theoretic network formation techniques.

Recent Research Findings:

The representation of linguistic variables in a dynamics modeling environment using fuzzy set, a management flight simulator to evaluates congestion pricing strategies, artificial intelligent formulations of downtown and parking reservation strategies.

Challenges and Opportunities:

There are two opportunities, i.e., is the initiation of a collaborative activity with colleagues in China; and second a special issue on traffic congestion with *Transportation Planning and Technology*. The main challenge continues to be the integration of the different methodologies.

Project Title: **Evaluating the Effects of Dams on Social Dynamics**

Proposal #: 0623087
HSD Emphasis Area: AOC

Lead PI: Desiree Tullos, Oregon State University
Co-PIs: Bryan Tilt, Oregon State University
Phil Brown, Colby College
Aaron Wolf, Oregon State University
Darrin Magee, Evergreen College

Collaborators: He Daming, Asian International River Center, Yunnan University
Chen Daqing, Yangtze River Fisheries Institute

Research Goals:

1. Synthesize the literature on disciplinary effects of dams and dam removal and describe the links between those disciplinary effects
2. Propose new approach for integration of disciplinary effects
3. Compare two communities in southwest China in terms of their integrated ecological, economic, and socio-cultural conditions.

Thematic Areas:

1. dams
2. social impact assessment
3. environmental impact assessment

Methodologies:

For this project, we developed a large synthesis on the literature of dam effects and interdisciplinary modeling, developed collaborative partners in China, organized and hosted an international symposium in the Pacific Northwest on measuring and modeling the effects of dams, applied and received funding for an additional symposium in the Northeast US, selected and confirmed a journal to guest editor a special issue, and selected an international conference in Kunming China at which we will host a special session. Through meeting remotely and intensively in person at these events, we are developing recommendations for applying a new approach to interdisciplinary analysis of dam effects, which will be published as the final paper in a special issue journal of which two investigators will guest-editor.

Recent Research Findings:

April 2007 International Symposium at Skamania Lodge – Symposium on Modeling of Dams (http://rivers.bee.oregonstate.edu/CHINA%20DAM%20STUDY%20PAGE/2007%20SYMPOSIUM.html)

October 2007 International Symposium at Colby College – "Damming the Nu: Assessing Hydropower on China's *Angry River*"

Special Session at Annual Conference of the International Union ofAnthropological and Ethnological Sciences in Kunming, China—"Dams and Development: An Assessment of Ecological, Economic and Socio-cultural Impacts"

Journal of Environmental Management special issue – "Interdisciplinarity in measuring and predicting impacts of large dams"

Challenges and Opportunities:

Challenges are common to those associated with large international collaborations – finding the time and opportunity to contribute in meaningful ways has been difficult. However, by working independently and meeting regularly, we believe the collaboration is successful, producing numerous new ideas and deliverables. Opportunities include the intellectual development of working across disciplines and cultures. One undergraduate student and one graduate student participated in the interdisciplinary literature survey and group discussions for this project and will continue to play a role in the project, fulfilling our commitment to student training and mentoring. The commitment already invested by this group make it well-prepared to move this exploratory research into a full field- and modeling-based research project in China.

Project Title: Exploring the Social Dynamics of Accessibility, Travel Behavior, and Physical Activity by Income/Race, Age and Gender: An Inner-City/Suburb Comparison in the Detroit Region

Proposal #: 0624263
HSD Emphasis Area: AOC

Lead PI: Igor Vojnovic, Michigan State University
Co-PIs: Joseph Messina (Michigan State University), June Thomas (Michigan State University), Kameshwari Pothukuchi (Wayne State University), Ellen Velie (Michigan State University).
Collaborators: Joe Darden (Michigan State University), Bruce Pigozzi (Michigan State University), Daniel Griffith (University of Texas at Dallas).

Research Goals:

1. To measure neighborhood accessibility and quantify functional differences for two two-miles squared inner-city Detroit sites, and four suburban sites in each of the cities of Bloomfield, West Bloomfield, Birmingham, and Ann Arbor selected, based on socioeconomic status and race/ethnicity.
2. To explore how perceptions of travel behavior—and specifically motorized versus non-motorized travel—vary by income, race, age, gender, and neighborhood structure.
3. To explore urban structural modifiers of behavior including system feedbacks, thresholds, and dynamics in a complex systems simulation framework.

