

ANNUAL REPORT
09-10

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Director's Statement

Dear IMBS Colleagues and appropriate administrators,

Again, it is the time of the year to review the activities of our IMBS members and of the IMBS over the past academic year. A crude measure of the activity over the year is that IMBS members were on grants (some multiyear and multi-participants) involving over \$80 MM; while many of these grants were processed through individual departments, they nicely reflect the research activity stimulated by IMBS. Another measure is given by publications and presentations. Here again IMBS is doing quite well; during the year our members published over 190 papers (which includes some books), and gave over 185 invited presentations. (For more specific information about individual activity, please see the Appendices of this report.) This has been, again, an active year!

The strength of the IMBS comes directly from our members and their contributions. As such, let me recommend that in reading this report you start in Section II-D, **Summaries of Significant Findings**. This section provides a sample of the wide variety of results that have been discovered over the last year by our colleagues. As an illustration, in this section you will find how research within the IMBS ranged from that of Duncan Luce's concluded project about utility theory and his longer term project of exploiting predictions from his global psychophysical theory, Lisa Pearl's (a new IMBS member) work on native language acquisition, David Eppstein's development of methods to speed up Monte Carlo simulations of social networks, Bill Batchelder's development of his "Cultural Consensus Theory," Bill Branch's work questioning standard economic models, Jan Brueckner's analysis of urban sprawl, Simon Levin (a "Princeton IMBS member" who is on campus at least each January) exploration of the integration of the ecological sciences and economics, Katie Faust's analysis of contradictory results arising in social networks, Marek Kaminski's work on game theory as applied to political science, and on and on. And, this is just a small sample of what you will discover.

Each year the IMBS puts on widely recognized conference/workshops. (Videos of the talks can be found on the conference link of <http://www.imbs.uci.edu>.) The first of the three major conferences of the 2009-10 academic year took place in November (*Inference and Imaging*), the second in January (*Public Goods: From Ecology to Economics*), and the third in February (*Modeling Conflict and its Governance*).

The theme of the first conference came from a controversy in psychology about the statistics in imaging processes. To get answers, statisticians, philosophers, psychologists, experts in imaging, and others participated. The second conference was an interesting interdisciplinary exploration about public goods, where we pulled together economists, evolutionary biologists, and political scientists. It was surprising how many results from one discipline provided nice insights into issues from other areas. The third conference addressed issues that arise in many of the social sciences; how does "conflict" affect conclusions of our basic modeling? Game theorists, economists, political scientists came together to explore these topics.

Other conferences include a one-day October conference/workshop emphasizing the commonality of ideas raised in group decision procedures and those needed in statistics. The

other was our annual graduate student conference, which provides a platform for our students to present their ideas to fellow students and faculty; over the day of the conference, about 75 people attended.

As I have described in previous reports, the goal of our graduate program extends beyond those students who are actually enrolled in our program to provide a home for *any* UCI graduate student who has an interest in combining mathematics with puzzles coming from the social and behavioral sciences. The effects of this outreach can be seen from the list of speakers at our graduate student conference (Section III B) and the participation of students from many different disciplines that enroll in our graduate research seminar.

In addition to our active colloquia series (see Section IV E), our subgroups, *Social Dynamics and Complexity* has a weekly series (that involves several other universities), the *Social Networks Research Group* has weekly discussion meetings as does the newly formed *Evolution of Signaling Systems* group. Information about their activities can be found in the report; let me encourage you to read them.

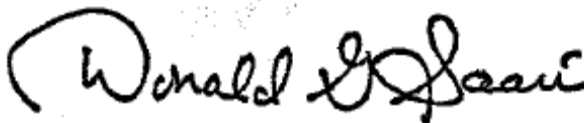
In summary, 2009-10 was a successful year for the IMBS. Success must be measured by how the institute helps our members advance their research programs. This means we need your continual support, participation, and, of particular importance, ideas and suggestions! Success also must be measured in terms of how IMBS helps promote interdisciplinary research and discussions across campus, how it helps develop the talents of our graduate students. As the report demonstrates, we are doing a strong job, but we always can do better; as such, we welcome suggestions about what else we can be doing.

Although the financial difficulties hit us during the 2009-10 academic year, the IMBS enjoyed a full, active year, and we expect to do the same during the coming year; indeed, several conferences currently are being planned. As this report proves, the cost of the institute is most modest, particularly considering the impact we have in terms of funding, helping to develop and promote new approaches, our work with graduate students, and the impact that the IMBS has been having on a variety of fronts as outlined in this report. While it is not clear what will be possible to do during the new academic year, we are hoping for the best.

To conclude, I want to thank two people. During spring term, I was on leave (in part at the Santa Fe Institute); *Kim Romney* agreed to serve as Acting Director while I was gone. He did a great job! Our thanks!

Another person who is central to the IMBS and who constantly does a great job is *Janet Phelps*; as everyone familiar with the IMBS knows, she always plays a key and important role for the success of the IMBS. My warm and deep thanks to Janet for everything she continually does to make the IMBS run so smoothly!

Sincerely,

A handwritten signature in black ink that reads "Donald G. Saari". The signature is written in a cursive, flowing style with a large initial 'D'.

Donald G. Saari
Director, IMBS

I. ORGANIZATION AND ADMINISTRATION

A. Administration

The Director of the Institute for Mathematical Behavioral Sciences is Professor Donald G. Saari. He reports both to the Dean of the School of Social Sciences and to the Vice-Chancellor for Research. An Executive Committee for consultation and decision-making regarding the long-term direction of the Institute assists the Director, (section B below).

The staff of the Director's office consists of an Administrator. Presently, some bookkeeping and personnel matters are being taken care of by the School of Social Sciences.

Director:	Donald G. Saari, 2003-present
Previous Directors:	R. Duncan Luce, Founding Director, 1989-1998 William H. Batchelder, 1999-2003
Graduate Director:	Louis Narens
Graduate Advisors:	Marek Kaminski & Michael McBride
Administrator:	Janet Phelps

B. Executive Committee

Carter Butts, Associate Professor of Sociology
Marek Kaminski, Associate Professor, Political Science
Michael D. Lee, Associate Professor, Cognitive Sciences
Mark Machina, Professor of Economics, UC San Diego
Stergios Skaperdas, Professor of Economics
Brian Skyrms, Professor of Philosophy

II. RESEARCH

A. Current Research Programs

The 63 members of the Institute for Mathematical Behavioral Sciences (IMBS) and their research interests are listed in Appendix A.

The IMBS is roughly partitioned into five research clusters. These are listed below and should be considered as informal intellectual groupings, rather than formal structures.

1. Measurement Theory, Foundational Issues, and Scaling Models: Barrett, Batchelder, Burton, Falmagne, Lefebvre, Luce, Maddy, Narens, Romney, and Skyrms

2. Statistical Modeling:

Cognitive: Baldi, Batchelder, Doshier, Eppstein, Falmagne, Lee, Iverson, Riefer, Romney, Smyth, Steyvers, and Yellott

Economic: Brownstone, Poirier, Saari, and Small

Sociological/Anthropological: Boyd, Butts, Faust, Freeman, and White

3. Individual Decision Making: Birnbaum, Keller, Luce, Machina, Narens, and Saari

4. Perception and Psychophysics:

Vision: Braunstein, Chubb, DeFigueiredo, D’Zmura, Hoffman, Iverson, Palais, Romney, Sperling, Srinivasan, Wright, Yellott, Xin, and Zhao

Psychophysics and Response Times: Brown, Falmagne, Iverson, Luce, Narens, and Yellott

5. Social and Economic Phenomena:

Economics and Game Theory: Branch, Brownstone, Brueckner, Burton, Frank, Garfinkel, Komarova, Kopylov, Levin, McBride, Poirier, Skaperdas, Skyrms, Saari, and Small.

Public Choice: Cohen, Glazer, Grofman, Kaminski, Keller, McGann, and Uhlaner

Social Networks: Batchelder, Butts, Boyd, Chiang, Faust, Freeman, Noymer, Romney, and White

Social Dynamics and Evolution: Butts, Huttegger, Narens, Romney, Saari, Skyrms, Smyth, Stern, and White

B. Publications

The members who have replied report a total 197 journal publications (published or in press) for the current academic year. These are listed in Appendix B.

The IMBS has a technical report series that is available to all members and qualified graduate students who are submitting a paper to a refereed journal or book. The series editor is Donald Saari. Appendix C lists the 14 technical reports issued during the academic year. Technical reports since 1993 can be found under “printed resources” on the Institute’s web site at www.imbs.uci.edu.

C. Public Talks and Colloquia

IMBS members actively participated in numerous off-campus research seminars and conferences. The members who replied gave a total of 188 talks listed in Appendix D. Their awards and achievements for this year can be found in Appendix E.

D. Summaries of Significant Findings

An important aspect of the Institute is the research conclusions developed by its members. What follows is a sample of what has happened this year.

Measurement Theory, Foundational Issues, and Scaling Models

Statistical Modeling

William Batchelder

My active research grants are to further develop models and statistical inference for ‘Cultural Consensus Theory (CCT).’ CCT was invented in the 1980s by Professor A.K. Romney and myself, and it has become the leading methodological approach in cultural anthropology for

pooling information from groups of informants who share cultural beliefs. The goal is to estimate the likely consensus beliefs unknown apriori to the researcher. Example application areas could be to develop the syntax of an exotic language, piece out the events from eyewitnesses to a traumatic event, determine superstitious medical beliefs, determine ties in a covert social network, and to pool data from forecasters of future events.

Jeff Barrett

I was awarded an NSF grant this last year to organize the papers that were recently found of Hugh Everett III on the many-worlds formulation of quantum mechanics. This will lead to a new volume of Everett's collected works published by Princeton University Press and an online archive of scans of the work at UCISpace. I am writing a conceptual introduction and commentary for the volume.

I have also been thinking about physical computation (what our best physical theories actually might allow one to compute) and evolutionary game theory.

David Eppstein

My paper “The h-index of a graph and its application to dynamic subgraph statistics” with sociology student Emma Spiro concerns methods for speeding up the steps in Monte Carlo simulations of social networks, by efficiently maintaining counts of the different subgraphs appearing in these networks. The key idea is to use the h-index, a concept from bibliometrics that we have adapted and generalized to apply to networks more broadly: the h-index of a graph is the largest number h such that the graph has at least h vertices all of which have degree at least h . We show how to compute the h-index efficiently, and we show experimentally that many real-world networks of different types have small h-index values.

Louis Narens

During the past year, Narens worked with IMBS colleagues on three grants, two from NSF of which he is Co-PI, and one from AFOSR of which he is PI. The NSF grants are about (1) an evolutionary game-theoretic approach for understanding the psychological and social bases involved in the emergence of culturally defined categories (e.g., color naming), with Kimberly Jameson of IMBS and Natalia Komarova of Mathematics as collaborators, and (2) the developing and testing of new models for psychological judgments of intensity, with R. Duncan Luce and Ragnar Steingrímsson of Cognitive Science as collaborators. The AFOSR grant is about developing alternative probability theories based on new event spaces for applications in psychology, economics, and game theory. These new event spaces allow for counterfactual reasoning, emotional decision making, and uses of various levels of knowledge in ways that are not possible to describe using the standard event structures or logics that current probability theory is based on. The AFOSR research is done in collaboration with Brian Skyrms of the Department of Logic and the Philosophy of Science.

The grant research has resulted in a number of colloquia at other universities and presentations at national and international conferences by my collaborators. My own presentations include a voting conference at UCI, a foundations of mathematics conference at the University of Chicago,

a presentation to the Air Force at Arlington, and a presentation at the Annual Mathematical Psychology Meetings, Portland.

The main bulk of my research effort has been devoted to producing a book on alternative probability theories. I have also worked with Donald Saari in applying new topological methods for psychological research. These methods employ homotopy theory, and we are applying them to the psychophysics of color and to the cognitive modeling of emotion in faces. During this year we have, with the help of Kimberly Jameson (IMBS) and Nancy Alvarado (Cal State Polytechnique), collected data using facial expression stimuli to test our modeling methods. During this period the article, Narens, "A foundation for support theory based on a non-Boolean event space," has been published in the *Journal of Mathematical Psychology*, and the article, Duncan Luce, Ragnar Steingrimsson, and Louis Narens, "Are Psychophysical Scales of Intensities the Same or Different When Stimuli Vary on Other Dimensions? Theory with Experiments Varying Loudness and Pitch," was submitted and accepted for publication in the journal *Psychological Review*.

I am currently in the process of preparing a large grant proposal as PI for NSF's program in Cyber-Enabled Discovery and Innovation, with Kimberly Jameson, Natalia Komarova, Brian Skyrms, and Kevin Zollman (CMU) as Co-PIs. This grant integrates the applied game-theoretic research of the above investigators to the challenging problem of simultaneously co-evolving social networks, shared concepts, and shared knowledge, and will show how this co-evolution impacts language systems and social institutions.

Decision-Making

Robin Keller

In "Product Quality Risk Perceptions and Decisions: Contaminated Pet Food and Lead-Painted Toys" (forthcoming in *Risk Analysis*), Tianjun Feng (UCI Merage doctoral alumnus, assistant professor at Fudan University), L. Robin Keller (UCI Merage School professor), Liangyan Wang (UCI Merage doctoral alumna, associate professor at Shanghai Jiao Tong University), and Yitong Wang (UCI Merage doctoral student) examine patterns of risk perceptions and decisions when facing consumer product-caused quality risks, in the context of the recent recalls of contaminated pet food and lead-painted toys in the United States. Two approaches were used to explore risk perceptions of the product recalls. In the first approach, they elicited judged probabilities and found that people appear to have greatly overestimated the actual risks for both product scenarios. In the second approach, they applied the psychometric paradigm to examine risk perception dimensions concerning these two specific products through factor analysis. There was a similar risk perception pattern for both products: they are seen as unknown risks and are relatively not dread risks. This pattern was also similar to what prior research found for lead paint. Further, they studied people's potential actions to deal with the recalls of these two products. Several factors were found to be significant predictors of respondents' cautious actions for both product scenarios. They discussed policy considerations regarding product quality risks. For example, risk communicators could reframe information messages to prompt people to consider total risks packed together from different causes, even when the risk message has been initiated due to a specific recall event.

Vladimir Lefebvre

This year I spent working on the reflexive game theory. This theory is intended to address problems different from those addressed by classical game theory. Its goal is to predict the individual choice made by a subject belonging to a group and outline the possibility for controlling this choice. The term subject refers to single individuals or to various types of organizations: political parties, military units, states, and even civilizations. Relations between the interests of a group and those of individual subjects are regulated by a rule called the anti-selfishness principle: a subject in a group while pursuing one's own goal may not cause harm to the group as a whole. This principle is as important in reflexive game theory as is the principle of guaranteed results in classical game theory.

R. Duncan Luce

One major project was concluded and another was one actively underway during 2009-2010.

(1) The concluded project was my work – a good deal joint with János Aczél, A. J. Marley, C. T. Ng -- on issues about utility theory. The two solo papers in 2010 involves the basic decision making insight of Luce (2010a) that there must be three types of people vis-à-vis risk, and which provides an empirically simple behavioral criterion for determining a person's type. This raises the question whether the experiments that various people have carried out testing the several invariance properties that theorists have posited actually need to be redone, carefully separating respondents by type. This project is described in the in press article Luce (2010b). In brief, although some invariance properties are unaffected by respondent type, the more elaborate ones that rest upon links between the structure of joint receipts and that of uncertain alternatives are so affected, and therefore need to be redone. This is a fairly major experimental program.

(2) The longer term project which involved, this year, Louis Narens and Ragnar Steingrímsson and me is exploiting predictions from my global psychophysical theory (Luce, 2004, 2008) in the *Psychological Review* involving both auditory and visual stimuli using visual equipment purchased under a supplementary grant to the main one. It brought to successful conclusion empirical work described in Luce, Steingrímsson, and Narens (2010), which establishes that the ratio scale of loudness at each frequency can be cast as a single ratio scale that for each frequency reduces to the usual one. So loudness of pure tones is a unitary concept. Similar work is being actively pursued for brightness now that we have suitable visual equipment. When that is done and if successful, we will next explore cross modal auditory and visual matching to ask whether the evidence supports the hypothesis that subjective intensity is really the same scale for both loudness and brightness? If so, matching loudness to brightness makes sense. If that is sustained, does it apply to other domains? For example, Linda Bartoshuk (in an invited address at the 2009 San Francisco meeting of the Association of Psychological Science) proposed replacing the quite unsatisfactory 10-point category scale of subjective pain – widely used in hospitals to evaluate pain level to decide on medications – by having people match loudness of comparable subjective intensity to their experienced pain. Her proposal currently lacks good scientific justification; we hope to be able to provide one.

Perception and Psychophysics

Donald Hoffman

Does natural selection favor veridical perceptions, those that more accurately depict the objective environment? Students of perception often claim that it does. But this claim, though influential, has not been adequately tested. Here we formalize the claim and a few alternatives. To test them, we introduce "interface games," a class of evolutionary games in which perceptual strategies compete. We explore, in closed-form solutions and Monte Carlo simulations, some simpler games that assume frequency-dependent selection and complete mixing in infinite populations. We find that veridical perceptions can be driven to extinction by non-veridical strategies that are tuned to utility rather than objective reality. This suggests that natural selection need not favor veridical perceptions, and that the effects of selection on sensory perception deserve further study.

Kimberly Jameson

Significant research advances were made during 2009-2010 on issues related to how individual variation in the processing of environmental color impacts (a) the sharing of human color communication systems, and (b) the evolutionary dynamics of color meaning systems. These advances were largely the product of (i) modeling and comparative analyses of color vision behavior, genetics and neural processing in animals and humans, and (ii) findings from simulation investigations using artificial agent color category learning and shared categorization evolution (with N. Komarova, UCI Mathematics).

Due in part to the past years scientific advances, new collaborative relationships were established and led to currently-on-going, or under development, new projects. These projects include: (1) empirical investigations of human and robot color communications and the sharing of information among observers with varying perceptual processing (with N. Komarova UCI, Mathematics & P. Goebel, The Center for Advanced Study in the Behavioral Sciences at Stanford & CEO of Vista Robotics, LLC); (2) empirical investigations of color perception variation correlated with photopigment opsin genotype in thirteen sub-Saharan African ethnic groups (with S. Tishkoff, U. of Pennsylvania Medical School, Genetics and Biology); and (3) empirical investigations of the processing of reflectance spectra by fish in the Salmonidae family and the design of fly-fishing lures (with J. Miyamoto, U. Washington, Psychology & J. Anderson, U. Washington, School of Aquatic and Fishery Sciences).

In addition, a research direction was undertaken in the mathematical modeling of the individual neural processing of facial expression of emotion, and thus far empirical data for a substantial number of subjects has been collected through experimental investigations. This is a very interdisciplinary project and a collaborative effort between me, N. Alvarado, CSU Pomona, Psychology; D. Saari, UCI Mathematics and IMBS; and L. Narens, UCI Cognitive Sciences. Finally, in 2009 a new funding award supplied new technology that permits significant advances in the generation of stimuli with highly specific reflectance properties, using a rapid computer-controlled interface format. This advanced technology is currently being evaluated (with M. Webster, U. Nevada, Reno, Psychology) and programmed (with J. Yellott, UCI IMBS), and promises in the coming years to open up a new direction in the empirical testing of human color perception in my research program.