Thematic Areas:

1. Spatial Analysis and Complex System Simulations
2. Urban and Transportation Geography
3. Urban Planning and Design
4. Public Health

Methodologies:

The team will gather data from six two-mile square neighborhoods in the Detroit Region. Surveys will be mailed to 1600 households in the two Detroit neighborhoods and 800 households in the four suburban sites. This will enable the research team to focus on urban form, travel behavior, physical activity, and obesity within the context of diverse socioeconomic conditions and race/ethnic populations. Statistical methods of relevance include dummy variable regression, polynomial regression, network structures, location-allocation models, and discriminant analysis. Multinomial logit models will be used to explore the relationship between the built environment, physical activity and obesity. A dynamic spatial simulation-modeling environment will be employed to characterize, link, and model structural determinants, feedback systems, thresholds, and individual, household, and community behaviors. The project intends to integrate modern computing and simulation theory with urban design, two research tracts have been dissimilar enough in both language and methods to inhibit collaborative work.

Recent Research Findings:

The project is still in its infancy, receiving funding in November 2006 and being initiated full force in January 2007. The work until now has largely concentrated on the land use analysis, the GIS mapping, and the 3D AutoCAD modeling. The surveys will be mailed out in September, and they will be collected throughout October and November, with the data coding, statistical analysis, and complexity modeling following throughout 2008 and 2009.

Challenges and Opportunities:

We are currently exploring modeling environments to include both the proposed expansion of the CAPE model developed by Messina as part of NASA NAG 5-12617 and also the NetLogo modeling environment. Both modeling tools allow for the inclusion of multiple land cover types or multiple agents. At this early stage in the research we are allowing the emergent research questions to dictate modeling environments rather than enforcing an inappropriately constraining system on the neighborhoods and Detroit context. Further, we are not pre-ordaining our complex modeling environment as it is yet to be determined which if not more than one theoretical complex interactive systems are active. To date the vast majority of the geospatial modeling work has focused on database development.

Project Title: Extensible Machine Intelligence for Automated Video Understanding of Longitudinal Change in Individual and Social Behavior

Proposal #: IIS-0624236
HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Howard Wactlar, Carnegie Mellon University
Co-PIs: Michael Christel, CMH; Alexander Hauptmann, Carnegie Mellon University; Scott Stevens, Carnegie Mellon University; Bryan MacWhinney, Carnegie Mellon University
Collaborators: Frank Moretti, Columbia University Teachers College; Ashok Bhuracha, University of Pittsburgh School of Medicine

Research Goals:
1. Create tools and establish methodologies that will enable continuous, longitudinal observation and monitoring for behavioral research.
2. Performance of integrated tools (accuracy, speed) shall surpass that of established manual and computer-assisted rating instruments based on human observation.
3. Implement behavioral observation tools that are researcher extensible to account for needs that might arise from a particular study, environment, or discipline.

Thematic Areas:
1. The elderly: nursing home patient social interactions and aberrant behaviors.
2. The young: childhood and classroom communicative discourse
3. The impaired: autistic behavior in the very young for training, diagnosis and treatment

Methodologies:
1. Computer vision, speech understanding, machine learning and measurement technologies (e.g., environmental and biometric sensors) for a continuously captured audiovisual record of activity and behavior
2. Information retrieval, reduction, and visualization through web-based digital video and data library
3. Automated data anonymization, privacy, and security controls for data sharing
4. Collaboration and access through a distributed digital "library" infrastructure
5. Data export, exchange, and compatibility managed through adherence to standards

Recent Research Findings:
Automatic Collection, Analysis, Access and Archiving of Psycho/Social Behavior by Individuals and Groups (CARPE 2006)

Machine Perception for Occupational Therapy: Toward Prediction of Post-Stroke Functional Scores in the Home (RESNA 2006)

Ethical Considerations in the Conduct of Electronic Surveillance Research, Jnl.Law, Medicine & Ethics, 2006

Detecting Social Interaction of Elderly in a Nursing Home Environment, ACM Trans. On Multimedia Computing, 2007