Lisa Pearl

Social information is available in text such as intentions like persuasion and deception, emotions like embarrassment and disbelief, and attitudes like politeness, rudeness, and confidence.

However, advanced machine learning techniques cannot be developed to automatically extract this information and/or identify messages likely to be confusing to humans without having large reliable databases to work with that have text annotated with the social information of interest. Drawing from computational social science, we designed a game with a purpose that encourages humans to annotate the necessary data in the context of a game. We found that this methodology yields useful databases of social information in text. In addition, we discovered a wisdom of the crowds effect where the crowds combined perception of the social information was more accurate than any individuals perception. Important findings in native language acquisition:

(1) A lively debate has been going for many decades in the cognitive science community regarding the nature of language acquisition, specifically whether native language learning requires language-specific innate knowledge or whether this difficult task can be accomplished with only domain-general learning mechanisms that apply to many other areas of cognition besides language. We investigated a well-known linguistic phenomenon that plays a role in the debate, known as anaphoric *one*. Traditionally, this phenomenon was thought to require language-specific innate knowledge to successfully learn. Recently, it has been argued that a domain-general learner using Bayesian inference could successfully learn the relevant knowledge. We found that this is true only if the Bayesian learner incorporates language-learning biases that are in fact language-specific in nature. This suggests that there is still a significant role for language-specific knowledge in this area of native language learning.

(2) An implicit assumption of many theoretical proposals of linguistic knowledge representation concerns language acquisition: If children already know the potential options for how language is represented (say, in the form of linguistic parameters and the values these parameters can take), learning the adult language representation is simple. This implicit assumption has rarely been explicitly tested. I examined this claim for metrical phonology systems that have been proposed to account for English. Surprisingly, I found that the commonly accepted analysis for adult English is not the analysis that is most compatible with English child-directed speech. This suggests that English children either (1) acquire a different analysis from English data, calling into question the validity of the current English analysis, or (2) have some additional knowledge that biases them to select the current English analysis. Exploring the second possibility, I discovered that a probabilistic learner who is biased to learn only from data perceived as unambiguous for a particular parameter value will select the English analysis when given English child-directed speech data. This suggests that the current English analysis may indeed be valid, but that children would require additional innate knowledge to learn it.

(3) Ideal Bayesian models are starting to become very popular in language acquisition research. However, one common criticism of them is that they do not explain how the child accomplishes the necessary data analysis in a cognitively plausible way. We implemented several constrained Bayesian learners that incorporated memory constraints and operated in an incremental fashion, the way that children are believed to process data. Applying it to the task of segmenting words from fluent speech, we found that many of our constrained learners performed nearly as well as the unconstrained ideal Bayesian learners did and in one notable case, actually out-performed ideal Bayesian learners. These results suggest that human processing limitations may actually be beneficial for solving this language acquisition task.

Jack Xin

Research progress is made with coworkers and students in (1) blind source separation of chemical and sound mixtures by formulating convex objectives through either geometric construction or silence detection, improving iterative stochastic approximation schemes; (2) homogenization and effective Hamiltonian of inviscid and viscous G-equation in premixed turbulent combustion (a level set Hamilton-Jacobi equation with non-coercive Hamiltonian), in particular the sensitive dependence of effective Hamiltonian on diffusivity.

Social and Economic Phenomena

(a) Economics and Game Theory

William Branch

Standard macroeconomic models assume a representative agent structure: perfectly functioning capital markets ensure that households and firms are able to hedge any heterogeneous risks. Most monetary models assume perfectly functioning capital markets and homogenous, perfectly rational households and firms. The financial crisis of 2008-2009 cast doubt on these assumptions. In recent research, I depart from these assumptions by assuming that financial markets may not be complete and that it is costly for households to plan/forecast perfectly rationally. In a series of papers, I show that heterogeneity may arise in equilibrium, and that this has strong implications for monetary policy and business cycle dynamics.

Jan Brueckner

Fundamental forces such as population and income growth help to cause urban spatial expansion. The resulting process of urban sprawl has been widely criticized, but economists argue that sprawl can be faulted on efficiency grounds only if the operation of the fundamental forces is distorted by market failures. Several market failures have indeed been identified, including unpriced traffic congestion, failure to account for open-space amenities in development decisions, and failure to levy marginal-cost-based infrastructure charges. One of my recent theoretical papers (coauthored with Robert Helsley) shows that the same market failures that contribute to urban sprawl also contribute to urban blight, another serious urban problem. To achieve this goal, the paper develops a simple dynamic model of an urban economy in which new suburban properties and older central-city properties compete for mobile residents. Then, with unpriced traffic congestion, underpriced infrastructure provision, or open-space amenities, both sprawl and blight arise from the natural operation of the land market: the cost of suburban living is inefficiently low, which distorts the allocation of population, drawing residents away from the downtown. This population shift in turn depresses housing prices in the center and undermines incentives to maintain or reinvest in existing structures. Under each market failure, the appropriate corrective policy shifts population toward the city center, improving maintenance incentives and reducing urban blight. The analysis thus demonstrates that blight reduction is a beneficial byproduct of policies designed to control urban sprawl.

Steve Frank

Why do observed patterns of nature often follow only a few different common patterns? Many people are familiar with the bell curve that shows the distribution of IQ or weight or other

common measurements. A few other curves describe the characteristic patterns for distances to galaxies or waiting times until a machine breaks. We showed that these different common patterns arise from two processes. First, the tendency for randomness to increase over time spreads the observations over wider measurements. That increase in entropy is widely known. Second, we added the restrictions that come from the way in which measurements are made. Measurement determines how one sees the world and therefore what sorts of patterns one observes. By combining entropy and measurement, we give what may be the first comprehensive theory that explains most of the common patterns of nature from a few basic principles.

Natalia Komarova

With my IMBS colleague K. Jameson I have continued to work on problems of human color perception and naming. In particular, I have started working on perceptual models of color spaces, and its relevance for high-level human cognitive tasks, such as odd-one-out triad choices. Such tests commonly used in color research allow for an interesting geometric interpretation. I also worked on mathematical modeling of eavesdropping in nature, and its possible impact on the evolution of language (or animal signaling systems). I also continued to work on mathematical modeling of cancer, focusing in particular on spatial modeling of cellular competition and cooperation, and the role of motility and cooperation in evolution. I also worked on topics related to Alzheimer's disease. In particular, I designed a method of extracting the mean and the variance in Alzheimer's disease stage duration from very sparse patient datasets. This enabled us to identify the existence of two groups of Alzheimer's patients, which we termed "rapid" and "slow" progressors. Another topic of my research has been cross-resistance in leukemia drug treatments.

Igor Kopylov

I have developed a new axiomatic approach to modeling expected utility together with model uncertainty. Starting from preferences over menus of objective lotteries or the Savage-style acts, my result uncovers the decision maker's unique subjective finite set of models M and her expected utility function with a unique second-order belief over M . Unlike the existing representations for model uncertainty and second-order beliefs, my framework does not require that bets can be made contingent on the realization of the model in the set M . Such bets are both empirically and conceptually problematic. Therefore, my result should provide a useful insight for many applications of model uncertainty and robustness in macroeconomics, econometrics, and decision theory. This result builds on one of my earlier papers "Finite Additive Representations for Preferences over Menus".

Simon Levin

I have become convinced that solutions to the world's crucial environmental problems will require a more seamless integration of ecological science and economics, and a closer coupling of basic science and policy. This has been reflected in work and publications on the robustness and resilience of ecological and economic systems; on the importance of discounting for how humans use resources in an uncertain environment; and on the challenges of management where public goods are at stake, and where social norms dominate behaviors. The latter effort has led to a variety of collaborations, for example with a large group that I have led through the sponsorship

of the McDonnell Foundation, and through a Special Year on Social Norms at the Institute for Advanced Study, which I co-directed with Debbie Prentice (Professor of Psychology, Princeton University) and Eric Maskin (Professor of Social Science, Institute of Advanced Study).

As in the past, my research program continues to have four main thrusts:

- (1) Fundamental laws of biology
- (2) The dynamics of biodiversity and biocomplexity
- (3) The dynamics of infectious diseases
- (4) The interface between ecological systems and socioeconomic systems

In all of these, a central thread is the development of rules for scaling from the microscopic to the macroscopic, from individuals to collectives, from small scales to large, from short time scales to long. I am also committed to building interfaces between theoretical investigations and their applications to the management of natural resources, and to use applications to stimulate theoretical investigations.

Dale Poirier

The *Handbook of Bayesian Econometrics* (J. Geweke, G. Koop, H. Van Dijk, eds., Oxford University Press, forthcoming) is the first handbook of Bayesian econometrics. It has brought together worldwide leaders in the field. My contribution deals with foundational issues in subjective probability.

Donald Saari

A main thrust of my research is to continue to develop my observation that the standard "divide and conquer" methodology (which is common in almost all disciplines) introduces an unexpected form of complexity; this complexity tends to frustrate achieving intended objectives. Indeed, this result can be viewed as a form of an Arrow impossibility theorem that is applicable to almost anything. Topics where this theme is being developed include standard modeling in economics and management (a paper will appear shortly), in engineering (a paper in the engineering *Journal of Mechanical Design* will appear in Sept 2010), and in astronomy in the context of "dark matter" (one paper is scheduled to appear in fall of 2010, another is being written). A recent NSF grant, which starts in Dec. 2010, will support my analysis of how to circumvent this weakness.

Another thrust continues to be my analysis of group decision rules. This is taking four directions. First, I recently discovered how to relate the game theoretic concept of a core to whether or not a large collection of paradoxical difficulties in group decisions can arise. A book is being prepared to describe all of this. Second, I continue my work of finding an explanation for all possible ranking paradoxes with normal voting rules. This NSF supported research is coming to a close; I now can describe all of this in terms of symmetry structures that define a "coordinate system" for the space of profiles. Third, I have been exploring where these results can be applied in other areas. With a former graduate student, we have shown that the same symmetry structures I developed to explain voting systems also applies to non-parametric systems in statistics. (Paper submitted) With Louis Narens, we are discovering how some of the topological approaches address questions in psychology. Recently, I discovered that this mathematical structure answers questions about a widely used decision approach called "Analytic Hierarchy Procedure" (AHP). It turns out that a simple map creates an isomorphism with voting rules, so the voting structure

that is being used to find answers can be applied to AHP. And, in another publication being prepared, I am showing how some of these structures help explain concerns from economics such as price dynamics.

(b) Public Choice

Marek Kaminski

I continue to work on extending the principle of backward induction to a larger class of games than finite games of perfect information. Preliminary results show that such an extension is in fact universally possible for various types of strategies and for games that admit incomplete information, a continuum of actions, and infinite play. The entry for the Encyclopedia of Operations Research and Management Science summarizes our present understanding of backward induction.

Anthony McGann

In articles published this year, I demonstrate that the liberal conception of political equality (treating all individual voters equally) logically implies proportional representation in legislative elections. Thus the case for proportional representation does not rest on any idea of group fairness, but rather on the far more fundamental idea that individuals be treated equally. This contradicts the basis for at least one significant US Supreme Court finding (Vieth vs. Jubilirer 2004).

(c) Social Networks

John Boyd

I am now working on using spectral analysis on weighted digraphs. This generalizes the approach taken by the founders of Google in their PageRank analysis of websites.

Katherine Faust

My paper “A puzzle concerning triads in social networks” examines the seemingly contradictory results that, although a large majority of social networks from diverse animal species and social relations show substantial triadic patterning, in comparative perspective around 90% of the variance in observed distributions across the 16 triad isomorphism classes can be explained by lower order graph properties, such as the dyad census. The paper resolves this puzzle by mapping a theoretical space of triad expectations within which expectations for empirical networks are located. Within the theoretical space, any empirical network is constrained to fall within an extremely limited region.

My review chapter “Animal social networks” outlines structural parameters that are foundational for all social networks, regardless of species, and reviews recent substantive findings in the study of animal social networks.

Andrew Noymer

I work on the area where two complex systems interface: Epidemiology. While work on the spread of diseases is now a well-elaborated sub-field of mathematical biology, the complex social system also affects who gets diseases, when, and with what severity. As a sociologist/demographer, I work mostly on social and historical epidemiology, though some of my work straddles this area and methodological and modeling concerns. I continue to do much work on influenza pandemics, the subject of my PhD dissertation (2006). The impact of pandemics is socially-mediated: in 1918, my work shows that the *subsequent* epidemiology of tuberculosis was affected by the pandemic. This points to a disproportionate impact on the tuberculous (disproportionately, then as now, a poor group) by the influenza pandemic. I am working on papers on a number of aspects of social and technical epidemiology.

E. Research Seminars and Activities

The research activities of the Institute members often result in graduate research seminars. Among those this year were:

- Mathematical Models of Cognitive Processes [Batchelder]
- Topics in Evolution [Frank]
- Learning in Games [Huttegger]
- Experiential Learning Field Study [Keller]
- Decision Analysis [Keller]
- Workshop on Hierarchical Bayesian Modeling (before Annual Meeting of Society for Mathematical Psychology, Amsterdam, August 2009) [Lee]
- Philosophies of Common Sense [Maddy]
- Computational Models of Language Learning [Pearl-Steyvers]
- Social Dynamics [Saari, Narens, Skyrms]
- Methods and Models [Saari, Narens].
- Colloquium in Transportation Science [Small]
- Transportation Economics [Small]

INTER-DISCIPLINARY READING GROUP SPANNING UC SCHOOLS (UCI & UCLA): COMPUTATIONAL MODELS OF LANGUAGE

Assistant Professor of Cognitive Science, Lisa Pearl, has started a discussion group on computational models of language spanning multiple UC Schools. The group meets every two weeks to discuss topics concerning computational models of language, including mathematical models of language acquisition by humans and models of information extraction from language by humans. Information can be found at:

<http://www.ling.cogsci.uci.edu/~colalab/CoLaReadingGroup/index.html>

EVOLUTION OF SIGNALING SYSTEMS

Kimberly A. Jameson (Project Scientist, IMBS), Natalia L. Komarova (Mathematics), Louis Narens (Cognitive Sciences), and Ragnar Steingrímsson (Project Scientist, IMBS) formed a group doing research in the evolution of psychological categories, with special emphasis on the

evolution of color naming (signaling) systems from the point of view of culture, cognition, and artificial intelligence. In Fall 2007 this subgroup received a \$410,000 grant from NSF (Komarova, PI) to fund this research. The primary aims of this research are summarized as follows: A longstanding issue in the humanities and sciences is distinguishing aspects of human behavior that are primarily biological from those that are primarily social or cultural. One issue with a long history of scientific investigation involving the fields of physiology, linguistics, psychology, anthropology, and more recently genetics, is color categorization and naming. In this area the issue is whether universal tendencies exist in the ways different linguistic societies categorize and name perceptual color experiences.

The most popular view in the empirical literature on color categorization and naming is that the commonalities of color categorization across individuals and cultures are largely explained by two factors: (i) physiological features of human perceptual color processing, and (ii) universal features of individual psychological processing believed to underlie color experience. The established position in the area is a strong form of this universalist view that asserts that the pan-human uniformity in human visual processing gives rise to a regular, if not uniform, pan-human phenomenological color experience, and that this regularity is the basis for the empirically observed regularity in color categorization across cultures.

The extreme form of the alternative view to this established position in the literature is a relativist one that asserts that very little in the way of "universal tendencies" exist, and that most of the "universalist" findings in the literature are more attributable to constraints imposed by the empirical assessment of the phenomena than they are to actual features of color categorization phenomena. And of course there are other positions that blend the universalist and relativist ones. Various languages have different color naming systems. In a few of these, i.e., those with a long tradition of writing, the evolution of a color naming system can be traced through historical, linguistic, and anthropological analyses, for example the evolution of color terms from Homeric Greek (which had only color words only for black, white, a red-purple color, and a green-yellow color) to modern Greek. The data for such analyses is obviously weak compared to experimental data where a individuals from a populations is asked to name, as in the World Color Survey of 110 non-industrialized ethnolinguistic societies, about 400 carefully chosen color chips, and for each name to produce a chip that best exemplifies that name.

However, such experimental data only shows the current state of a long evolutionary process of a given language, and across languages, the states along the evolutionary trajectory may differ. Drs. Komarova, Jameson, Steingrimsson, and Narens saw that they could apply evolutionary game theory to explain the regularities observed in color naming across the societies in the World Color Survey, as well as provide an evolutionary theory -- supported by mathematical theory and computer simulations -- explaining why these regularities came about. Unlike the established position regarding color categorization and naming, Drs. Komarova, Jameson, Steingrimsson, and Narens approach emphasizes individual differences in color perception, pragmatic influences, and efficiency of communication, instead of universal color perception determined by a pan--human biology, and their research involves a formal mathematical presentation of their ideas with theorems and simulations to validate their conclusions. The ultimate goal of their research is to explain experimental regularities found in over 100 years of experimental cross-cultural studies of color naming. The described research has also been enriched by conferences and seminars on

evolutionary game theory sponsored by the Institute, Drs. Komarova of Mathematics, Jameson and Steingrimsson of IMBS, and Narens of Cognitive Sciences.

Initial significant advances of this work, revealing heretofore undemonstrated exogenous constraints on color categorization dynamics, appeared in *Journal of Mathematical Psychology* in 2007. Subsequent new advances formally demonstrating evolutionary trade-offs between simulated observer variation, environmental structure and communication pragmatics were reported in *Journal of Theoretical Biology* in 2008. In 2009 two publications crucial to the realistic generalizability of the earlier formal results appeared in *Journal of the Optical Society of America (JOSA)*. Both the JOSA articles were honored by independent editorial selection for reprinting in the *Virtual Journal of Biomedical Optics* in 2009. Among the findings the JOSA articles empirically show are, for the first time, the important formal and pragmatic mechanisms that likely contribute to shared meaning in realistic human populations of observers with diverse color processing phenotypes. Results from these latter papers also allow more informed interpretations of human color perception variation and the shared communication of basic sensory experience among substantially varying observer types. Two new articles appeared (one in 2009 and a second 2010 in *GlimpseJournal: The Art + Science of Seeing*) that were aimed at general scientific and public audiences for the purposes of communicating the wider implications of some of the theoretical and empirical results produced by this group.

With respect to extramural funding, the group has also enjoyed further success in the past academic year. In 2009 two supplemental funding awards from the National Science Foundation were coordinated by Jameson and submitted for the purposes of optimizing the research program of this Evolution of Signaling Systems group and the independent but complementary research program on perceptual psychophysics headed R. D. Luce, L. Narens and R. Steingrimsson. In 2009 both requests were awarded (detailed below) providing essential additional research resources for these projects.

(1) 2009 National Science Foundation Supplemental Funding Award. Evolutionary Game Theoretic Investigations into Color Category Evolution. Supplement to NSF-0724228 SES - Methodology, Measurement, & Statistics. Award Funded: \$34, 697. N. Komarova (PI), K. A. Jameson (Co-PI), L. Narens (Co-PI), Ragnar Steingrimsson (Co-PI). Request Type: Supplemental.