Project Title: Collaborative Research: Shared Governance of Risk

                      Proposal #:0623907
                      HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: William A. Wallace, Decision Sciences and Engineering Systems, Rensselaer Polytechnic Institute

Collaborators: Peter J. May, Center for American Politics and Public Policy, University of Washington

Research Goals:

1. Applying social anthropologist Mary Douglas's Cultural Theory, as interpreted by political scientists Thompson, Ellis, and Wildavsky, to assess the responses of FEMA, the Coast Guard, the Bush Administration, and on-site emergent groups respectively to Hurricane Katrina.
2. Coding materials 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 to determine the cultural bias of and change in organizations responding to Hurricane Katrina.
3. Implementing the coded materials as an organizational response timeline into a formalized computer simulation of cultural theory written in Visual Basic.NET called Organizational Response and Culture in Disaster Simulation (ORCiDS).

Thematic Areas:

1. Organizational studies: management culture and change during disaster.
2. Disaster planning and response: task resolution as a function of cultural bias.
3. Cultural theory simulation: formal modeling task resolution as a function of cultural bias.

Methodologies:

Key methodologies included document collection and analysis of transcript and verified source material. Transcripts included daily teleconferences of federal managers during the first eight days of responding to Hurricane Katrina, as well as US Senate hearing testimony, government self-assessment documents, and source-verified periodicals. In each case, coding was done to assess the dominant cultural bias and management style (fatalist, individualist, egalitarian, or hierarchist) of the responding organization and how it changed over time during disaster response. Additionally, data were used in dynamic systems modeling using Ventana Systems VenSim software, and in formal modeling using Visual Basic .NET to understand task resolution and how it is affected by management cultural biases.

Recent Research Findings:

Transcripts coded in terms of cultural biases found that the Coast Guard maintained a hierarchist organizational culture, favoring a "high-grid" task resolution style that emphasizes adherence to orders and protocol but is also "high-group," indicating heightened improvisation. FEMA increasingly adopted a fatalist approach to disaster tasks, involving a "high-grid" approach that favored orders and regulations, but a "low-group" approach that proved inflexible when it came to responding to community needs. The White House tightened its individualist cultural bias, indicating a "low-grid" and "low-group" management style resulting in no clear procedures or responsiveness, while on-the-scene emergent groups shifted from a

slightly fatalist bias to a clearly egalitarian cultural bias. Egalitarian groups functioned with no clear procedural protocol or methods ("low-grid"), but proved highly responsive to community needs and task resolution methods ("high-group").

Dissemination:

Rachel A. Dowty, Colin E. Beech, Peter J. May, and William A. Wallace. (2006) Responding to Chaos: Organizational Cultures and the Hurricane Katrina Response, Paper presented at the 28th annual meeting of the Association for Public Policy Analysis and Management (APPAM), Madison, WI, November 2-4, 2006

Rachel Dowty and Colin Beech. (2006) Resolving Crisis Tasks: Organizational Cultures and Disaster Response, Presentation given at the Rockefeller College of Public Affairs and Policy, Department of Public Administration and Policy, State University of New York at Albany, October 19, 2006

Challenges and Opportunities:

The opportunity presented by this project is to clearly understand how organizational culture shapes effective and ineffective disaster response. This approach to coding documents also makes it possible to quantitatively model Douglas' cultural theory to assess its effectiveness as a framework of analysis and planning for organizational response to disasters.

In developing the ORCiDS simulation software, our research shows that treating disaster tasks as an undifferentiated quantity flow, which is the traditional approach in dynamic systems modeling, did not take full advantage of the cultural theory framework. This is because a cultural theory model of organizational response proposes that tasks are not uniform, and cannot be represented as a homogenous stock. Visual Basic .NET offers the necessary flow control for a model that differentiates between tasks by a two dimensional vector (grid and group) and are resolved by one of four different cultural biases; VenSim and its flow control was never intended for this type of modeling process.