(2) 2009 National Science Foundation Supplemental Funding Award. "Empirical and Theoretical Studies of Psychophysical Phenomena." Existing Award Number: NSF-0720288 SES - Perception, Action & Cognition. Award Funded: \$16,184. R. Duncan Luce (PI), L. Narens (Co-PI), Ragnar Steingrimsson (Co-PI). Request Type: Supplemental.

One advantage these funds provide to the Evolution of Signaling Systems research includes the acquisition of cutting edge equipment needed to pursue significant, generalizable, theoretical modeling extensions of the project. The funds also allow essential augmentation and extension of existing published human data that are insufficient for our realistic modeling aims. The innovative OL 490 Agile Light Source device was obtained in early 2010 and is in the process of being evaluated and configured for use in the collection of human perceptual data, and it promises to advance the research program of this group to greater levels of specificity and generalizability.

It should also be noted that Jameson and Komarova are extending their results into the area of human-robot interactions and shared communication, and developed extramural funding applications on this topic, in addition to other federal funding applications to continue this research that group and their close collaborators have participated in during the past year.

As described in previous annual reports, this group continues to conduct the highly interdisciplinary IMBS Cognition and Color Critical Science Reading Group that focuses on the presentation and discussion of cutting-edge research in the area of, and areas directly related to, the NSF funded research. The seminar consists of a regular contingent of attendees comprised of Institute for Mathematical Behavioral Sciences Faculty, Emeritus Social Sciences Faculty, Cognitive Sciences Faculty; Logic and Philosophy of Science Faculty; Faculty from the Philosophy Department at Cal State University Long Beach; and several UC Irvine graduate student attendees. This reading group has thus far been the source of numerous research presentations relevant to the research project, and has generally contributed to a broader understanding of modeling and empirical challenges relevant to the area. The group meetings have also fostered the general dissemination of research in the area, and have served as a regular educational resource for this research topic that is not otherwise locally available. The group's websites containing content used during the funding period are available online.

New seminar schedules for the 2009-2010 funding period are found at:

<http://aris.ss.uci.edu/~kjameson/ColorCog.html>

<http://aris.ss.uci.edu/~kjameson/ColorCogFALL2009.html>

<http://aris.ss.uci.edu/~kjameson/ColorCogSPRING2009.html>

<http://aris.ss.uci.edu/~kjameson/ColorCogWINTER2009.html>

SOCIAL NETWORKS RESEARCH GROUP

The objective of the UCI Social Network Research Group is to:

- provide an informal setting for discussion of current and ongoing network-related research at UCI (and elsewhere);
- facilitate the exchange of information regarding new techniques, tools, data sources, and research findings;
- support graduate student training in the network field; and
- encourage collaboration among faculty and students on network-related topics.

The Social Network Research Group is organized and run by IMBS member Carter Butts, with participation by a number of other IMBS faculty (John Boyd, Katie Faust, Lin Freeman, Doug White, and Andrew Noymer). During the 2009-2010 academic year the group met weekly to discuss ongoing research on wide range of topics related to modeling complex relational data structures and processes. In addition to open discussions, the following research presentations were given this year:

FALL 2009

September 28

Dynamic Brokerage
Emma Spiro

October 5

What's "Social" About Social Networks?
Katie Faust

October 12

Exchange Networks as Social Hierarchies
Reuben Kline

October 19

Entailment Dynamics in US Political Participation
Lorien Jasny

October 26

Predicting Regional Identification with Tie Volume Models
Zack Almquist

November 2

Predicting Regional Identification, Continued
Zack Almquist

November 9

Using Spatial Covariates in ERGMs
Christine Bevc

November 16

Robustness of the WTC Radio Communication Networks
Sean Fitzhugh

November 23

Approximate Likelihood Methods for ERGMs
Arthur Asuncion

November 30

Indices for Lattice-like Properties of Directed Graphs
Carter Butts

WINTER 2010

January 15

Generalized Stochastic Blockmodels for Relational Event Data
Chris DuBois

January 29

Markov Chain Methods for Network Sampling: Some Recent Work
Carter Butts

February 19

Dynamics of Propositional Norms in Political Participation

Lorien Jasny

February 26

Group Homophily and the Emergence of Upstream Reciprocity

Yen-Sheng Chiang

March 12

Measuring "Neighborhood": Constructing Network Neighborhoods

John Hipp

SPRING 2010

March 29

Open Discussion

April 5

Some Further Advances on Network Robustness

Carter Butts and Sean Fitzhugh

April 12

Cross-sectional Evolution of Personal Network Properties on Twitter: Some Initial Results

Emma Spiro

April 19

Near-optimal Fixed-parameter Tractability of the Bron-Kerbosch Algorithm for Maximal Cliques

Darren Strash

April 26

Models for Regional Identification

Zack Almquist

May 3

Spectral Analysis of the Supreme Court

David Uminsky

May 10

Robustness in the WTC Communication Networks

Sean Fitzhugh

May 24

Update on WTC Radio Dynamics

Carter Butts

June 7

SOCIAL DYNAMICS AND COMPLEXITY RESEARCH GROUP

The focused research group in Social Dynamics and Complexity, headed by Professor Douglas White, has a mediawiki InterSciWiki web site for complexity, dynamics, and network sciences, 16 core members and 13 affiliates. It has a 5 year-long track record in biweekly videoconferences across the four UC campuses, and on-demand streaming replays of speakers in complexity social sciences and student/faculty discussions. The "idea is to have interdisciplinary and intercampus graduate seminars" carried out without the need of any formal institutional funding or administration. Each subgroup in this loose teaching/research network has their own graduate students, and undergraduates participate as well. The peer-reviewed e-journal of anthropological and related sciences, *Structure and Dynamics*, continues, and has now published 49 open access articles, widely cited (1,850 Google:hits, 167 Google Scholar listed articles, and 4000+ downloads), with 5 articles forthcoming in the next two issues. With completion of a fifth year in 2010 the group hopes to be indexed in the Intercollegiate Studies Institute (ISI). The group was the subject of a featured article by UCOP and the President's Office of Berkeley electronic Press, and is featured in the AA Newsletter. The newly created UC eRepository version of *World Cultures: eJournal of Cross-Cultural Research* has only begun to publish its first three issues with 13 articles but already has 1,450 Google:hits, 50 Google Scholar listed articles, 1000+ downloads, and will publish 15 legacy issues while it moves forward with new issues. The group has initiated EduMod sites on its InterSciWiki for open access instruction in a variety of research methodologies, from structural cohesion in social networks to causal analysis with Peer effects. It is in as second round of NSF grant submittals for intermeshed projects titled *Networks and Multilevel Anthropology* (D. White PI, D. Bell Co-PI) and *A New Dynamic Productive-Wealth Code for the Standard Cross-Cultural Sample* (D. Bell PI, D. White Co-PI). White has taken MBS graduate students for research projects the Santa Fe Institute three times in past years and will do so again this summer.

III. GRADUATE TRAINING

A. Ph.D. and M.A. Students

Louis Narens is the Director of the MBS graduate program. Others on the graduate committee who assist Professor Narens are Professors Marek Kaminski and Michael McBride. Working with the faculty of the Institute are 62 Ph.D. students, of whom 23 have advanced to candidacy during the year. They are listed in Appendix F. Of these, the following students were enrolled in the Ph.D. program in Mathematical Behavioral Sciences during the current academic year:

Kalin Agrawal
Matthew Feldman
Giorgio Gosti
Dan Jessie
Tom McIntee
Ray Mendoza
Heidi Tucholski
Sam Thorpe

Two new students, Robert Forbes and Bahattin Tolga Oztan, will be entering the program in fall.

During the year, the Institute continued a program of recruiting graduate students via a mass e-mail describing our program to the Chairs and key faculty of the major colleges and universities in the country.

Insofar as the Institute's budget allows, students in MBS as well as other students whose research relates to MBS are awarded summer stipends. Due to budget cuts, this year the IMBS awarded funds to its graduate students only. We hope to continue the tradition of awarding funds to other mbs-related students in the future.

B. Graduate Activities

This past year the IMBS graduate students organized student meetings with colloquia speakers. This gave students an opportunity to interact and network with professors. One of the goals is to gain some insight into how students perceive IMBS and how to facilitate more involvement of the social science student body. The students cooperated with other graduate students in putting on the 8th Annual Graduate Student Conference. The graduate organizers were Elliott Wagner and Reuben Kline. Following is the conference agenda:

8th ANNUAL GRADUATE STUDENT CONFERENCE

- 10:30 Tucker Lentz - LPS
Rationality and conventions
- 11:00 Bennett Holman - LPS
Methodological Problems and Statistical Solutions in Randomized Clinical Trials
- 11:30 Lunch
- 12:30 Dan Wolf – Political Science
Conflict and bargaining, extension of McBride+Skaperdas
- 1:00 George Ng -Economics
Land Redevelopment: The Hold Up and N-Agent Package Bargaining
- 1:30 15 minute break
- 1:45 Ryan Kendall - Economics
Lexicographic Preferences Embedded within Determining Bodies
- 2:15 Jonathan Cook - Economics
Intensive margin bias in the price of US imports and exports: How well can a Laspeyres index emulate a Fisher index?
- 2:45 15 minute break

3:00 Ray Mendoza - MBS
Extracting Semantic Information from Large Corpora of Texts

3:30 Greg McWhirter - LPS
Combinatorial signaling systems

4:00 10 minute break

4:10 Giorgio Gosti - MBS
Naming Games, Hierarchical Systems and the "Tower of Babel"

C. Undergraduate Training

The firm of Sanli Pastore & Hill, located in Los Angeles, has given a gift to the IMBS to support undergraduate students in Economics. The company is a business valuation, financial analysis and litigation consulting firm. The gift is for five years and is divided in two parts: one for a summer internship and one for a paper award in economics. The internship is for eight weeks and this year's intern will be Vykunth Ashok an undergraduate student in Economics. Last year's intern was economics undergraduate student Susan Weinfurther. This year's first-place winner for the "Excellence in Economics Writing" award was Tammy Smith Williams and she received \$500. The title of her paper was, "Can economics motivation explain votes in favor of minimum wage initiatives"? Second and third place winners were Yo-Long Lin, whose paper was titled, "On the determinants of environmental and trade policies", and Jay Simon, whose paper was titled "Decision-making with prostate cancer: A multiple-objective model with uncertainty".

Each year, the IMBS gives the "Jean-Claude Falmagne dissertation award" to a graduate student for the best dissertation that uses mathematics to develop conceptual advances for issues coming from the social and behavioral sciences. Going beyond the use of mathematics for computational purposes, the intent is to award a dissertation that uses concepts from mathematics to reach new conclusions. The prize is \$1,000 and this year's winner was Reuben Kline, graduate student in political science.

IV. COMMUNICATION

A. Conferences

The IMBS held conferences on various topics. Below are the conference agendas.

CONFERENCE ON INFERENCE AND IMAGING November 13-15, 2009

Friday, November 13

1:00 – 1:15 Opening Remarks by Donald Saari

1:15 – 2:00 "The Skeptic's Tale", William Uttal, Arizona State University

- 2:00 – 2:45 "On Combining and Contrasting Brains", Nicole Lazar, University of Georgia
- 2:45 – 3:00 Break
- 3:00 – 3:45 "When Is a Brain Like the Planet?", Clark Glymour, Carnegie Mellon
- 3:45 – 4:30 DISCUSSION

Saturday, November 14

- 9:00 – 9:45 "The pros and cons of circular inference", Christopher Baker, NIMH
- 9:45 – 10:30 "From Reverse Inference to Pattern Classification", Russell Poldrack, University of Texas at Austin
- 10:30 – 10:45 Break
- 10:45 – 11:30 "Power analysis for group fMRI", Jeanette Mumford, University of Texas at Austin
- 11:30 – 12:15 DISCUSSION
- 12:15 – 1:45 LUNCH
- 1:45 – 2:30 "Information mapping with multiple pattern classifiers", Francisco Pereira, Princeton
- 2:30 – 3:15 "Neurovascular factors in functional MRI: The need for multimodal approaches" Tom Liu, UCSD
- 3:15– 3:30 Break
- 3:30 – 4:15 "Using the Temporal Domain to Analyze Brain Functioning", Frithjof Kruggel, UCI
- 4:15 – 5:00 DISCUSSION

Sunday, November 15

- 9:00 - 12:00 GENERAL DISCUSSION

PUBLIC GOODS: From Ecology to Economics
 (Partial financial support from the Center for the Study of Democracy)
January 22-23, 2010

Friday, January 22

- 1:00 – 1:10 Conference begins with comments by Donald Saari, Director of IMBS
- 1:10 – 2:00 “Darwin's Revolution: Natural Theology to Natural Selection”, Francisco Ayala, UCI
- 2:00 – 2:15 Discussion
- 2:15 – 3:05 “Coordinated, contingent punishment is group beneficial and can increase when rare”, Robert Boyd, UCLA
- 3:05 – 3:20 Discussion
- 3:20 – 3:40 BREAK
- 3:40 – 4:30 “Microbial pathogenesis and metabolism: economic and social perspectives”
Steve Frank, UCI
- 4:30 – 4:45 Discussion

Saturday, January 23

- 9:00 – 9:50 “Evolution and Public Goods”, Simon Levin, Princeton
- 9:50 – 10:00 Discussion
- 10:00–10:50 “Using national pro-social preferences to provide global public goods”, Avinash Dixit, Princeton
- 10:50–11:00 Discussion
- 11:00–11:15 BREAK
- 11:15–12:05 “Ethics, evolution, and neighborly games”, Ted Bergstrom, UCSB
- 12:05–12:15 Discussion
- 12:15–1:45 LUNCH BREAK
- 1:45 – 2:35 “On the Free-rider Problem in Churches”, Michael McBride, UCI
- 2:35 – 2:45 DISCUSSION
- 2:45 – 3:00 BREAK
- 3:00 – 3:50 “Public goods in microbial ecosystems”, Steve Allison, UCI
- 3:50 – 4:00 DISCUSSION

“MODELING CONFLICT AND ITS GOVERNANCE”
(Partial funding from the Center for the Study of Democracy)
February 12-14, 2010

Friday, February 12

- 1:00 – 1:10 Comments by Donald Saari, Director of IMBS
- 1:10 – 2:00 “War Finance and Coercive Bargaining”, Branislav Slantchev, UCSD
- 2:00 – 2:10 Discussion
- 2:10 – 3:00 “Multi-Dimensional Diplomacy”, Robert Trager, UCLA
- 3:00 – 3:10 Discussion
- 3:10 – 3:30 BREAK
- 3:30 – 4:20 “Peace and War with Endogenous State Capacity”, Michael McBride, UCI
- 4:20 – 4:30 Discussion

Saturday, February 13

- 9:00 – 9:50 “Torture”, Sandeep Baliga, Northwestern
- 9:50 – 10:00 Discussion
- 10:00–10:50 “Vagueness, Prestige and Taboos”, Barry O’Neill, Political Science, UCLA
- 10:50–11:00 Discussion
- 11:00–11:15 BREAK
- 11:15–12:05 “Mediation and Peace”, Massimo Morelli, Economics and Political Science,
Columbia
- 12:05–12:15 Discussion
- 12:15–1:45 LUNCH BREAK
- 1:45 – 2:35 “International Trade and Transnational Insecurity: How Comparative Advantage
and Power are Jointly Determined”, Constantinos Syropoulos, Drexel
- 2:35 – 2:45 Discussion

2:45 – 3:00 BREAK

3:00 – 3:50 “The Optimal Defense of Networks of Targets”, Dan Kovenock, University of Iowa

3:50 – 4:00 DISCUSSION

Sunday, February 14

9:00-12:00 General Discussion

B. Conferences/Seminars organized by IMBS Members

William Batchelder

Co-Organizer with Richard Schweickert of Winer Memorial Lectures in ‘Processing Trees and Similar Models’, Purdue University, October 2009.

Co-Organizer with Marjite Raijmakers and Verena Schmittmann of “Symposium of Recent Developments and Applications of Mathematical Learning Theory”.

Michelle Garfinkel

Co-organized IMBS conference on “Modeling Conflict and its Governance”, with S. Skaperdas and D. Saari. UC Irvine, February 2010. .

Robin Keller

Arrangements chair for Southern California Operations Research/Operations Management Conference, May 2010, at UCI (co-sponsored with Pepperdine University). Conference rotates annually between UCLA, USC, and UCI.

Appointed member in 6/2009 of the International Programme Committee of the International Conference on “Uncertainty and Robustness in Planning and Decision Making.” INESC Coimbra, an R&D unit of the University of Coimbra, conference organized in the framework of the COST Action IC0602 on Algorithmic Decision Theory (www.algodec.org), held April 15-17, 2010.

Simon Levin

Co-Director: A Special Year on Social Norms. Institute for Advanced Study, Princeton, NJ.

Co-Organizer: Strategies to Predict the Antigenic Evolution of H1N1pdm. Chauncey Conference Center, Princeton, NJ.

Co-Organizer: National Science Foundation, Towards a Science of Sustainability Conference. Airlie Center, Warrenton, VA.

Co-Organizer: 2nd Symposium of Mathematical Systems Biology (Collective Dynamics in Biological Systems). Beckman Center of the National Academies of Sciences and Engineering, University of California, Irvine.

Organizer: DARPA Workshop on Evolution in Coupled Physical-Biological Models of Marine Ecosystems, Princeton University, Princeton, NJ.

Co-Organizer: Evolution, Ethics, and Environment: Biological Perspectives on Achieving a Sustainable Future Symposium (In Honor of the Inamori Foundation and Kyoto Prize Laureates B. Rosemary Grant, Peter R. Grant, Simon A. Levin, and Daniel H. Janzen), Princeton University, April 27, 2010.

Co-Organizer: DARPA Fundamental Laws of Biology Conference. Chauncey Conference Center, Princeton, NJ.

Lisa Pearl

Input and Syntactic Acquisition Workshop, September 11-12, 2009 at UC Irvine (with Jon Sprouse). <http://www.ling.cogsci.uci.edu/isa2009/index.html>

Kenneth Small

Program Committee, Kuhmo-Nectar Fourth Annual Conference on Transport and Urban Economics, Copenhagen, July 2009.

C. Future Conferences

The Institute is planning several conferences next year and topics are currently in discussion.

D. Visitors

The Institute hosted 2 visitors during the year. Letters can be found in Appendix H.

Willemien Kets
Omidyar Postdoctoral Fellow
Santa Fe Institute

Simon Levin
Moffett Professor of Biology
Princeton University

Next year the Institute will again sponsor the visits of Simon Levin, and Willemien Kets, and will also host Fulbright Fellow, Mikaela Fudolig from the University of the Philippines, Diliman.

E. Colloquia Series

During the academic year the Institute conducts a colloquia series with speakers both from inside as well as outside the Institute. For speakers outside California, we attempt, insofar as possible, to coordinate their visit with other travel to California. Some speakers are brought here jointly with UCLA's Marschak Colloquium where the speaker first talks at UCI on a Thursday and at UCLA on the following day. We distribute a relevant paper, when available, prior to each colloquium. Most papers are also downloadable from the IMBS web site at www.imbs.uci.edu.