Project Title: DHB: Exploring Educational Policy and Change from a Complex Systems Perspective

                        Proposal #: 0624318
                        HSD Emphasis Area: Dynamics Of Human Behavior

Lead PI: Dr. Uri Wilensky, Northwestern University
Co-PIs: Dr. Louis Gomez, Northwestern; Dr. Luis Amaral, Northwestern
Collaborators: Spiro Maroulis, Hisham Petry, William Rand

Research Goals:

This research concerns the creation of new kinds of tools for understanding and characterizing school reform initiatives. By utilizing the strengths of two new modeling and analysis techniques – agent-based modeling and social network analysis -- we address the following overarching question: Why, despite so much individual level effort and activity, system-level change is so difficult to achieve? More specifically, in this effort we will model and analyze the problem of understanding the emergence of system-level change in the context of three cases of reform initiatives: school choice, small schools reform and individualized instruction through tracking.

Thematic Areas:

1. agent-based modeling
2. social network analysis
3. school reform

Methodologies:

- Agent-Based Modeling (ABM)
- Social Network Analysis (SNA)
- Hierarchical Linear Modeling (HLM)
- General Linear Modeling (GLM)
- Clinical and Task interviews -- questions and tasks

Recent Research Findings:

- Using data collected from a complete network of adolescents in one large, urban school engaged in a small schools reform, we find that the academic performance of peers is "contagious." Moreover, we find that this peer effect is easy to miss if one only looks at the average effect. Instead, we find evidence that peer effects are moderated by network structure, with students in highly dense networks of friends subject to stronger contagion.
- In our HLM analysis of historic achievement data from Chicago Public Schools, we find that amount of the variance in high school student achievement that can be attributed to differences is schools is approximately 45%, but decreases to about 10% when controlling for prior achievement. Although small, there seem to be statistically significant differences in school effects across schools that are stable over time.

- Using SNA of enrollment patterns in Chicago Public schools, we have also confirmed that, for the most part, students are indeed leaving low achieving schools for higher achieving schools, with higher achieving students more likely to choose not to attend their assigned school.
- Using SNA of freshmen peer friendship structures we find that communities (groups of friends) predict 35% of math achievement. We also find that the peer groups predict 9% of the change in math achievement (growth). Further, including peer groups in general linear models (GLMs) adds significant predictive power (10% for achievement and 7% for growth) even controlling for math teacher, demographics (including race, gender, and age), small schools, and previous achievement (8th grade math scores).
- Using clinical and task interviews with one higher achieving and one lower achieving peer community we find significant differences in the norms of the two communities. This exploratory work is intended to account for the correlations between peer groups and achievement. The findings suggest that higher performing peer groups are pruning their old friendships to establish stronger ties with their present academic community. Additionally, the higher performing community is more likely to do low consequence academic tasks (e.g., homework, and tutoring sessions) with their peer group than the lower performing community. Further, it appears that the lower performing community members may be doing more outside of school to prepare for future contingencies that do not include higher education.

Challenges and Opportunities:

- With respect to our work on school choice, our primary challenge is collecting data that will give us a greater understanding of how households decide which schools to attend. This information can then be combined with our school effects finding in an agent-based model of school choice in Chicago that gives us a better idea of what emergent outcomes are reasonable to expect in choice-based reforms.
- With respect to our work on peer effects, the primary challenge is investigating our initial findings in other settings. Our current work comes only from data collected in one school. This aspect of our work has implications for our other two cases as well, both small schools reform (which attempts to change student social structure), and tracking reforms, which group students by ability levels.

Project Title: A Multidisciplinary Protocol for Assessing Climate Impacts, Vulnerability, and Adaptation

Proposal #: 0622954
HSD Emphasis Area: AOC

Lead PI: Julie A. Winkler (Michigan State University)
Co-PIs: Jeffrey A. Andresen, , John R. Black, Scott Loveridge, Pang-Ning Tan, Suzanne D. Thornsbury (Michigan State University)
Collaborators: Frank-M. Chmielewski (Humboldt University, Germany), Robert Kurlus (University of Poznan, Poland), Tadeusz Niedzwiedz (University of Silesia, Poland), Denys Nizalov (Kiev Economics Institute, Ukraine), Olena Nizalova (Kiev Economics Institute, Ukraine), Zbigniew Ustrnul (Institute of Meteorology and Water Management, Poland), Harald von Witzke (Humboldt Univerity, Germany), Costanza Zavalloni (University of Antwerpen, Belgium)

Research Goals:

1. Develop a framework and methods for incorporating spatial-temporal dynamics (e.g., international trade, emerging/declining production regions and markets, experiential learning, adaptation) into climate change impact assessments.
2. Evaluate the relative importance of climate variability and change as one agent of change among other agents such as political and economic risk.
3. Improve the communication of uncertainty and risk.