Following are the IMBS colloquia.

FALL 2009

October 8

Jeffrey A. Barrett, Logic & Philosophy, Social Science, UCI
"The coevolution of theory and language"

October 15

I. R. Goodman, Space and Naval Warfare Systems Center and Donald Bamber, Cognitive Sciences, UCI
"Entailment in Conditional Probability Logics and Its Relation to Conditional Event Algebra"

October 22

Brian Skyrms, Department of Logic & Philosophy of Science, UCI
"Signaling Games and Networks: Dynamics and the Flow of Information"

October 29

Michael McBride, Department of Economics, UCI
"Conflict, Settlement, and the Shadow of the Future"

November 5

George Sperling, Department of Cognitive Science, UCI
"Towards a theory of the perception of motion direction. Plaids"

November 12

Andrew Noymer, Department of Sociology, UCI
"Do social gatherings predict influenza mortality?"

November 19

Rein Taagepera, Department of Political Science, UCI
"Interconnected knowledge requires symmetric regression"

WINTER 2009

January 7

Philip Stark, Department of Statistics, UC Berkeley
"Simple, Affordable, Risk-Limiting Election Audits"

January 14

Simon Levin, Department of Ecology & Evolutionary Biology, Princeton University.
“Intergenerational and intragenerational discounting: Lessons from evolutionary theory”

January 28

David Hirshleifer, Paul Merage School of Business, UCI
“Self-Enhancing Transmission Bias and Active Investing”

February 4

Ted Groves, Department of Economics, UCSD
“Decentralized Procedures for Video Multiplexing: Using economics to improve video communication protocols”

February 11

William H. Batchelder, Department of Cognitive Sciences, UCI
“Multinomial Processing Tree Models: Recent Formal Results and New Application Areas”

February 18

Mayuko Nakamaru, Dept. of Value and Decision Science, Tokyo Institute of Technology
“Evolution of cooperation in rotating indivisible goods game”

February 25

Pat Langley, Center for the Study of Language and Information, Stanford
“Computational Discovery of Explanatory Process Models”

March 4

Mark Machina, Department of Economics, UCSD
“Event-Separability in the Ellsberg Urn”

March 11

Hongkai Zhao, Department of Mathematics, UCI
“Image and shape classification”

SPRING 2009

April 8

Jeff Brantingham, Dept. of Anthropology, UCLA
“The Mechanistic Origin of Crime Hotspots”

April 15

Thorsten Ritz, Dept. of Physics and Astronomy, UCI
“Progress towards discovering the biophysical basis of magnetic sensing”

April 22

Eugene Galanter, Dept. of Psychology, Columbia
“Education for the New Century”

April 29

Don Hoffman, Dept. of Cognitive Sciences

“Natural Selection and Veridical Perceptions”

May 6

Carter Butts, Dept. of Sociology, UCI

“An Inferentially Tractable Behavioral Micro-foundation for Cross-sectional Network Models”

May 13

Michael D’Zmura, Dept. of Cognitive Sciences, UCI

“Intended Direction and Imagined Speech from EEG”

May 27

Yen-Sheng Chiang, Dept. of Sociology, UCI

“Partner Selection and the Emergence of Fairness”

B. Extramural Funding Activity

V. BUDGET

A. Appropriations and Expenditures

Appropriations:

IMBS 2009-10 Budget allocation	\$ 77,245
IMBS 2008-09 Carry Forward	\$ 26,002
Seed Grants	\$ 4,000
Total budget for 09-10	<u>\$107,247</u>

Expenditures:

Salaries (Director, Staff)	\$ 42,853
School Administrative Support	\$ 7,500
Conference/Colloquia	\$ 11,401
Equipment	\$ -0-
Supplies & Expenses	\$ 14,485
Graduate Student Support	\$ 26,000

Total Expenditures: **\$102,239**

Carry Forward to 2010-11: **\$ 5,008**

IMBS faculty research was supported by 47 research grants with 7 pending grants. Following is a detailed breakdown of the extramural funding.

GRANTS AWARDED AND ACTIVE:

PI	Source	Amount	Dates
Batchelder	NSF	\$240,000	7/06-8/010
<i>Multinomial processing Tree Models: New projects and Implementations, with X. Hu.</i>			
Batchelder	AFOSR	\$200,000	7/06-8/10
<i>Application of Cultural Consensus theory, with X. Hu.</i>			
Batchelder	Army Res. Office	\$355,000	7/10-8/13
<i>Statistical Inference for Cultural Consensus Theory.</i>			
Braunstein	NIH/NEI	\$499,579	10/07-8/12
<i>Subaward from UCR.</i>			
Brueckner	UC Trans. Center	\$66,245	6/09-7/10
<i>Transportation studies.</i>			
Butts	NSG ITR	\$8,957,651	10/03-9/08
<i>Collaborative Research: Responding to the Unexpected. Co-PIs S. Mehrotra, R. Eguchi, N. Venkatasubramanian, and M. Winslett.</i>			
Butts	NSF HD	\$749,999	6/08-7/09
<i>AOC: Improvisation in Emergency Response: Linking Cognition, Behavior and Social Interaction. Co-PIs D. Mendonca, and G. Webb.</i>			
Chubb	NINDS	\$1,212,209	1/09 -12/12
<i>Reflective light modulation by cephalopods in shallow nearshore habitats. PI: R. Hanlon, Marine Biological Laboratory, Woods Hole, MA. , Co-PI: C. Chubb.</i>			
Chubb	NINDS	\$419,781	1/09 -12/12
<i>Preattentive Visual Sensitivity. PI, C. Chubb; Co-PI, G. Sperling.</i>			
Eppstein	NSF	\$400,000	9/08 -5/011
<i>Algorithms for Grants on Surfaces. With M. Goodrich (UCI) and R. Tamassia (Brown).</i>			
Eppstein	ONR/MURI	\$1,400,000	9/08 -5/11
<i>Social network analysis.</i>			
Frank	NIH MIDAS	\$200,000	2/06-1/11
<i>Co-PI; Robin Bush, PI.</i>			
Frank	NSF	\$230,000	2/09-1/11
<i>Theoretical Biology.</i>			

Frank	J.S. McDonnell Foun.	\$50,000	2/09-1/10
Keller	NSF & U. of AZ	\$6,900,000	9/04-8/09
	<i>Decision Center for a Desert City.</i> Serve on decision research team with C. Kirkwood, C. Keefer and W. Verdini of ASU.		
Keller	UCI Environ. Inst.	\$48,000	Winter 2009
	<i>Using IT to Compress Perceived Time and Space in How People Think About Global Change: A Step Towards Behavioral Change.</i> PIs: Bill Tomlinson, Brett Sanders (Civil & Environmental Engineering), and Robin Keller (Merage School). \$12,051 to Keller and RAs, total \$48,000 = \$38,000 from Institute + \$10,000 from UCI UWRC.		
Komarova	NIH	\$299,564	7/05-6/11
	<i>Mathematical modeling of programmed CT proliferation.</i>		
Komarova	NSF	\$498,000	7/07-6/10
	<i>Evolutionary Game Theoretic Investigations into Color Category.</i> With K. Jameson, L. Narens and R. Steingrimsson as Co-PIs.		
Komarova	NIH	\$1,806,480	6/07-7/12
	<i>Quantifying the methylation rate in cancer cells: Computational and experimental approaches.</i>		
Komarova	NIH-ROI	\$375,000	7/05-3/12
	<i>Mathematical models of programmed CTL proliferation.</i> Role: Investigator. PI, D. Wodarz.		
Komarova	NIH-ROI	\$1,103,573	7/05-6/10
	<i>Specificity and spatial dynamics of cell signaling: Theory and experiment.</i>		
Komarova		\$3,067,892	6/07-7/12
	<i>Systems biology of morphogenesis and spatial information flow.</i> Role: Investigator. P.I. Arthur Lander.		
Lee	AFRL/AFOSR	\$456,000	1/07-11/09
	<i>Modeling Exploration and Exploitation in Structured Environments.</i> Co-PI, M. Steyvers.		
Lee	Alzheimer's Assoc.	\$80,000	9/08-8/10
	<i>Bayesian Methods for the Detection, Diagnosis and Treatment of Alzheimer's</i> (with Rod Shankle).		
Levin	Andrew Mellon Foundation..	\$295,000	10/08-9/11
	<i>Dynamics of South African Vegetation.</i>		
Levin	Defense Advanced Res. Proj. Agency	\$16,000,000	9/05-10/10
	<i>Microstates to Macrodynamics: A New Mathematics of Biology.</i>		

Levin	David and Lucile Packard Foundation	\$243,940	01/06-12/10
<i>Managing for Resilience: Science to Advance Ecosystem-Based Management in the Sea of Cortés Source of Support.</i>			
Levin	Defense Advance Res. Proj. Agency	\$5,200,000	8/10-7/11
<i>Predictive Biology: Adaptability, Robustness and the Fundamental Laws of Biology.</i>			
Levin	NSF	\$99,727	10/09-9/10
<i>Towards a Science of Sustainability: Conference Held Fall 2009 at Warrenton, VA. Co-PI: William Clark, Harvard University.</i>			
Levin	NSF	\$19,500	10/09-9/10
<i>Towards a Science of Sustainability: Conference Held Fall 2009 at Warrenton, VA. Co-PI: William Clark, Harvard University, Supplemental Grant.</i>			
Luce	NSF	\$350,000	9/07-8/10
<i>Empirical and Theoretical Studies of Psychophysical Phenomena. Co-PIs L. Narens and R. Steingrimsson.</i>			
Noymer	UC Pacific Rim	\$12,000	5/10-4/11
<i>Faculty Research/Planning Grant.</i>			
Noymer	NIH	\$3,000	7/09-6/10
<i>NIH Sub-Award grant.</i>			
Pearl	Navy	\$70,000	1/10-1/11
<i>Using Stylistic Topic Models to Detect Deception Through Unusual Linguistic Activity. N10A-T029, Information System for Uncovering Deception in Unstructured Data, with Mark Steyvers and Jeff Baumes.</i>			
Pearl	NSF	\$176,713	1/09-1/12
<i>Testing the Universal Grammar Hypothesis. Co-PI with Jon Sprouse.</i>			
Pearl	UCI Acad. Senate	\$13,000	1/09-1/10
<i>Linguistic Cues to Social Information .UC Irvine Academic Senate Council on Research, Computing, and Libraries Multi-Investigator Faculty Research Grant (PI), with Mark Steyvers and Padhraic Smyth.</i>			
Saari	NSF	\$300,000	9/06-9/11
<i>A Mathematical Foundation for Voting and Decision.</i>			
Saari	NSF	\$300,000	12/10-11/12
<i>Analyzing multi-scale and multi-unit methodologies.</i>			

Stern	NIH - NCRR	\$25,000,000	10/05-9/09
<i>Functional Imaging Research on schizophrenia Testbed. Chair of Statistics Working Group. S. G. Potkin (PI).</i>			
Stern	NSF	\$618,120	9/05-8/08
<i>Collaboration in Mathematical Geosciences (CMG): Characterization of Inter-Tropical Convergence Zone Dynamics and Breakdown Using Statistical Learning Methods and Satellite Data. Co-PI with G. Magnúsdóttir, P. Smyth.</i>			
Xin	NSF	\$300,000	7/07-6/10
<i>Dynamic Algorithms for Blind Separation of Convolutional Sound Mixtures.</i>			
Xin	NSF	\$1,950,568	9/09-8/14
<i>PRISM: UCI Interdisciplinary computational and applied mathematics program.</i>			
Xin	NSF	\$472,566	9/09-8/12
<i>ADT: Sparse Blind Separation Algorithms of Spectral Mixtures and Applications.</i>			
Zhao	ONR	\$560,000	2/06-11/09
<i>Time Reversal and Imaging in a Multiscale Environment and Applications to Imaging and Communications.</i>			
Zhao	DARPA	\$840,000	5/06-2/09
<i>Time Reversal and Imaging in a Multiscale Environment and Applications to Imaging and Communications. Co-PI on Phase II.</i>			
Zhao	MURI	\$600,000	5/07-9/12
<i>Model Classes, Approximation, and Metrics for Dynamic Processing of Urban Terrain Data.</i>			
Zhao	NSF	\$153,261	7/08-6/11
<i>The Fast Sweeping Method and Its Applications.</i>			

PROPOSALS PENDING

Levin	NSF	\$12,288	
<i>Dissertation Research: Moving Migration Theory to New Grounds: Information-Driven Movement, Reproductive Timing and Tradeoffs in Space, (Allison K. Shaw, Graduate Student, Princeton University).</i>			
Levin	NSF	\$14,225	
<i>Dissertation Research: What Determines the Global Distribution of Savanna? A Case for Complex Interactions Among Climate, Soil Resources, and Disturbance (Ann Carla Staver, Graduate Student, Princeton University).</i>			

Levin NSF \$1,977,955
Evolutionary Dynamics and Collective Foraging in Natural and Designed Populations (Co-PI: Naomi Leonard, Princeton University).

Levin NSF \$497,366
Dimensions: Biological Controls of Ocean C:N:P Ratios. Co-PI: Adam Martiny, University of California, Irvine.

Luce AFOSR \$373,427 9/10-8/12
Empirical and Theoretical Studies of Psychophysical Phenomena. Co-PI R. Steingrimsson.

McBride \$650,000 8/10-7/15
Inferring Structure and Forecasting Dynamics on Evolving Networks.

Xin AFOSR \$772,302
Sparsity Induced Convexity, Bregman Iteration and Fast Speech Extraction

VI. APPENDICES

APPENDIX A CURRENT FACULTY MEMBERS

MEMBERS

Pierre F. Baldi, (Ph.D. Mathematics, California Institute of Technology). Professor, Information and Computer Science, Director of the Institute for Genomics and Bioinformatics. Research areas: Bioinformatics/Computational Biology, Probabilistic Modeling/Machine Learning.

Jeffrey Barrett, (Ph.D. Philosophy, Columbia University). Professor of Philosophy, University of California, Irvine. Research areas: philosophy of science and the theory of knowledge, philosophy of physics.

William H. Batchelder, (Ph.D. Psychology, Stanford University). Professor of Cognitive Sciences, University of California, Irvine. Research areas: Mathematical modeling and measurement methodology in the social and behavioral sciences.

Michael H. Birnbaum, (Ph.D. Psychology, University of California, Los Angeles). Professor of Psychology, California State University, Fullerton. Research areas: Human judgment, decision-making, and utility measurement.

John P. Boyd, (Ph.D. Communication Sciences, University of Michigan). Professor of Anthropology, University of California, Irvine. Research areas: Algebraic models of social relations, quantitative methods, and sociobiology.

Myron L. Braunstein, (Ph.D. Psychology, University of Michigan). Professor of Psychology, University of California, Irvine. Research areas: Visual perception, especially depth and motion perception.

William Branch, (Ph.D. Economics, University of Oregon). Associate Professor of Economics, University of California, Irvine. Research areas: Macroeconomics, economic theory.

David Brownstone, (Ph.D. Econometrics and Applied Microeconomics, University of California, Berkeley). Professor of Economics, University of California, Irvine. Research areas: Computer-intensive analysis of statistical estimation strategies and applied econometrics.

Jan Brueckner, (Ph.D. Stanford University). Professor of Economics, University of California, Irvine. Research areas: Urban economics, public economics, industrial organization, and housing finance.

Michael L. Burton, (Ph.D. Anthropology, Stanford University). Professor of Anthropology, University of California, Irvine. Research areas: Economics anthropology, cognitive anthropology, and cross-cultural research methods.

Carter Butts, (Ph.D. Sociology, Carnegie Mellon University). Associate Professor of Sociology. Research areas: Computational and Mathematical Organization Theory, Games and Economic Behavior.

Yen-Sheng Chiang, (Ph.D. Sociology, University of Washington). Assistant Professor of Sociology. Research areas: Social Networks, Rational Choice Theory (Trust, Norms and Collective Action).

Linda Cohen, (Ph.D. Social Sciences, California Institute of Technology). Professor of Economics, University of California, Irvine. Research areas: Political economy, public choice, and governmental regulation of business.

Charles Chubb, (Ph.D. Experimental Psychology, New York University). Professor of Psychology, University of California, Irvine. Research areas: neural networks, perceptual learning, visual coding, visual short-term memory, and human choice behavior.

Rui De Figueiredo, (Ph.D. Applied Mathematics, Harvard University). Professor of Electrical and Computer Engineering and Mathematics, University of California, Irvine. Research areas: Mathematical foundations of neural networks, contextual feedback models for automated image understanding.

Barbara Doshier, (Ph.D. Experimental Psychology, University of Oregon). Professor of Cognitive Sciences, University of California, Irvine. Research areas: Memory, visual perception, and depth from visual motion.

Michael D'Zmura, (Ph.D. Psychology, University of Rochester). Professor of Cognitive Sciences, University of California, Irvine. Research areas: Visual perception, color, image understanding, and attention.

David Eppstein, (Ph.D. Mathematics, Columbia University). Professor of Computer Science, University of California, Irvine. Research areas: Computational geometry and geometric optimization, Triangulation and mesh generation, Graph drawing and information visualization, Data depth and robust statistics, Analysis of exponential-time algorithms.

Jean-Claude Falmagne, (Ph.D. Psychological Sciences, University of Brussels). Professor of Cognitive Sciences, University of California, Irvine. Research areas: Assessment of knowledge, measurement theory, psychophysics, and mathematical psychology.

Katherine Faust, (Ph.D. Social Science, University of California, Irvine). Professor of Sociology, University of California, Irvine. Research areas: Social Networks, research methods.

Steve Frank, (Ph.D. Biology, University of Michigan). Professor of Ecology and Evolutionary Biology. Research areas: Complex phenotypes; quantitative dynamics of genetical, biochemical, and cellular mechanisms.

Linton C. Freeman, (Ph.D. Sociology, Northwestern University). Research Professor of Social Sciences, University of California, Irvine. Research areas: Cognition of social structure, social networks.

Michelle Garfinkel, (Ph.D. Economics, Brown University). Professor of Economics, University of California, Irvine. Research areas: Strategic aspects of Monetary and Fiscal Policies.

Amihai Glazer, (Ph.D. Economics, Yale University). Professor of Economics, University of California, Irvine. Research areas: Public Choice, especially concerning commitment problems.

Bernard Grofman, (Ph.D. Political Science, University of Chicago). Professor of Political Science and Social Psychology, University of California, Irvine. Research areas: Models of group decision making, models of individual choice, electoral competition.

Donald Hoffman, (Ph.D. Computational Psychology, Massachusetts Institute of Technology). Professor of Cognitive Sciences and Information and Computer Science, University of California, Irvine. Research areas: Formal theories of perception, human and machine vision, recovery of depth from images.

Simon Huttegger, (Ph.D. Philosophy, University of Salzburg), Assistant Professor of Logic and Philosophy of Science. Research areas; Probability Theory; Philosophy of Probability; Induction, Decision Theory, Social Philosophy, Dynamical Systems.

Geoffrey Iverson, (Ph.D. Theoretical Physics, University of Adelaide, Australia; Ph.D. Experimental Psychology, New York University). Professor of Cognitive Sciences, University of California, Irvine. Research areas: Psychophysics, statistical estimation/testing of ordinal models.

Marek Kaminski, (Ph.D. Government and Politics, University of Maryland). Associate Professor of Political Science, University of California, Irvine. Research areas: political consequences of electoral laws, voting models, democratization,

L. Robin Keller, (Ph.D. Management Sciences, University of California, Los Angeles) Professor of Administration and Social Sciences, Graduate School of Management, University of California, Irvine. Research areas: Individual decision-making, risk analysis, decision problem structuring.

Natalia Komarova, (Ph.D. Applied Mathematics, University of Arizona), Associate Professor, Department of Mathematics and Ecology & Evolutionary Biology. Research areas: Mathematical modeling and biology, virus dynamics, cancer modeling.

Igor Kopylov, (Ph.D. University of Rochester), Assistant Professor of Economics. Research areas: Microeconomic theory, decision theory, and game theory.

Michael Lee, (Ph.D. Psychology, University of Adelaide), Professor of Cognitive Science, University of California, Irvine. Research areas: Mathematical and computational models of stimulus representation, categorization, memory, decision-making and problem-solving.

Simon A. Levin, (Ph.D. University of Maryland). Professor of Biology, Princeton University. Research areas: Modeling of ecological systems, dynamics of populations and communities, spatial heterogeneity and problem of scale, evolutionary, mathematical and theoretical ecology, evolution of cooperation and maintenance of social norms.

R. Duncan Luce, (Ph.D. Mathematics, Massachusetts Institute of Technology). Distinguished Research Professor of Cognitive Sciences, and Research Professor of Economics, University of California, Irvine. Research areas: Axiomatic theories of measurement, probabilistic choice and response time models, individual decision making.

Mark J. Machina, (Ph.D. Economics, Massachusetts Institute of Technology). Professor of Economics, University of California, San Diego. Research areas: Utility, decision making, risk behavior.

Penelope Maddy, (Ph.D. Philosophy, Princeton). Professor of Logic and Philosophy of Science, University of California, Irvine. Research areas: Philosophy of mathematics, especially the philosophy of set theory.

Michael McBride, (Ph.D. Economics, Yale University). Associate Professor of Economics. Research areas: Microeconomics, game theory, and political economy.

Anthony McGann, (Ph.D. Political Science, Duke University). Associate Professor of Political Science, University of California, Irvine. Research areas: party systems, democratic theory, formal models of political systems, European government.

Louis E. Narens, (Ph.D. Mathematics, University of California, Los Angeles). Professor of Cognitive Sciences, and Psychiatry and Human Behavior, University of California, Irvine. Research areas: Measurement theory, foundations of science, decision theory.

Andrew Noymer, (Ph.D. University of California, Berkeley). Assistant Professor of Sociology, University of California, Irvine. Research areas: Population, Social Networks, Mathematical Models, Demography of Health & Mortality, Historical Demography

Richard Palais, (Ph.D. Harvard University). Adjunct Professor of Mathematics, University of California, Irvine. Research areas: soliton mathematics, compact differentiable transformation groups, nonlinear global analysis, critical point theory, submanifold geometry, integrable systems.

Dale Poirier, (Ph.D. Economics, University of Wisconsin). Professor of Economics, University of California, Irvine. Research areas: econometrics, both theoretical and empirical, specializing in Bayesian econometrics.

David M. Riefer, (Ph.D. Psychology, University of California, Irvine). Professor of Psychology, California State University at San Bernardino. Research areas: Memory, cognitive science, and mathematical psychology.

A. Kimball Romney, (Ph.D. Social Anthropology, Harvard University). Research Professor of Anthropology, University of California, Irvine. Research areas: Cognitive anthropology, cultural consensus, quantitative methods.

Donald G. Saari, (Ph.D. Mathematics, Purdue University). Distinguished Professor of Mathematics and Economics, University of California, Irvine. Research areas: Mathematics and application of dynamical systems to social sciences; decision theory.

Stergios Skaperdas, (Ph.D. Economics, Johns Hopkins University). Professor of Economics, University of California, Irvine. Research areas: Bargaining models, applications of non-cooperative game theory, bilateral exchange.

Brian Skyrms, (Ph.D. Philosophy, University of Pittsburgh). Professor of Philosophy, University of California, Irvine. Research areas: Probability, induction, causation, rational choice.

Kenneth Small, (Ph.D. Economics, University of California, Berkeley). Professor of Economics, University of California, Irvine. Research areas: Urban economics, transportation economics, discrete-choice econometrics, and energy.

Padhraic Smyth, (Ph.D. Electrical Engineering, California Institute of Technology). Professor, Information and Computer Science, University of California, Irvine. Research areas: Statistical pattern recognition, probabilistic learning, information theory, artificial intelligence, image and time-series modeling.

George Sperling, (Ph.D. Psychology, Harvard University). Distinguished Professor of Cognitive Sciences, University of California, Irvine. Research areas: Human information processing, vision and visual perception, computer vision and image processing.

Ramesh Srinivasan, (Ph.D. Biomedical Engineering, Tulane University). Associate Professor of Cognitive Sciences, University of California. Research areas: Perception, development and cortical dynamics.

Hal Stern, (Ph.D. Statistics, Stanford University). Professor of Statistics, Department of Statistics, University of California, Irvine. Research areas: Bayesian methods, model diagnostics, statistical computing, applications to biological and social sciences, sports and statistics.

Mark Steyvers, (Ph.D. Psychology, Indiana University). Professor of Cognitive Sciences, University of California, Irvine. Research areas: Computational models of memory, reasoning and perceptions.

Rein Taagepera, (Ph.D. Physics, University of Delaware). Professor of Political Science, Department of Political Science, University of California, Irvine. Research areas: Quantitatively predictive models, electoral and party systems, Finno-Ugric area studies.

Carole Uhlaner, (Ph.D. Political Science, Harvard University). Associate Professor of Political Science, University of California, Irvine. Research areas: Rational actor models and statistical

analyses of political behavior, especially participation and voting; decision theory; comparative politics.

Douglas White, (Ph.D. Anthropology/Social Theory, University of Minnesota). Professor of Anthropology, University of California, Irvine. Research areas: Social theory, complexity, evolutionary theory, organization, networks, long-term field studies and social dynamics, world-system impacts on local communities, ethnosociology, comparative studies, quantitative methods.

Charles (Ted) Wright, (Ph.D. Experimental psychology, University of Michigan). Professor of Cognitive Science, University of California, Irvine. Research areas: Acquisition and cognitive representation of human skills, speed-accuracy trade-offs, models for shape of trajectories.

Jack Xin, (Ph.D. Courant Institute, New York University). Professor of Mathematics. Research areas: Partial Differential Equations (PDE), Asymptotic Analysis, Scientific Computation, and their Applications in Fluid Dynamics, Voice Signal Processing, Biology, Nonlinear Optics and Geoscience.

John I. Yellott, Jr. (Ph.D. Psychology, Stanford University). Professor Emeritus of Cognitive Sciences, University of California, Irvine. Research areas: Vision, probabilistic choice models.

Hongkai Zhao, (Ph.D. Mathematics, University of California, Los Angeles). Professor of Mathematics, University of California, Irvine. Research areas: Applied and computational mathematics with applications in physics, engineering, imaging science and computer vision.

Kimberly Jameson, (Ph.D. Psychology, University of California, Irvine). Associate Project Scientist, University of California, Irvine. Research areas: categorization behaviors; modeling concept formation for perceptual stimuli (e.g., the cognitive organization of color sensations and its relationship to linguistic classifiers); the development and breakdown of these cognitive functions; and optimum performance in tasks involving color codings.

Vladimir A. Lefebvre, (Ph.D. Psychology, Lomonosov Moscow State University). Researcher for Cognitive Sciences, University of California, Irvine. Research areas: Human reflexion, mathematical modeling of human inner world, military psychology.

APPENDIX B
SCIENTIFIC PUBLICATIONS OF MEMBERS, ACADEMIC 2009-10¹

Jeff Barrett

Barrett, J.A. (2009). Faithful description and the incommensurability of evolved languages, *Philosophical Studies*, DOI 10.1007/s11098-009-9456-9.

William Batchelder

Batchelder, W.H. Cognitive Psychometrics: Using Multinomial Processing Tree Models as Measurement Tools. In S. E. Embretson (Ed.). *Measuring Psychological Constructs: Advances in Model Based measurement*. Washington DC: American Psychological Association Books, 2009, Ch.4.

Purdy, B. and Batchelder, W. H. A context-free language for binary multinomial processing tree models. *Journal of Mathematical Psychology*, 2009, 53, 547-561.

Batchelder, W.H., Hu, X., and Smith, J.B. Multinomial processing tree models for discrete choice. Special Issue on New Developments in Multinomial Process Tree Modeling. *Zeitschrift für Psychologie*, 2009, 217, 149-158.

Batchelder, W.H., Strashny, A., and Romney, A.K. Cultural Consensus Theory: Aggregating Continuous Responses in a Finite Interval. In S.-K. Chai, J.J. Salerno, and P.L. Mabry (Eds.). *Social Computing, Behavioral Modeling, and Prediction*, 2010. New York: Springer, 2010, pp. 98-107.

Smith, J.B. and Batchelder, W.H. Beta-MPT: Multinomial processing tree models for addressing individual differences. *Journal of Mathematical Psychology*, 2010, 54, 167-183.

Wu, H., Myung, J.I., and Batchelder, W.H. On the minimum description length complexity of multinomial processing tree models. *Journal of Mathematical Psychology*, 2010, 54, 291-303.

Wu, H., Myung, J.I., and Batchelder, W.H. Minimum description length model selection of multinomial processing tree models. *Psychonomic Bulletin & Review*, 2010, 17, 275-286.

Batchelder, W.H., Hu, X., and Riefer, D.M. Multinomial Modeling. H. Pashler (Ed.). the *Encyclopedia of the Mind*. Sage Publications, in press.

¹ Those members not listed failed to respond to our request for information.

Batchelder, W.H. Mathematical Psychology. In L. Nadel (Ed.). Wiley Interdisciplinary Reviews: Cognitive Sciences. New York: Wiley, in press.

Schmittmann, V.D., Dolan, C.V., Raijmakers, M.E.J., and Batchelder, W.H. Parameter identification in multinomial processing tree models. *Behavior Research Methods*, in press.

John Boyd

John P. Boyd, William J. Fitzgerald, Matthew C. Mahutga and David A. Smith. (2010). Computing continuous core/periphery structures for social relations data with MINRES/SVD. *Social Networks*, 32, 125-137.

William Branch

Monetary Policy and Heterogeneous Expectations, (with George W. Evans). *Economic Theory*, forthcoming.

Business Cycle Amplification with Heterogeneous Expectations, (with Bruce McGough). *Economic Theory*, forthcoming.

Dynamic Predictor Selection in a New Keynesian Model with Heterogeneous Expectations, *Journal of Economic Dynamics and Control*, forthcoming.

Introduction to Special Issue on Complexity in Economics and Finance, (with Mikhail Anufriev) *Journal of Economic Dynamics and Control*, forthcoming.

Jan Brueckner

Gentrification and Neighborhood Housing Cycles: Will America's Future Downtowns Be Rich? 2009. (With Stuart S. Rosenthal), *Review of Economics and Statistics* 91, 725-743.

Manipulable Congestion Tolls. 2010. (With Erik T. Verhoef), *Journal of Urban Economics* 67, 315-321.

Airline Emission Charges: Effects on Airfares, Service Quality, and Aircraft Design (with Anming Zhang), *Transportation Research Part B*, forthcoming.

Carve-Outs Under Airline Antitrust Immunity (with Stef Proost), (2010). *International Journal of Industrial Organization*, forthcoming.

Schedule Competition Revisited, (2010). *Journal of Transport Economics and Policy*, forthcoming .

Managing Urban Development in Chinese Cities (with Alain Bertaud and Yuming Fu), (2009). In Chengri Ding and Yan Song, eds., *Smart Urban Growth for China*, Lincoln Institute of Land Policy, pp. 77-107.

Government Land-Use Interventions: An Economic Analysis, in Somik V. Lall, Mila Friere, Belinda Yuen, Robin Rajack, and Jean-Jacques Helluin, eds., *Urban Land Markets: Improving Land for Successful Urbanization*, (2009). Springer, pp. 3-23.

Charles Chubb

Hanlon R.T., Chiao C.C., Mathger L.M., Barbosa A, Buresch K.C. and Chubb, C. (2009). Cephalopod dynamic camouflage: bridging the continuum between background matching and disruptive coloration. *Philosophical Transactions of Royal Society B*. **364**: 429-437.

Chiao, C-C., Chubb, C., Buresch, K., Siemann, L., Hanlon, R. (2009). The scaling effects of substrate texture on camouflage patterning in cuttlefish, *Vision Research*, **49**, 1647-1656.

Nam, J-H, Solomon, J.A., Morgan, J.M., Wright, C.E. & Chubb, C. Coherent plaids are preattentively more than the sum of their parts. *Attention, Perception & Psychophysics*, in press.

Chubb, C. (2009). Texture Perception. Article in *Encyclopedia of Perception*, Ed. E. Bruce Goldstein, Sage.

Chiao, C.C., Chubb, C., Buresch, K., Allen, J., Barbosa, A., Mathger, L.M., Hanlon, R.T. (2010). Mottle camouflage patterns in cuttlefish: quantitative characterization and visual stimuli that evoke them. *Journal of Experimental Biology*, **213**, 187-199.

Allen, J., Mathger, L.M., Barbosa, A., Buresch, K.C., Sogin, E., Schwartz, J., Chubb, C., Hanlon, R.T., Cuttlefish dynamic camouflage: responses to substrate choice and integration of multiple visual cues. *Proc. Royal Soc. B*, in press.

David Eppstein

D Eppstein. (2009). Testing bipartiteness of geometric intersection graphs. *ACM Trans. Algorithms* 5(2):15.

Eppstein. (2009). Squarepants in a tree: sum of subtree clustering and hyperbolic pants decomposition. *ACM Trans. Algorithms* 5, (3):A29.

D. Eppstein. (2009). All maximal independent sets and dynamic dominance for sparse graphs. *ACM Trans. Algorithms* 5(4):A38, 2009.

D. Eppstein. (2009). Manhattan orbifolds. *Topology and its Applications* 157(2): 494-507, 2009.

D. Eppstein, M. van Kreveld, E. Mumford, and B. Speckmann. (2009). *Comp. Geom. Theory & Applications* 42(8): 790-802.

D. Eppstein, J.-C. Falmagne, and H. Uzun. (2009). On verifying and engineering the well-gradedness of a union-closed family. *J. Mathematical Psychology* 53(1):34-39.

- D. Eppstein. (2009) Finding large clique minors is hard. *J. Graph Algorithms and Applications* 13(2):197-204.
- D. Eppstein, E. Mumford, B. Speckmann, and K. Verbeek. (2009). Area-universal rectangular layouts. 25th ACM Symp. *Comp. Geom.*, Aarhus, Denmark, 2009, pp. 267-276.
- M. Dickerson and D. Eppstein. Animating a Continuous Family of Two-Site Distance Function Voronoi Diagrams (and a Proof of a Complexity Bound on the Number of Non-Empty Regions). 25th ACM Symp. *Comp. Geom.*, Aarhus, Denmark, 2009, video and multimedia track, pp. 92-93
- D. Eppstein and E. S. Spiro. (2009). The h-index of a graph and its application to dynamic subgraph statistics. Algorithms and Data Structures Symposium (WADS), Banff, Canada. *Lecture Notes in Comp. Sci.* 5664, pp. 278-289.
- W. Du, D. Eppstein, M. T. Goodrich, G. Lueker. (2009). On the approximability of geometric and geographic generalization and the min-max bin covering problem. Algorithms and Data Structures Symposium (WADS), Banff, Canada. *Lecture Notes in Comp. Sci.* 5664, pp. 242-253.
- D. Eppstein and E. Mumford. (2009). Orientation-constrained rectangular layouts. Algorithms and Data Structures Symposium (WADS), Banff, Canada. *Lecture Notes in Comp. Sci.* 5664, 2009, pp. 266-277.
- D. Eppstein and K. Wortman. (2009). Optimal embedding into star metrics. Algorithms and Data Structures Symposium (WADS), Banff, Canada. *Lecture Notes in Comp. Sci.* 5664, pp. 290-301.
- D. Eppstein. (2009). Graph-theoretic solutions to computational geometry problems. 35th International Workshop on Graph-Theoretic Concepts in Computer Science (WG 2009), Montpellier, France, *Lecture Notes in Comp. Sci.* 5911, 2009, pp. 1-16.
- P. Diaz-Gutierrez, D. Eppstein, and M. Gopi. (2009). Curvature-aware fundamental cycles. 17th Pacific Conf. Computer Graphics and Applications, Jeju, Korea, *Computer Graphics Forum* 28(7):2015-2024.
- D. Eppstein, M. T. Goodrich, and L. Trott. (2009). Going off-road: transversal complexity in road networks. *Proc. 17th ACM SIGSPATIAL Int. Conf. Advances in Geographic Information Systems*, Seattle, pp. 23-32.
- D. Eppstein. (2010). Paired approximation problems and incompatible in approximabilities. arXiv:0909.1870. 21st ACM-SIAM Symp. *Discrete Algorithms*, Austin, Texas.
- D. Eppstein, Z. Galil, and G.F. Italiano. (2010). Dynamic graph algorithms. Algorithms and Theoretical Computing Handbook, M. J. Atallah, ed., 2nd. ed., CRC Press, Vol. I: *General Concepts and Techniques*, chapter 9, pp. 9-1 - 9-28.
- D. Eppstein. (2010). Happy endings for flip graphs. *Journal of Computational Geometry* 1(1):3-28.

Jean-Claude Falmagne

Learning Spaces. Jean-Claude Falmagne and Jean-Paul Doignon, in press. (Expected publication date: October) Springer.

Axiomatic Derivation of the Doppler factor and Related Relativistic Laws. Jean-Claude Falmagne. *Aequationes Mathematicae*, forthcoming.

Katherine Faust

Faust, Katherine. (2010). A puzzle concerning triads in social networks: Graph constraints and the triad census. *Social Network*, Vol. 32, Issue 3, Pages 161-252.

Faust, Katherine. (2010). Animal Social Networks. In Peter Carrington and John Scott, eds. *Sage Handbook of Social Network Analysis*.

Steve A. Frank

Frank, S. A. (2010). The trade-off between rate and yield in the design of microbial metabolism. *Journal of Evolutionary Biology* 23, 609-613.

Frank, S. A. (2010). Microbial secretor-cheater dynamics. *Philosophical Transactions of the Royal Society of London B*, in press.

Frank, S. A. (2010). A general model of the public goods dilemma. *Journal of Evolutionary Biology* 23,1245-1250.

Frank, S. A. (2010). Demography and the tragedy of the commons. *Journal of Evolutionary Biology* 23, 32-39.

Frank, S. A. (2010). Somatic evolutionary genomics: Mutations during development cause highly variable genetic mosaicism with risk of cancer and neurodegeneration. *Proceedings of the National Academy of Sciences USA* 107, 1725-1730.