Thematic Areas:

1. Climate Variability and Change
2. Impact assessments
3. Regional and international market systems

Methodologies:

A prototype industry that is relatively modest in scope but reflective of larger industries is being used to identify appropriate methodologies and assess data requirements. The prototype industry is the tart cherry industry which is 1) highly sensitive to climate extremes and threshold events, 2) reflects the limited adaptation strategies of any industry that has long planning horizons and long-term investments, and 3) currently is undergoing a substantial evolution in terms of emerging production areas in central Europe.

Recent Research Findings: *[Please note that this is a Planning Grant.]*

The planning period is being used to 1) develop a conceptual framework that links appropriate models from climate science, horticulture, and economics, 2) evaluate data needs for model development and/or validation, and 3) identify additional team members. Considerable progress on these goals was made during an international workshop held 22-26 January 2007 in Michigan. A second workshop is scheduled for 21-27 October 2007 in Poznan, Poland to further refine the methods. Availability of data in central Europe and Michigan currently is being investigated, and several additional scientists in the U.S. and Europe are now actively involved in the project.

Challenges and Opportunities:

A primary challenge is linking models from multiple fields that have different requirements in terms of the temporal and spatial resolution of the input data. The extensive data requirements also are a challenge. An important opportunity is the development of an interdisciplinary and international community (including a large number of graduate students) interested and proficient in the impact of climate on commodity markets.

Project Title: Community Risk Management of Hurricane and Tsunami Surge Hazards

                                           Proposal #: SES-0527520
                                           HSD Emphasis Area: Decision Making, Risk And Uncertainty

Lead PI: Harry Yeh, Oregon State University
Co-PIs: Cherri Pancake, Oregon State University
Collaborators: Michael Lindell & Carla Prater, Texas A&M; Toshitaka Katada, Gunma University

Research Goals:

1. Develop tools for assessing coastal communities' best options for protecting themselves from hurricane and tsunami surge hazards.
2. Develop comprehensive and integrated models of surge impacts, warning transmission, and evacuation behavior.

Thematic Areas:

1. Coastal hazards – tsunami and hurricane
2. Scenario simulation
3. Casualty and damage models

Methodologies:

To achieve our research goals, a comprehensive scenario simulator for hurricane and tsunami hazards is being developed. The simulator integrates models of surge impact, warning transmission, decision-making, evacuation behavior, and evaluation of casualties and damages. The following components are under development: rational and quantitative models for casualties and damages; behavior models to determine preparation times prior to evacuation; traffic models for evacuation. Their development requires close interdisciplinary collaboration, spanning the fields of social and behavioral science, information technology, geospatial information science, and hydrodynamics. Cyberinfrastructure support is making it possible 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.

Recent Research Findings:

Note that a prototype of the simulator was presented at the 2006 PI Meeting. While the framework of simulator is continually being improved, the following models that are incorporated in the simulator have been developed: 1) tsunami forces on onshore structures, and 2) casualty evaluation. The first provides practical means for evaluating the structural damage caused by tsunamis (*J. Disaster Res.*, in press). Using the second model, we found that biological and physiological disadvantages make a significant difference in casualty rate from tsunamis. Interestingly, gender and age discriminations in casualties become most pronounced when a tsunami is marginally strong; the difference tends to diminish as tsunami strength increases (MS in preparation). We also analyzed a wide variety of field observations – from hydrodynamics to human behaviors – in India for the 2004 Indian Ocean Tsunami (*ASCE J. Waterway, Port, Coastal, Ocean Eng.,* in press).

Challenges and Opportunities:

The scenario simulations involve many elements, including hydrodynamics, warning transmission, evacuation, human behavior, and social and environmental impacts. Once the prototype simulator is completed, it should give researchers in all aspects of coastal hazard sciences and planning an experience similar to that obtained in a real field investigation. In running the simulations and evaluating the results, critical problems will be identified for improvement in each specialized area. The simulation exercise will also provide a valuable common background from which to forge and maintain coherence in the broadly distributed multidisciplinary coastal-hazards community. Hence, further generalizing the simulator will be an opportunity to enhance and expedite collaboration for natural hazards research.