Frank, S. A. & Smith, D. E. (2010). Measurement invariance, entropy, and probability. *Entropy* 12, 289-303.

Donald Hoffman

D. Hoffman. Mind and Body. In *The Encyclopedia of Perception*, Bruce Goldstein (Ed.), Sage Publishers, Thousand Oaks, CA, 554-555.

D. Hoffman. Consciousness. In *The Encyclopedia of Perception*, Bruce Goldstein (Ed.), Sage Publishers, Thousand Oaks, CA, 300-304.

D. Hoffman. Computer consciousness. In *The Encyclopedia of Perception*, Bruce Goldstein (Ed.), Sage Publishers, Thousand Oaks, CA, 283-285.

D. Hoffman. Nature and consciousness. *Mindfields*, 1, 1, 6-7.

D. Hoffman. The laptop quantum computer. In *This Will Change Everything: Ideas That Will Shape The Future*. Harper Perennial, New York. 47-50.

D. Hoffman. Human vision as a reality engine. In *Psychology Reader*, Foundation for the Advancement of Behavioral and Brain Sciences.

Simon Huttegger

Simon M. Huttegger and Kevin J. Zollman. (2010). Dynamic Stability and Basins of Attraction in the Sir Philip Sidney Game. *Proceedings of the Royal Society London B* 277: 1925-1922.

Simon M. Huttegger. (2010). Generic Properties of Evolutionary Games and Adaptationism. *The Journal of Philosophy* 107: 80-102.

Philipp Mitterröcker and Simon M. Huttegger. (2009). The Concept of Morphospace in Evolutionary and Developmental Biology. *Biological Theory* 4: 5467.

Simon M. Huttegger. (2009). On the Relationship Between Games in Extensive Form and Games in Strategic Form. In: A. Hiecke and H. Leitgeb (eds.): *Reduction, Abstraction, Analysis*. Ontos-Verlag, Frankfurt ,375-385.

Simon M. Huttegger, Brian Skyrms, Rory Smead and Kevin J. S. Zollman. (2009). Evolutionary Dynamics of Lewis Signaling Games. *Synthese*, DOI 10.1007/s11229-009-9477-0.

Kimberly Jameson

Jameson, K. A. & Lomborg, J. (2010). Are Color Processing Universals an approach to the Construction of Interstellar Messages? Invited Article. *GlimpseJournal: The Art + Science of Seeing*, 2.4, Winter Issue on Cosmos, 36–44.

Alvarado, N. & Jameson, K. A. (in press. May, 2010). Shared knowledge about emotion among Vietnamese and English bilingual and monolingual speakers. *Journal of Cross-Cultural Psychology*.

Jameson, K. A. (2010). Where in the World Color Survey is the Support for Color Categorization Based on the Hering Primaries? In J. Cohen & M. Matthen (eds), *Color Ontology and Color Science*. Cambridge MA: Bradford Books, MIT Press: 179–202.

Jameson, K. A. (2009). Human Potential for Tetrachromacy. Invited Article. *GlimpseJournal: The Art + Science of Seeing*, 2.3, Autumn Issue on Color, 82–91.

Jameson, K. A. (2009). Human Potential for Tetrachromacy -Online Supplementary Material. Published online only as a supplemental resource in *GlimpseJournal: The Art + Science of Seeing*, 2.3. Available at <http://www.glimpsejournal.com/2.3-KAJ.html>.

Jameson, K. A. & Komarova, N. L. (2009a). Evolutionary models of color categorization. I. Population categorization systems based on normal and dichromat observers. *Journal of the Optical Society of America, A*, Vol. 26(6), pp. 1414–1423. Featured Reprint in *The Virtual Journal of Biomedical Optics*, 4(8).

Jameson, K. A. & Komarova, N. L. (2009b). Evolutionary models of color categorization. II. Realistic observer models and population heterogeneity. *Journal of the Optical Society of America, A*, Vol. 26(6), pp. 1424–1436. Featured Reprint in *The Virtual Journal of Biomedical Optics*, 4(8).

Jameson, K. A. (2009). Tetrachromatic Color Vision. Invited contribution to *The Oxford Companion to Consciousness*. Wilken, P., Bayne, T. & Cleeremans, A. (Eds). Pp. 155-158. Oxford University Press: Oxford.

Wasserman, L. M., Szeszel, M. K. & Jameson, K. A. (2009). Long-Range Polymerase Chain Reaction Analysis for Specifying Photopigment Opsin Gene Polymorphisms. Technical Report Series # MBS 09-07. Institute for Mathematical Behavioral Sciences University of California at Irvine. Irvine, CA, USA. Available at http://www.imbs.uci.edu/tr/abs/2009/mbs_09-07.pdf.

Marek Kaminski

Perfect Information and Backward Induction, *Wiley Encyclopedia of Operations Research and Management Science*, forthcoming.

Kaminski, M. Nash Equilibrium in a Pub. *Decisions*, forthcoming, in Polish.

Robin Keller

Tianjun Feng, L. Robin Keller, Liangyan Wang, and Yitong Wang. (2010). Product Quality Risk Perceptions and Decisions: Contaminated Pet Food and Lead-Painted Toys, *Risk Analysis*, forthcoming.

L. Robin Keller, Craig W. Kirkwood, and Nancy S. Jones. (2010). Assessing Stakeholder Evaluation Concerns: An Application to the Central Arizona Water Resources System, *Systems Engineering*. Volume 13(1), 58-71, forthcoming.

L. Robin Keller, Jay Simon, Yitong Wang. (2009). Multiple objective decision analysis involving multiple stakeholders, Chapter 7 in Mohammad R. Oskoorouchi (ed.) *TutORials in Operations Research- Decision Technologies and Applications*, Hanover, MD: Institute for Operations Research and the Management Sciences.

Jay Simon, Yitong Wang, and L. Robin Keller, online 2010, forthcoming January 2011 in print. Paradoxes and violations of normative decision theory. *Encyclopedia of Operations Research and Management Science*, Hoboken (NJ): Wiley, forthcoming

L. Robin Keller, Tianjun Feng, and Yitong Wang, online 2010, forthcoming January 2011 in print, Fairness and equity in societal decision analysis, *Encyclopedia of Operations Research and Management Science*, Hoboken (NJ): Wiley; 2010, forthcoming.

Yitong Wang, L. Robin Keller, and Jay Simon, online 2010, forthcoming January 2011 in print, Descriptive models of perceived risk, Encyclopedia of Operations Research and Management Science, Hoboken (NJ): Wiley, forthcoming

L. Robin Keller, Tianjun Feng and Yitong Wang, online 2010, forthcoming January 2011 in print, Measures of risk equity, Encyclopedia of Operations Research and Management Science, Hoboken (NJ): Wiley, forthcoming.

Natalia Komarova

Thalhauser C.J., Komarova N.L. (2010). Signal response sensitivity in the yeast mitogen-activated protein kinase cascade. *PLoS One*.

Thalhauser C.J., Lowengrub J.S., Stupack D, Komarova N.L. (2010). Selection in spatial stochastic models of cancer: migration as a key modulator of fitness. *Biol Direct*.

Katouli A.A., Komarova N.L. (2010). The Worst Drug Rule Revisited: Mathematical Modeling of Cyclic Cancer Treatments. *Bull Math Biol*.

Komarova N.L., Levin S.A. (2010). Eavesdropping and language dynamics. *J Theor Biol*. 264(1):104-18.

Komarova N.L., Wodarz D. (2010). ODE models for oncolytic virus dynamics. *J Theor Biol*. 263(4):530-43.

Igor Kopylov

Kopylov. I. Unbounded Probabilistic Sophistication, *Mathematical Social Sciences*, forthcoming.

Kopylov, I. Simple Axioms for Countably Additive Subjective Probability, *Journal of Mathematical Economics*, forthcoming.

Michael Lee

Yi, S.K.M., Steyvers, M., & Lee, M.D. (2009). Modeling human performance in restless bandits using particle filters. *Journal of Problem Solving*, 2(2), 33-53.

Lee, M.D., & Sarnecka, B.W. (2010). A model of knower-level behavior in number-concept development. *Cognitive Science*, 34, 51-67.

Zeigenfuse, M.D., & Lee, M.D. (2010). Finding the features that represent stimuli. *Acta Psychologica*, 133, 283-295.

Iverson, G.J., Wagenmakers, E.-J., & Lee, M. D. (in press). A model averaging approach to replication: The case of prep. *Psychological Methods*. Accepted 6-Feb-2009.

Iverson, G.J, Lee, M.D., & Wagenmakers, E.-J. (2010). The random-effects prep continues to mispredict the probability of replication. *Psychonomic Bulletin & Review*, 17, 270-272.

Wetzels, R., Lee, M.D., & Wagenmakers, E.-J. (in press). Bayesian inference using WBDDev: A tutorial for social scientists. *Behavior Research Methods*. Accepted 24-Jan-2010.

Newell, B.R., & Lee, M.D. (in press). The right tool for the job? Comparing an evidence accumulation and a naive strategy selection model of decision making. *Journal of Behavioral Decision Making*. Accepted 4-Mar-2010.

Vandekerckhove, J., Tuerlinckx, F., & Lee, M.D. (accepted). Hierarchical diffusion models for two-choice response time. *Psychological Methods*.

Macguire, A.M., Humphreys, M.S., Dennis, S.J., & Lee, M.D. (in press). Global similarity accounts of embedded-category designs: Test of the Global Matching models. *Journal of Memory & Language*. Accepted 23-Mar-2010.

Zeigenfuse, M.D., & Lee, M.D. A general latent-assignment approach for modeling psychological contaminants. *Journal of Mathematical Psychology*, in press.

Stephens, R.G., Navarro, D.J., Dunn, J.C., & Lee, M.D. (2009). The effect of causal strength on the use of causal and similarity-based information in feature inference. In *ASC09: Proceedings of the 9th Conference of the Australasian Society for Cognitive Science*. Edited by Wayne Christensen, Elizabeth Schier, and John Sutton. Sydney: Macquarie Centre for Cognitive Science.

Lee, M.D., & Shi, J. The accuracy of small-group estimation and the wisdom of crowds. In R. Catrambone, & S. Ohlsson (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society, in press.

Lee, M.D., & Wetzels, R. Individual differences in attention during category learning. In R. Catrambone, & S. Ohlsson (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society, in press.

Zhang, S., & Lee, M.D. Cognitive models and the wisdom of crowds: A case study using the bandit problem. In R. Catrambone, & S. Ohlsson (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society, in press.
Zeigenfuse, M.D., & Lee, M.D. Heuristics for choosing features to represent stimuli. In R. Catrambone, & S. Ohlsson (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society, in press.

Pooley, J.P., Lee, M.D., & Shankle, W.R. Modeling change in recognition bias with the progression of Alzheimer's. In R. Catrambone, & S. Ohlsson (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society, in press.

Yi, S.K., Steyvers, M., Lee, M.D., & Dry, M.J. Wisdom of the crowds in minimum spanning tree problems. In R. Catrambone, & S. Ohlsson (Eds.), *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society, in press.

Vladimir Lefebvre

Lectures on the Reflexive Game Theory. (2009). Moscow, Cogito-Centre, (in Russian).

Reflexive Analysis of Groups. In: Shlomo Argamon and Newton Howard (Eds.) Computational Methods for Counterterrorism, Springer, 2009, pp.173-210.

A Bipolar Choice in the Experimental Chamber. (2009). *Psichologicheskyy Zhurnal*, Vol. 30, pp.65-72 (with Federico Sanabria, in Russian).

Simon Levin

Levin, S.A., ed. (2009). Games, Groups, and the Global Good. Berlin; London: Springer.

Levin, S.A., ed. (2009). The Princeton Guide to Ecology. Princeton, NJ: Princeton University Press.

Arrow, K and S.A. Levin. (2009). Intergenerational resource transfers with random offspring. *PNAS* 106(33):13702-13706.

Gross, T., L. Rudolf, S.A. Levin, and U. Dieckmann. (2009). Generalized models reveal stabilizing factors in food webs. *Science* 325(5941): 747-750.

Johnson, D. and S. Levin. (2009). The tragedy of cognition: Psychological biases and environmental inaction. *Current Science* 97(11). Available from: <http://www.ias.ac.in/currsci/>.

Leslie H., M. Schlueter, R. Cudney-Bueno, and S.A. Levin. (2009). Modeling responses of coupled social-ecological systems of the Gulf of California to anthropogenic and natural perturbations. *Ecological Research* 24: 505- 519.

Levin, S.A. (2009). "Games, Groups, Norms, and Societies." In Games, Groups, and the Global Good, ed. S.A. Levin, 143-153. Berlin; London: Springer.

Levin, S.A. (2009). Preface to Games, Groups, and the Global Good, ed. S.A. Levin, v-vi. Berlin; London: Springer.

Levin, S.A. 2009. Preface to Princeton Guide to Ecology, ed. S.A. Levin, vii-viii. Princeton, NJ: Princeton University Press.

Menge, Duncan N.L., S.A. Levin, and L.O. Hedin. (2009). Facultative versus obligate nitrogen fixation strategies and their ecosystem consequences. *The American Naturalist* 4(174): 466-477.

Miki, T., L. Giuggioli, Y. Kobayashi, T. Nagata, and S.A. Levin. (2009). Vertically-structured prokaryotic community can control the efficiency of the biological pump in the oceans. *Theoretical Ecology* 2:199-216.

Moore, S.A., T.J. Wallington, R.J. Hobbs, P.R. Ehrlich, C.S. Holling, S. Levin, D. Lindenmayer, C. Pahl-Wostl, H. Possingham, M.G. Turner, and M. Westoby. (2009). Diversity in current

ecological thinking: implications for environmental management. *Environmental Management* 43:17-27.

Muneepeerakul, R., E. Bertuzzo, S.A. Levin, A. Rinaldo, and I. Rodriguez-Iturbe. (2009). River networks as ecological corridors: a complex system perspective for integrating hydrologic geomorphic and ecological dynamics. *Water Resources Research* 45, W01413, doi:10.1029/2008WR007124.

Nabet, B., N. Leonard, I.D. Couzin, and S.A. Levin. (2009). Dynamics of decision making in animal group motion. *Journal of Nonlinear Science* 19(4): 399-345.

Ndifon, W., N.S. Wingreen, and S.A. Levin. 2009. Differential neutralization efficiency of hemagglutinin epitopes, antibody interference, and the design of influenza vaccines. *PNAS* 106(21): 8701-8706.

Ndifon, W., J. Dushoff, and S.A. Levin. (2009). On the use of hemagglutination-inhibition for influenza surveillance: surveillance data are predictive of influenza vaccine effectiveness. *Vaccine* 27(2009): 2447-2452.

Schlueter, M., H. Leslie, and S.A. Levin. (2009). Managing water use tradeoffs in a semi-arid river delta – a modeling approach. *Ecological Research* 24: 491-503.

Walker, B. S.A. Levin et al. (2009). Looming global-scale failures and missing institutions. *Science* 235: 1345-1346.

Bartumeus, F.L. Giuggioli, M. Louzao, V. Bretagnolle, D. Oro, and S.A. Levin. (2010). Fishery activities distort seabird foraging. *Current Biology* 20:1-6: doi:10.1016/j.cub.2009.11.073.

Espenshade, T.J., Olgiati, AS, and S.A. Levin. 2010. On nonstable and stable population momentum. *Demography*, forthcoming.

Gleick, P.H. et al. 2010. Climate change and the integrity of science. *Science* 328: 689-670.

Komarova, N.L. and S.A. Levin. (2010). Eavesdropping and language dynamics. *Journal of Theoretical Biology* 264(1): 104-18, forthcoming.

Levin, S.A. (2010). Crossing scales, crossing disciplines: Collective motion and collective action in the Global Commons. A special issue of *Philosophical Transactions of the Royal Society B* (Royal Society's 350th Anniversary) 365(1537): 13-17.

Levin, S. (2010). The evolution of ecology. *Chronicle of Higher Education*, forthcoming.

Levin, S.A. (2010). Prologue for Gumel and Lenhart, eds. *Modeling Paradigms and Analysis of Disease Transmission Models*, forthcoming.

Raghib, M., S.A. Levin, and I.G. Kevrekidis. (2010). Multiscale analysis of collective motion and decision-making in swarms: An advection-diffusion equation with memory approach. *Journal of Theoretical Biology* 264(3): 893-213.

Sagarin, R. et al (including S. Levin). (2010). National security: A biologically-inspired approach to security in society. *Demography*, forthcoming.

R. Duncan Luce

Luce, R.D. (2009). A Functional Equation Proof of the Distributive-Triples Theorem. *Aequationes Mathematicae*, 78, 321-328.

Luce, R.D. (2010a). Interpersonal comparisons of utility for 2 of 3 types of people. *Theory and Decision*, 68, 5-24.

Luce, R.D (2010b) Behavioral Assumptions for a Class of Utility Theories: A Program of Experiments. *Journal of Risk and Uncertainty*, in press.

Luce, R.D., Steingrímsson, R., & Narens, L. (2010). Are psychophysical scales of intensities the same or different when stimuli vary on other dimensions? Theory with experiments varying loudness and pitch, *Psychological Review*, in press.

..

Ng, C. T, Luce, R.D., & Marley, A.A. J. (2009a). Utility of gambling when events are valued: An application of inset entropy, *Theory and Decision*, 67, 23-53.

Ng, C. T., Luce, R.D., & Marley, A.A. J. (2009b). Utility of gambling under p-additive joint receipt and segregation or duplex decomposition. *Journal of Mathematical Psychology*, 53, 273-286.

Penelope Maddy

Defending the Axioms: on the Philosophical Foundations of Set Theory, Oxford University Press, to appear.

Logic Colloquium 2007. (2010). Françoise Delon, Ulrich Kohlenbach, Penelope Maddy, and Frank Stephan, eds., Cambridge: Cambridge University Press.

Michael McBride

McBride, M. (2010). Threshold Uncertainty in Discrete Public Good Games: An Experimental Study. *Economics of Governance*, 11(1): 77-99.

McBride, M. (2010). Money, Happiness, and Aspirations: An Experimental Study. *Journal of Economic Behavior and Organization* 74(3): 262-276.

Anthony McGann

Eliora van der Hout & Anthony McGann. (2009). Proportional Representation within the Limits of Liberalism Alone. *British Journal of Political Science* 39:735-54.

Eliora van der Hout & Anthony McGann. (2009). Liberal political equality implies proportional representation. *Social Choice and Welfare* 33.4: 617-620.

Voting Rules, Legislative” in Edward Badie, Dirk Berg-Schlosser and Leonardo Morlino, eds. Forthcoming in *Encyclopedia of Political Science*. Sage (International Political Science Association).

Run-off in American Political Science Association, *Encyclopedia of Political Science*. Congressional Quarterly Press, 2010.

Andrew Noymer

Epidemics and time: Influenza and tuberculosis during and after the 1918–1919 pandemic (ch. 8, pp. 137–152). in: *Plagues and epidemics: Infected spaces past and present*. Edited by D. Ann Herring and Alan C Swedlund. (Wenner-Gren International Symposium Series) Berg. (2010) (peer-reviewed book chapter).