Project Title: An Integrative Impact Evaluation of China's Ecological Restoration Programs

Proposal #: 0624018
HSD Emphasis Area: AOC

Lead PI: Runsheng Yin, Michigan State University Dept. of Forestry
Co-PIs: David Rothstein, Michigan State University Dept. of Forestry
Jiaguo Qi, Michigan State University Dept. of Geography
Collaborators: Xiangzheng Deng, Center for Chinese Agricultural Policy, Chinese Academy of Sciences (CAS); Jintao Xu, Peking University College of Environmental Science; Can Liu, Forest Economics and Development Research Center; State Forest Administration; Yukuan Wang, Institute of Mountain Hazards and the Environment, Chinese Academy of Sciences; Shunbo Yao, Northwest Agricultural and Forestry University

Research Goals:
1. To evaluate the environmental and socioeconomic impacts of China's ecological restoration initiatives, including the Natural Forest Protection Program and the Sloping Land Conversion Program;
2. To gain a clear understanding of and thus an enhanced ability to execute these unprecedented programs of ecological restoration;
3. To generate insights for fostering adaptation options and sustainability strategies within and outside of China.

Thematic Areas:
1. Environmental dynamics – erosion/desertification control, biodiversity protection, and carbon storage;
2. Socioeconomic impacts – livelihood change, targeting efficiency, and cost effectiveness;
3. Student engagement in primary research and experiential learning.

Methodologies:
1. Building comprehensive geospatial and statistical datasets at multiple scales;
2. Developing effective treatment effect models to estimate the socioeconomic and ecological effects induced by implementing the programs;
3. Integrating expertise and approaches in landscape ecology, social science, remote sensing, and climate change.

Recent Research Findings:
1. The programs have been implemented differently, and thus their impacts vary. In some areas they have been very successful, while in other areas they have failed; the success or failure has much to do with the effectiveness of the local schemes of program execution and follow-up monitoring and management.
2. Biodiversity, measured in terms of multiplicity and variation of species and the structure of regional ecosystems have seen improvement in certain places.
3. While carbon stored in the vegetation of regional ecosystems has trended up, that stored in the soil has not increased at the best due to continued, severe erosion.
4. Livelihoods of households and communities have been mostly affected in positive ways, but the in-discriminatory, top-down approach to program implementation is inefficient, and the transition to a more sustainable economy has been slow to come by.

Challenges and Opportunities:

1. China's ecological restoration efforts carry some tremendous domestic and international implications in terms of both economics and ecology;

2. The acquisition and processing of a large number of satellite images and the development of an erosion simulation model have taken more time and effort than expected;

3. Collaborating with Chinese scientists is very beneficial. But it has been slow to come due to the segmentation of the research community in China and their lack of familiarity with international research developments and practices;

4. Done properly, the Chinese government is willing to listen to what's been suggested by international research, and is thus willing to take actions in improving its policy, which suggests that projects like this can and will make a significant impact;

5. Assessing the environmental and socioeconomic impacts of China's ecological restoration programs will lay a solid foundation for ecosystem service evaluation and compensation, which will offer some great follow-up research opportunities.

Project Title: See Where I'm Looking: Using Shared Eyegaze to Coordinate Time-Critical
                      Collaborative Tasks

            Proposal #: HSD-0527585
            HSD Emphasis Area: DHB: Dynamics of Human Behavior

Lead PI: Gregory Zelinsky, Stony Brook University
Co-PIs: Susan E. Brennan, Dimitris Samaras, Stony Brook University
Collaborators: Karla Batres, Xin Chen, Christopher Dickinson, Alexia Galati, Joy Hanna, Anna Kuhlen,
                      Mark Neider

Research Goals:
1. Cognition is usually studied in people acting alone, but much of everyday human behavior requires interacting or collaborating with other people. Our goal is to study cognition, especially visual search, in collaborative tasks. Collaborating has obvious benefits, but it also requires coordination, which has its costs.

2. For this project, we created a shared gaze system in which two remotely located partners can view the same scene with each other's eyegaze cursor superimposed over it. This enables partners to monitor each other's attentional focus in real time and with more precision than in face-to-face configurations.

3. Using this system, we are exploring the effects of shared gaze alone and in combination with speech in tasks with increasing complexity: search tasks, search + consensus tasks, and tracking tasks (with moving targets).

Thematic Areas:
1. Collaborative cognition
2. Visual search in naturalistic environments
3. Interactive multi-modal communication and coordination

Methodologies:
We conduct laboratory experiments in which human subjects perform collaborative tasks alone, in pairs, or in small groups (currently, 4). In these, we combine techniques and tasks from the field of visual attention (PI Zelinsky's field) with those from psycholinguistics of spoken dialogue (Co-PI Brennan's field). Our experimental tasks include that rely on 3-D simulation and the processing of 3-D information that enable mapping between the perspectives of two partners located at different points in an environment (Co-PI Samara's area of expertise).

In addition to our prototyping efforts on the shared gaze system used for the 2-person experiments (and single person controls), we are implementing and exploring the use of different visual and temporal representations of a partner's focus of attention.

While the main focus of the project is on collaboration between remotely located partners, some of our experiments look at how pairs of co-present people interacting face-to-face use visible and spoken cues about each others' focus of attention. In Hanna & Brennan (2007), we report evidence that people use information about where a partner is looking to disambiguate referring expressions early (before hearing the whole expression).

Recent Research Findings:
In a collaborative O-in-Qs search task, pairs of collaborating partners performed better than solitary searchers. In comparisons of collaborating via voice alone shared gaze alone (SG), or shared gaze and voice (SG+V), search in the shared gaze condition was best of all: twice as fast and efficient as solitary search. In fact partners can successfully communicate and coordinate joint search using shared gaze alone (in this task, quickly dividing up the display and following a "Look where I'm not looking" strategy, with the first partner to finish assisting the slower partner). Strikingly, and somewhat surprisingly, SG search was faster than with voice added (SG+V); In this task, which terminated as soon as one partner found the target, speaking incurred substantial costs. This experiment is reported in Brennan, Chen, Dickinson, Neider, & Zelinsky (2007) and has been presented at several conferences. The shared gaze prototype was introduced at the 2005 meeting of the Vision Sciences Society (Zelinsky, Dickinson, Chen, Neider, & Brennan, 2005).

In a more complex search task that required both partners to fixate and achieve consensus on a target (a sniper in an urban landscape), being able to communicate with shared gaze and voice (SG+V) enabled the partner who first found the target to alert the other partner so that partner could align gaze with the first partner ("Look where I'm looking"). Our current experiments examine collaborative tracking of moving targets, the effects of different gaze cursor representations of a partner's attention, spatial division of visual search labor among 4-person groups, and whether the interpretation of a speaker's eye gaze is automatic/reflexive (as opposed to a more flexible and adaptive cue).

Challenges and Opportunities:
Opportunities: On the technological front, our shared gaze system improves the ability of remotely located team members to communicate spatial and dynamic information quickly and efficiently under time pressure. On the scientific front, our studies are enabling us to better understand how people use verbal and non-verbal cues to coordinate their attention in tasks of varying complexity, with and without time pressure.

Challenges: Currently our shared gaze experiments use EyeLink head-mounted eye-trackers worn by stationary remote partners, whose movement through an environment is simulated. We would like to transfer our system to a platform that enables wireless operation for tasks that require moving through an environment. For experimental tasks on stationary collaborators, we would like to move to a desk-mounted or screen-mounted platform that enables automatic capture and calibration of the user's face and eyegaze.

Conclusion: The coordination of joint spatial referencing is dramatically affected by the availability of shared gaze information. When partners are either co-present in the same environment or able to share visual information remotely, they can use where each other is looking as a coordination device. A partner's eye gaze provides incremental and highly sensitive information that is missing from more intentional forms of pointing with a mouse or other input device. A gaze or a glance may be not only instrumental (necessary for performing a spatial task), but also informative (one partner may be able to use this information in interpreting another's utterance or intentions), or even communicative (the gazer may actually intend for the partner to recognize a meaning and may point with the eyes. Shared gaze affords a highly efficient method of coordinating parallel activity in a time-critical spatial task.

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