Lisa Pearl

Pearl, L. Using computational modeling in language acquisition research, In E. Blom & S. Unsworth (eds). *Experimental Methods in Language Acquisition Research*, John Benjamins, forthcoming.

Pearl, L. & Steyvers, M. (2010). Identifying Emotions, Intentions, & Attitudes in Text Using a Game with a Purpose. *Proceedings of NAACL-HLT 2010 Workshop on Computational Approaches to Analysis and Generation of Emotion in Text*. Los Angeles, CA: NAACL.

Pearl, L., Goldwater, S., & Steyvers, M. (2010). How Ideal Are We? Incorporating Human Limitations into Bayesian Models of Word Segmentation, In K. Franich, K. Iserman, and L. Keil (eds), *Proceedings of the 34th annual Boston University Conference on Child Language Development*, Somerville, MA: Cascadilla Press, 315-326.

Pearl, L. (2009). Learning English Metrical Phonology: When Probability Distributions Are Not Enough, In Jean Crawford, Koichi Otaki, and Masahiko Takahashi (eds.), *Proceedings of the 3rd Conference on Generative Approaches to Language Acquisition North America (GALANA 2008)*, Somerville, MA: Cascadilla Press, 200-211.

Pearl, L. & Lidz, J. (2009). When domain general learning fails and when it succeeds: Identifying the contribution of domain specificity, *Language Learning and Development*, 5(4), 235-265.

Dale Poirier

Exchangeability, Representation Theorems, and Subjectivity, in *Handbook of Bayesian Econometrics*, J. Geweke, G. Koop, H. Van Dijk, eds., Oxford University Press, forthcoming.

Donald Saari

(With G. Asay), Finessing a point; augmenting the core. *Social Choice & Welfare*, (2010), (34), 121-143.

Systematic Analysis of Multiple Voting Rules. (2010). *Social Choice & Welfare*, (34), 217 – 247.

The core with positional spatial voting. (2009). *Homo Oeconomicus*, (26) 501-517.

(With M. Merrifield), Telescope time without tears -- A distributed approach to peer review (August 2009). *Astronomy & Geophysics*, (50), 4.16-4.20.

From Black's Advice and Arrow's Theorem to the Gibbard-Satterthwaite Result, pp. 1-16 in *Collective Decision Making: Views from Social Choice and Game Theory*, ed. A. Van Deemen and A. Rusinowska, Springer, 2010.

Connections and Implications of the Ostrogorski Paradox for Spatial Voting Models, (with H. Nurmi), pp 31-56 in *Collective Decision Making: Views from Social Choice and Game Theory*, ed. A. Van Deemen and A. Rusinowska, Springer, 2010.

Explaining Paradoxes in Nonparametric Statistics, (with A. Bargagliotti). *International Encyclopedia of Statistical Sciences*, ed. M. Lovric, Springer, New York, 2010.

Reexamining the complexities in consensus theory, in *Advances in Interdisciplinary Applied Discrete Mathematics. Interconnections between Consensus and Voting Theory, Clustering, Location Theory, Mathematical Biology, and Optimization*, ed. Mulder, H. and H. Kaul, IMS, 2010.

Mathematical snapshots motivated by “dark matter;” in *Mathematics and Astronomy: A Joint Long Journey*, ed. M de Leon, American Inst. Physics, 2010.

Stergios Skaperdas

Skaperdas, Stergios and Vaidya, Samarth. Persuasion as a Contest. *Economic Theory*, forthcoming (published online in September 2009).

Garfinkel, Michelle R., Skaperdas, Stergios, and Syropoulos, Constantinos. (2009). Globalization and Insecurity: Reviewing Some Basic Issues, in G.D. Hess (ed.), *Guns and Butter: The Economic Causes and Consequences of Conflict*, Cambridge, MA: MIT Press.

Kumar, Vimal and Skaperdas, Stergios. (2009). Organized Crime, in N. Garoupa (ed.) *Criminal Law and Economics, Encyclopedia of Law and Economics, 2nd Edition*, Northampton, MA: Edgar Elgar.

Skaperdas, Stergios. The Costs of Organized Violence: A Review of the Evidence. *Economics of Governance*, forthcoming.

Fiala, Nathan and Skaperdas, Stergios, “Economic Perspectives on Civil Wars,” forthcoming in C. Coyle (ed.), *Handbook of war and Peace*, Edgar Elgar.

Brian Skyrms

Signals, Evolution, Learning and Information, Oxford University Press.

Evolutionary Dynamics of Lewis Signaling Games (with Simon Huttegger, Rory Smead and Kevin Zollman). (2010). *Synthese*, 172: 177-191. DOI: 10.1007/s11229-009-9477-0.

The Flow of Information in Signaling Games (2010) *Philosophical Studies* 147: 155-165. doi: 10.1007/s11098-009-9452-0.

Learning to Network (with Robin Pemantle). (2010). In *Probability in Science*. Ed. E. Eells and J. Fetzer. Berlin: Springer.

Ken Small

Parry, Ian W.H., & Kenneth A. Small. (2009). Should Urban Transit Subsidies Be Reduced? *American Economic Review*, 99(3), 2009, pp. 700-724.

Savage, Ian, & Kenneth A. Small. A Comment on ‘Subsidization of Urban Public Transport and the Mohring Effect. *Journal of Transport and Economic Policy*, 44(3), forthcoming.

Small, Kenneth A., Private Provision of Highways: Economic Issues. *Transport Reviews*, 30(1), 2010, pp. 11-31.

Hymel, Kent, Kenneth A. Small, & Kurt Van Dender. Induced Demand and Rebound Effects in Road Transport. *Transportation Research Part B – Methodological*, forthcoming.

Small, Kenneth A. (2009). Triple Convergence toward a Higher Gasoline Tax. *Weekly Policy Commentary* No. 101, Resources for the Future, Washington, D.C. (Nov. 20, 2009). Web publication: <http://www.rff.org/Publications/WPC/Pages/Triple-Convergence-toward-a-Higher-Gasoline-Tax.aspx>

Charles (Ted) Wright

Emmorey, K., Gertsberg, N., Korpics, F., & Wright, C.E. (2009). The influence of visual feedback and register changes on sign language production: A kinematic study with deaf signers. *Applied Psycholinguistics*, 30, 187-203.

Nam, J.-H., Solomon, J. A., Morgan, M. J., Wright, C. E., and Chubb, C. (2009). Coherent plaids are preattentively more than the sum of their parts. *Attention, Perception & Psychophysics*, 71 1469-1477.

Jack Xin

An Introduction to Fronts in Random Media, Surveys and Tutorials in the Applied Mathematical Sciences, 2009, Vol. 5, Springer.

Stochastic Approximation and a Nonlocally Weighted Soft-Constrained Recursive Algorithm for Blind Separation of Reverberant Speech Mixtures (with M. Yu). (2010). *Discrete and Continuous Dynamical Systems-A, Trends and Developments in DE/Dynamics, Part II*, 28(4), pp 1753-1767.

A Nonlocally Weighted Soft-Constrained Natural Gradient Algorithm for Blind Source Separation of Reverberant Speech (with M. Yu, Y-Y Qi, H-I Yang, F-G Zeng). *Proceedings of IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA)*, pp 81-84, Oct 2009, New Paltz, NY, eds. Jacob Benesty and Tomas Gaensler.

A Nonlocally Weighted Soft-Constrained Natural Gradient Algorithm and Blind Separation of Strongly Reverberant Speech Mixtures (M. Yu, J. Xin, Y-Y Qi, H-I Yang, F-G Zeng), *Proceedings of 43rd Asilomar Conference on Signals, Systems and Computers*, pp 346-350, Nov 1-4, 2009, Pacific Grove, CA.

A Time Domain Blind Decorrelation Method of Convolutional Mixtures Based on an IIR Model (with J. Liu, Y-Y Qi), *J. Computational Mathematics*, Vol. 28, No. 3, pp 371-385, 2010.

A Soft-Constrained Dynamic Iterative Method of Blind Source Separation (with J. Liu, Y-Y Qi), *SIAM J. Multiscale Modeling Simulations*, Vol. 7, No. 4, pp 1795-1810, 2009.

Unique Solvability of Under-determined Sparse Blind Separation (with Y. Sun), to appear in proceedings of IASTED international conference on signal and image processing, Aug, 2010.

Convexity and Fast Speech Extraction by Split Bregman Method (with M. Yu, W. Ma, S. Osher), to appear in proceedings of *Interspeech*, 2010.

Reducing Musical Noise in Blind Source Separation by Time-Domain Sparse Filters and Split Bregman Method (with M. Yu, W. Ma, S. Osher), appear in proceedings of *Interspeech* 2010.

Periodic Homogenization of Inviscid G-equation for Incompressible Flows (with Y. Yu). *Comm Math Sciences*, forthcoming 2010.

Bounds on Front Speeds for Inviscid and Viscous G-equations (with J. Nolen, Y. Yu), to appear in *Methods and Applications of Analysis*, 2010.

APPENDIX C
IMBS TECHNICAL REPORTS, 2009-10

[MBS 09-03](#)

Connections and Implications of the Ostrogorski Paradox for Spatial Voting Models
Hannu Nurmi and Donald G. Saari

[MBS 09-04](#)

The Core with Positional Spatial Voting
Donald G. Saari

[MBS 09-05](#)

Evaluation of Time-Order Error Predictions from a Model of Global Psychophysics
Ragnar Steingrímsson and R. Duncan Luce

[MBS 09-06](#)

Evaluating a Model of Global Psychophysical Judgments for Brightness: I. Behavioral Properties
Summations and Productions
Ragnar Steingrímsson

[MBS 09-07](#)

Long-Range Polymerase Chain Reaction Method for Detection of Human Red and Green Opsin
Gene Polymorphisms
Linda M. Wasserman and Monika K. Szeszel and Kimberly A. Jameson

[MBS 09-08](#)

Inventing New Signals
Brian Skryms and S. L. Zabell

[MBS 09-09](#)

Modeling color with and without an observer
A. Kimball Romney

[MBS 09-10](#)

Modeling trichromatic color appearance with only two spectrally distinct photopigments
A. Kimball Romney and Chuan-Chin Chiao

[MBS 09-11](#)

Evolutionary model of the concepts of 'color chip' and 'color category' in Evolutionary models of
color categorization based on discrimination
Ragnar Steingrímsson

[MBS 10-01](#)

Are Psychophysical Scales of Intensities the Same or Different When Stimuli Vary on Other

Dimensions? Theory with Experiments Varying Loudness and Pitch
R. Duncan Luce, Ragnar Steingrímsson, and Louis Narens

[MBS 10-02](#)

Evaluating a Model of Psychophysical Judgments for Brightness: II. Behavioral Properties
Linking Summations and Productions
Ragnar Steingrímsson

[MBS 10-03](#)

A Note on Generalized Edges
Carter T. Butts

[MBS 10-04](#)

Bayesian Meta-Analysis of Social Network Data via Conditional Uniform Graph Quantiles
Carter T. Butts

[MBS 10-05](#)

The Dynamics of Costly Signaling
Elliott Wagner

APPENDIX D
COLLOQUIA AND CONFERENCES OF IMBS MEMBERS, 2009-10²

William Batchelder

“Multinomial Processing Tree Models of Paired-Comparisons”. Paper read at Joint Annual Convention of the Society for Mathematical Psychology and the European Mathematical Psychology Group. Special Session on Multinomial Modeling Amsterdam, July 2009.

“On the Minimum Description Length Complexity and Selection of Multinomial Processing Tree (MPT) Models”, (Wu, H. (Presenter), Myung, J., and Batchelder, W.H. Joint Annual Convention of the Society for Mathematical Psychology and the European Mathematical Psychology Group. Special Session on Multinomial Modeling, Amsterdam, July 2009.

“Multinomial Processing Tree (MPT) Models Analysis for Quasi-independence Contingency Tables”, (Hu, X. (Presenter), You, Y., and Batchelder, W.H. Joint Annual Convention of the Society for Mathematical Psychology and the European Mathematical Psychology Group. Special Session on Multinomial Modeling, Amsterdam, July 2009.

“Multinomial Processing Tree Models: State of the Art and Open Problems”. Invited keynote address at Winer Memorial Lectures, Purdue University, October 2009.

“Developing Discarded Learning and Memory Models into useful measurement Tools”. Invited Keynote Talk in Symposium on Recent Developments and Applications of Mathematical Learning Models. University of Amsterdam, October 2009.

“Cultural Consensus Theory: New Models for Continuous Response and Matching Tests”. AFOSR Joint Review Cognition and Decision Making Program and Human-System Interface Program. Arlington, Vg., January 2010.

“Multinomial Processing Tree Models: Recent Formal Results and New Application Areas”. Invited paper read at Institute for Mathematical Behavioral Sciences Colloquium series. University of California Irvine, February 2010.

“Cultural Consensus Theory: A model for a continuous responses in a finite interval”, (Batchelder, W.H., Strashny, A., and Romney, A.K.). Invited Paper read at the Annual Conference on Social Computing, Behavioral Modeling, and Prediction. NIH Campus, Bethesda, MD, April 2010.

John Boyd

² Those members not listed failed to respond to our request for information.

“Continuous Core/Periphery Models for Social Relations Data: MINRES-SVD and Quasi-Independence”, with W. Fitzgerald. Sunbelt Social Network Conference XXIX, San Diego, CA, February 2010.

William Branch

PUGLIA Workshop on Heterogeneous Beliefs, November 2009.

University of Amsterdam, November 2009.

Monetary Policy with Heterogeneous Expectations. SITE Conference on Diverse Beliefs, August 2009.

Jan Brueckner

International Industrial Organization Conference, Vancouver, May 2010.

Workshop in Aviation Economics, University of British Columbia, May 2010.

Texas A & M University, March 2010.

Vanderbilt University, February 2010.

Regional Science Association International Meetings, San Francisco, November 2009.

Arizona State University, October 2009.

UCLA, Ziman Center for Real Estate Research Day, October 2009.

Institute of Transportation Studies, UC Berkeley, October 2009.

University of Chile, September 2009.

University of Barcelona, July 2009.

4th Kuhmo-Nectar Transport and Urban Economics Conference, Copenhagen, July 2009.

Charles Chubb

“Measuring the Filters of Attentional Selection”. Invited talk presented at the Joint Symposium on Neural Computation, UCLA, May 2010.

David Eppstein

“Studying (non-planar) road networks through an algorithmic lens”. Invited talk at INFORMS, San Diego, 2009.

“The h-index of a graph and its application to dynamic subgraph statistics”. Algorithms and Data Structures Symposium (WADS), Banff, Canada, 2009.

“Optimal embedding into star metrics”. Algorithms and Data Structures Symposium (WADS), Banff, Canada, 2009.

“Graph-theoretic solutions to computational geometry problems”. Invited talk at the 35th International Workshop on Graph-Theoretic Concepts in Computer Science (WG 2009), Montpellier, France, 2009.

“Hyperconvexity and metric embedding”. Invited talk at Fifth William Rowan Hamilton Geometry and Topology Workshop, Dublin, Ireland, 2009.

“Hyperconvexity and metric embedding”. Invited talk at IPAM Workshop on Combinatorial Geometry, UCLA, 2009.

“Paired approximation problems and incompatible in approximabilities”. 21st ACM-SIAM Symp. Discrete Algorithms, Austin, Texas, 2010.

Katie Faust

“What is Social about Social Networks?” Henkels Lecture Series on Social Networks, Notre Dame University, 2009.

Steve Frank

Banquet talk at conference on Systems Biology of Stem Cells. Beckman Center, UCI, May 25, 2010.

Seminar on cancer and another on social evolution. University of Utah, October 2009.

Seminar on social evolution. Santa Fe Institute, Sept 2009.

Michelle Garfinkel

“War, trade and natural resources”, Princeton-Yale Workshop on War and Trade, April 2010.

Donald Hoffman

“Visual Intelligence & Marketing”. Procter & Gamble, Mind Matters Meeting. Cincinnati, Ohio, 2009.

“Consciousness”. Parapsychological Association. University of Washington, Seattle, 2009.

“Vision Science”. VF Corporation, Greensboro, North Carolina, 2009.

“Mind, Emotion, Connection”. Workshop (with Rupert Sheldrake). Esalen, Big Sur, CA, 2009.

“Visual Intelligence”. Inside Edge Foundation for Education, University Club, UCI, 2009.

“The Interface Theory of Perception”. Psychology Department, UC San Diego, 2009.

“Research in Psychology”. Psychology Student Association, UC Irvine, 2010.

“Visual Intelligence: How We Create What We See”. Irvine Presbyterian Church, 2010.

“Visual Intelligence”. VF Jeanswear, Kansas City, Kansas, 2010.

“Natural Selection and Veridical Perception”. Inst. Math. Behav. Sci., UC Irvine, 2010.

“Artificial Neural Networks for ARPDD”. Naval Research Labs, Washington, DC., 2010

Simon Huttegger

“Networks and Information Transfer”. Workshop on Networks, Signaling, and Social Epistemology, London School of Economics, July 2010.

“Networks, Signaling, and Social Epistemology”. Tutorial for the master class of the Choice Group at the London School of Economics, July 2010.

“Communication and Conflict”. Workshop on Game Theory and Communication, Stanford University, May 2010.

“Game Theory and Adaptationism”. Department of Philosophy, University of Salzburg, December 2009.

“Group Selection and the Stag Hunt”. Evolution, Co-operation and Rationality Conference, University of Bristol, UK, September 2009.

Kimberly Jameson

“The use of color in interstellar design”. Jameson, K. A. & J. Lomberg. Astrobiology Message Science Conference: Evolution and Life: Surviving Catastrophes and Extremes on Earth and Beyond. League City, Texas, April 2010.

Marek Kaminski

“Strategic Ailment”. Pedagogical Academy”. Warsaw, Poland, November 2010.

“Generalized Backward Induction”. Institute of Sociology, Warsaw University, Warsaw, Poland, November 2010; International Conference in Game Theory, Stony Brook, July 2009.

Robin Keller

“Multiple objective decision analysis involving multiple stakeholders”. L. Robin Keller, Jay Simon, Yitong Wang. Invited 90 minute tutorial at the San Diego INFORMS conference in Fall 2009.

“Time Inconsistency of Risk Perception”. Yitong Wang, Tianjun Feng L. Robin Keller, presented by Wang, San Diego INFORMS conference, October 2009.

“Reference-dependent Expected Utility: Possibilities and Challenges”. Jay Simon and L. Robin Keller, presented by Simon, San Diego INFORMS conference, October 2009.

“Preference over Ambiguous Time”. Yitong Wang and L. Robin Keller. Poster presented at Behavioral Decision Research in Management conference, Pittsburgh, June 2010.

“Avoiding Risk by Seeking Uncertainty”. James Leonhardt, L. Robin Keller, and Peter Ditto. Poster presented by Leonhardt at Society for Personality and Social Psychology conference, January 2010.

“Preferences and Subjective Valuation of Sequences of Lives”. Jeffery L. Guyse and L. Robin Keller. Invited presentation in session organized by Keller at upcoming INFORMS conference in Austin, TX, November 2010.

“Modeling Reference-Dependence Under Uncertainty”. Jay Simon and L. Robin Keller. Invited presentation in session organized by Keller at upcoming INFORMS conference in Austin, TX, November 2010.

“Exploration and Extension of the Uncertainty Effect: Probabilistic Ambiguity and Comparison Direction”. Yitong Wang, L. Robin Keller, Tianjun Feng. Invited presentation in session organized by Keller at upcoming INFORMS conference in Austin, TX, November 2010.

“Accountability-aversion and a preference for uncertainty”. James Leonhardt and L. Robin Keller. Invited presentation in session organized by Keller at upcoming INFORMS conference in Austin, TX, November 2010.

Natalia Komarova

“Computing stem cell: problem of optimization and tissue design”. Symposium: Systems Biology of Stem Cells, UCI, Spring 2010.

“Stochastic modeling of drug treatment in cancer”. UC Davis Mathematical Biology seminar. Spring 2010.

“Drug resistance in cancer: principles of emergence and prevention”. Mathematical Methods in Systems Biology, International Workshop, Tel Aviv, Winter 2010.

“Mathematical problems in cancer modeling.” MBI current topics workshop, Mathematical Developments Arising from Biology, (plenary speaker), Fall 2009.

“Stochastic modeling of cancer treatment”. UC San Diego Center for Theoretical Biological Physics seminar, Fall 2009.

Igor Kopylov

“Simple axioms for subjective probability”. Risk, Uncertainty and Decisions Conference, Paris, June 2010.

“Simple axioms for subjective probability”. Boconni University, Milan, March 2010.

“Choice deferral and ambiguity aversion”. GREG HEC, Paris, March 2010.

“Perfectionism and Choice”. Southwest Economic Theory Conference, UCLA, February 2010.

Michael Lee

“Bayesian interpretations of sequential sampling models”. Annual Summer Interdisciplinary Conference, Aosta, Italy, July 2009.

“Hierarchical Bayesian models in cognitive science”. Invited symposium presentation, Annual Meeting of Society for Mathematical Psychology, Amsterdam, August 2009.

“A cyclic model of bistable perception”. Annual Meeting of Cognitive Science Society, Amsterdam, July 2009.

“A Bayesian model of children's development of number concepts”. Invited presentation, Dutch Royal Academy of Sciences, Amsterdam, August 2009.

“Cognitive models and the wisdom of crowds”. Departmental Seminar, University of Adelaide, October 2009.

“Using memory models and hierarchical Bayes to understand Alzheimer's”. Context and Episodic Memory Symposium, Philadelphia, April 2010.

Vladimir Lefebvre

“The Anti-Selfishness Principle as the Base for the Decision Making”. World Public Forum Dialogue of Civilizations, VII Annual Session, Rhodes, Greece, 2009.

“The Representation of Morality in the Formal Models of Choice”. VII International Symposium on Reflexive Processes and Control, Moscow, 2009.

Simon Levin

“Intra-generational equity and the problem of discounting”. IIASA (Laxenburg, Austria), Conference on Evolution of Cooperation, Models and Theories, September 2009.

“Contagion, Modularity and Robustness in Ecological Webs and Financial Networks”. Santa Fe Institute, Systemic Risk Initiative Meeting and Working Group, New York, NY, October 2009.

“Intergenerational Equality and Discounting, Fairness and the Commons: Socio-economic Strategies and Resource Dynamics”. Fondazione Giorgio Cini, San Giorgio Maggiore Island, Venice, Italy, October 2009.

“The Challenge of Sustainability: Lessons from an Evolutionary Perspective”. McGill University, Department of Biology, Department of Biology Organismal Seminar Series, November 2009.

“Intergenerational and Intragenerational Equity and the Problem of Discounting”. McGill University, Centre for Applied Mathematics in Bioscience and Medicine (CAMBAM), The CAMBAM Seminar Series, November 2009.

“Some Challenges in the Theory of Infectious Diseases, Dynamical Systems and Mathematical Modeling”. Graduate Student Organized Course, Princeton University, November 2009.

“Some Challenges in the Theory of Infections Diseases, Looking Back: Looking Forward”. DIMACS 20th Birthday Conference, Rutgers University, New Brunswick, NJ, November 2009.

“The Challenge of Sustainability: Lessons from an Evolutionary Perspective”. Shih-I Pai Lecture, Institute for Physical Science and Technology, University of Maryland, December 2009.

“Sustainability, Discounting and Cooperation: The Need for New Institutions”. Rachel Carlson Distinguished Lecture, Center for Systems Integration and Sustainability, Michigan State University, December 2009.

“Sustainability and the Robustness of Ecosystem Properties”. 2nd Symposium of Mathematical Systems Biology (Collective Dynamics in Biological Systems), Beckman Center of the National Academies of Sciences and Engineering, University of California, Irvine, January 2010.

“Intergenerational and Intragenerational Discounting: Lessons From Evolutionary Theory”. Colloquium, Institute for Mathematical Behavioral Sciences, University of California, Irvine, January 2010.

“Evolution and Public Goods, Public Goods: From Ecology to Economics”. Conference, Institute for Mathematical Behavioral Sciences, University of California, Irvine, January 2010.

“Cooperation and the Global Commons”. Lecture, Environmental Affairs Forum, Princeton University, February 2010.

“The Challenge of Sustainability: Lessons from Evolutionary Theory and Classical and Current Issues in the Theory of Infectious Diseases”. Lectures for seminar *Ecological, Evolutionary and Economic Perspectives on Biodiversity* held at the University of Puerto Rico-Rio Piedras, San Juan, March 2010.

“On the Evolution of Ecosystems Patterns”. 25th US International Association of Landscape Ecologists (IALE) Symposium, University of Georgia, April 2010.

“The Challenges of Sustainability”, “Collective Motion in Animal Populations”. Edward L. Reiss Memorial Lectures in Applied Mathematics, Northwestern University, Department of Engineering Sciences and Applied Mathematics, April 2010.

“Cultural Evolution and Social Norms: Problems of Equity”. Evolution, Ethics, and Environment: Biological Perspectives on Achieving a Sustainable Future Symposium (In Honor of the Inamori Foundation and Kyoto Prize Laureates B. Rosemary Grant, Peter R. Grant, Simon A. Levin, and Daniel H. Janzen), Princeton University, April 2010.

“The Challenge of Sustainability”. NSF Lecture Series (co-sponsor NSF Directorate for Biological Sciences), Washington, DC, May 2010.

“Environmental Commons and the Green Economy”. Discussant, Development Challenges in a Post-Crisis World, Annual Bank Conference on Development Economics, Stockholm, Sweden, May-June 2010.

R. Duncan Luce

“Functional Equations in Individual Decision Making: Some of János Aczél’s Impact”. INFORMS, San Diego, October 2009.

“Interpersonal Comparisons of Utility for Two Types of People”. Marschak Colloquium, UCLA, November 2009.

“Opening the Black Box versus Behavioral Invariance”. Eastern Psychological Association, Brooklyn, N.Y., March 2010.

Penelope Maddy

“Thin realism”. Stanford University, October 2009.

“Naturalism and common sense”. UCLA, March 2010.

“Naturalism and common sense”. Toronto, April 2010.

“Naturalism and common sense. Rocky Mountain Philosophy Conference, Keynote address, April 2010.

Naturalism and common sense”. University of Pennsylvania, April 2010.

“Objectivity in mathematics”. Sixth Annual Thomas and Yvonne Williams Lecture for the Advancement of Logic and Philosophy, April 2010.

“Naturalism and common sense”. Simon Fraser University, May 2010

Michael McBride

CSIP Workshop on Happiness and the Economy, Federal Reserve Bank of San Francisco, San Francisco, CA, September 2009.

CSU Fullerton, Fullerton, CA, Oct 2009.

UCI Human Sciences and Complexity Seminar, Oct 2009, Irvine, CA.

UCI IMBS Colloquium, Irvine, CA, October 2009.

Determinants of Social Conflict Conference, Institute for Economic Analysis (CSIC), Madrid, Spain, January 2010.

Prosperitas Group, Paul Merage School of Business, UCI, Irvine, CA, February 2010.

UC Riverside, Riverside, CA, February 2010.

HEC Montreal, Montreal, Canada, March 2010.

Public Choice Society Meetings, Monterey, CA, March 2010.

University of Illinois-Urbana Champaign, Urbana, IL, April 2010.

Paris School of Economics, Paris, France, June 2010.

Money and Happiness. Prosperitas Group, Paul Merage School of Business, UCI, Feb 2010.

Anthony McGann

“Constitutional Diversity and Supermajority Rule”, Public Choice Society Conference, Monterey, CA, March 2010.

“Proportional Representation within the Limits of Liberalism Alone”, Public Choice Research Centre, University of Turku, September 2009.

“The Surprisingly Majoritarian Nature of Proportional Democracy”, APSA Conference, Toronto, Canada, September 2009.

“Orthodox Social Choice versus Veto Players”, APSA Conference, September 2009.

Andrew Noymer

“Historical Influenza Pandemics: Lessons Learned”. MISMS Meeting, Copenhagen. The 1918 influenza pandemic hastened the decline of tuberculosis in the U.S., Session IV (by invitation), 2010.

Population Association of America, Annual Meeting, Dallas. Author-meets-critics: *Conquest: The destruction of the American Indios and El Dorado in the marshes: Gold, slaves and souls between the Andes and the Amazon* by Massimo Livi Bacci. Session 111, (by invitation), 2010.

“The decline of TB mortality: The USA and Southeast Asia in historical-comparative perspective”. College of Public Health, University of Philippines, Manila (UP-M), May 2010.
“Do social gatherings predict influenza mortality”? Andrus Gerontology Center, Univ. of Southern California, Institute for Mathematical Behavioral Sciences, UC, Irvine, November 2009.

“Who dies in flu pandemics? Evidence from 1918”. Stop TB Department, World Health Organization Headquarters, Geneva, September 2009.

“The 20th century decline of TB in the USA, with potential comparisons to high- and medium-TB-prevalence countries today”. Institute for Population and Social Research, Mahidol University, Salaya, Thailand, 2 September 2009.

Lisa Pearl

“Identifying Emotions, Intentions, & Attitudes in Text Using a Game with a Purpose,” NAACL-HLT 2010 Workshop on Computational Approaches to Analysis and Generation of Emotion in Text, Los Angeles, CA, June 2010 (with Mark Steyvers).

“Acquiring maximality in free relatives and definite descriptions”. Semantics and Linguistic Theory 20, Vancouver, British Columbia, Apr 2010 (with Ivano Caponigro, Neon Brooks, and David Barner).

“Computation in Acquisition”. Linguistics Colloquium, University of Maryland, College Park, March 2010.

“On the acquisition of maximality”. 36th Incontro di Grammatica Generativa, Universita degli Studi di Milano-Bicocca, Milan, Italy, Feb 2010 (with Ivano Caponigro, Neon Brooks, and David Barner).

“How Ideal Are We?” Incorporating Human Limitations into Bayesian Models of Word Segmentation, Boston University Conference on Language Development 34, Boston University, Boston, MA, Nov 2009 (with Sharon Goldwater and Mark Steyvers).

Dale Poirier

“Exchangeability, Representation Theorems, and Subjectivity”. Econometrics Colloquium, Department of Economics, UC Irvine.

Donald Saari

“Mathematics and new insights into dark matter”. Keynote speaker, Conference on Mathematics and Astronomy: A Joint Long Journey, International Year of Astronomy IYA2009, 90th anniversary of IAU event, (IAU, IMU), Madrid, Spain, November 2009.

“Understanding institutions via voting theory”. Institutions in Context, University of Tampere, Tampere, Finland, May 2010.

“The source of problems in spatial voting”. Public Choice, University of Turku, Turku, Finland, June 2010.

“Institutions in Context”. SSEAC Workshop on Voting and Allocation Systems, Mariehamn, Aland, Finland, June 2010.

“Understanding institutions via voting theory”. Institutions in Context, University of Tampere, Tampere, Finland, May 2010.

“The source of problems in spatial voting”. Public Choice, University of Turku, Turku, Finland, June 2010.

“Voting rules that encourage coalition formation”. SEAC Workshop on Voting and Allocation Systems, Mariehamn, Aland, Finland, June 2010.

“How can we get a ‘fair’ voting system”? American Association for Advancement of Science, annual meeting, San Diego, Session on "Mathematics and the Analysis of Fairness in Political Processes", February 2010.

“Contributions of Mathematical Economics Toward System Design”. NSF Workshop, Engineered Systems Design, Arlington, VA., February 2010.

“Decision problems that occur even with certainty”. NSF Workshop, Uncertainty in Machining, Arlington, VA. Feb. 2010.

“Dethroning -- and even exporting --- social choice dictators”. Keynote address, Public Choice Society, Monterey, CA. , March 2010.

“Making mathematics real!” Plenary lecture, National Council of Teachers and Mathematics, 2010 annual convention, San Diego, CA, April 2010.

“Learning to learn”. Plenary lecture, Process Education Conference, St. Louis, June 2010.

“Searching for appropriate dynamics for the social sciences”. Colloquium, Mathematics, Peking University, Beijing, China, July 2009.

“Mathematics of the social sciences”. Colloquium, Economics, Suzhou University, Suzhou, China, July 2009.

“The challenge of finding appropriate dynamics for the social sciences”. Colloquium, Mathematics, Shanghai University of Finance and Economics, China, July 2009.

“Chaotic elections! Why do we not elect whom we really want?” Arnold Family Lecture Series (public lecture), NSF Institute for Mathematics and its Applications, U. of Minnesota, September 2009.

“Using ‘donuts’ to analyze mathematical problems of the social sciences”. Fullerton College, CA, Mathematics, October 2009.

“Chaotic elections! And the role of mathematics”. West Chester University, Penn, Mathematics, October 2009.

“We make decisions. But are they appropriate?” Loyola Marymount University, Los Angeles, Public lecture, Feb. 2010.

“The role of mathematics in understanding economics”. Orange County Financial Society, February 2010.

“Did your group elect whom they really wanted?” Furman University, Greenville, SC. Donald Clanton Public Lecture, March 2010.

“Donut power! Mathematical consequences of a torus”. Furman University, Greenville, SC. Colloq, Mathematics, March 2010.

“Voting rules and the Grammys”. Recording Academy, Grammy executive board meeting, Santa Monica, CA , April 2010.

“Arrow's Theorem: What does it really mean and how does it affect *all* academic disciplines?” Karl Menger Distinguished Lecturer (Fourth Annual), IIT, Chicago, April 2010.

“Consequences for the social and behavioral science coming from the mathematics of a torus”. General public lecture, Illinois Institute of Technology, Chicago, April 2010.

“Dark Matter: A mathematician's perspective”. Mathematics, Colloquium, IIT, Chicago, April 2010.

“Complexity caused by reducing complexity”. Santa Fe Institute, Santa Fe, NM, May 2010.

“A voting rule for the Grammys”. Grammys Board of Trustees, Montage Bay Resort, Laguna Beach, May 2010.

Stergios Skaperdas

“International Trade and Transnational Insecurity”. Yale-Princeton Conference on War and Trade, Sponsored by the Niehaus Center for Globalization and Governance, Princeton University, April 2010.

“Peace and war with Endogenous State Capacity”. Conference on Game Theoretic Analysis of Conflict, (Politics Department, The Economic Theory Center and The Research Program in Political Economy) Princeton University, February 2010.

“Peace and war with Endogenous State Capacity”. Peace and Development International Workshop, The World Bank, Washington DC, December 2009.

“Conflict, Settlement, and the Shadow of the Future”. European Summer Symposium in Economic Theory (ESSET), Study Center Gerzensee, Switzerland, July 2009.

Brian Skyrms

Frieburg University Inst. Adv. Study, July 2009.

IIASA, Austria, September 2009.

University of Bristol Conf. 1 & 2, September 2009.

Venice Conference on Evolutionary Game Theory and the Environment, October 2009.

Johns Hopkins Philosophy Colloquium, November 2009.

Ken Small

Speaker, Public Affairs Symposium and Forum, Federal Reserve Bank of Atlanta, Oct. 2009.

“Gasoline and Carbon Taxes”. Conference on *Transportation Revenue Options: Infrastructure, Emissions and Congestion*, Harvard Kennedy School, Cambridge, MA, May 2010.

“Land Use and Vehicle Miles of Travel in the Climate Change Debate”. Discussant, Conference on *Climate Change, Environment, and Land Use Policies*, Lincoln Institute of Land Policy, Cambridge, MA, May 2010.

Charles (Ted) Wright

“Transfer of Motor Movements”. Hu, S. & Wright, C. E. Poster presented at the Cognitive Neuroscience Society annual meeting. San Francisco, 2009.

“Influences on Transfer of Motor Learning across Learning-Transfer Effector Combinations”. Hu, S. & Wright, C. E. Poster presented at the meetings of the Psychonomics Society. Boston, MA, 2009.

Jack Xin

IEEE Workshop on Applications of Signal Processing to Audio and Acoustics, New Paltz, NY, October 2009.

43rd Asilomar Conference on Signals, Systems, and Computers, November 2009.

Applied Mathematics Seminar, Stanford University, November 2009.

SIAM Conference on Analysis of PDEs, organizer and speaker of mini-symposium, Miami, December 2009.

CSC/PIMS Distinguished Lecture, Simon Fraser University, February 2010.

Applied and computational mathematics seminar, University of Texas at Austin, Austin, TX, April 2010.

Mathematics Colloquium, University of Central Florida, Orlando, April 2010.

3rd Southern CA Symposium on the Mathematics of Fluids, Caltech, April 2010.

First Workshop on Interdisciplinary Applied and Computational Mathematics, Zhejiang University, Hang Zhou, China, June 2010.

APPENDIX E
FACULTY AWARDS/ACHIEVEMENTS, 2009-10

William Batchelder

Special Issue of *Zeitschrift für Psychologie* on Multinomial Processing Tree Models.

Winer Memorial Conference on 'Processing trees and Similar Models' Purdue University.

(Both concern a popular family of models invented and developed by myself and students).

Jan Brueckner

Special-issue editor: "Economic Analysis of Airport Congestion," *Transportation Research Part B*, March 2010.

David Eppstein

Best paper award, Algorithms and Data Structures Symposium (WADS), Banff, Canada, 2009, for "Optimal embedding into star metrics"

Katie Faust

Elected Chair of the Mathematical Sociology Section of the American Sociological Association.

Steve Frank

Elected fellow of the American Association for the Advancement of Science.
Named to the External Faculty at the Santa Fe Institute.

Michelle Garfinkel

Serve on the editorial boards of several journals: *Journal of Conflict Resolution*, *Journal of Macroeconomics*, *Journal of economics and business*, *Defence and Economics*, *European Journal of Political Economy*.

Donald Hoffman

Who's Who in the World

Robin Keller

Editor-in-Chief, *Decision Analysis*, January 2007-Dec. 2009 (term 1) and January 2010-December 2012 (second and final term).

National Academies Committee Memberships:

1. U. S. National Committee for the International Institute for Applied Systems Analysis (IIASA), Board on International Scientific Organizations; appointed as member by Ralph Cicerone, Chair of the National Research Council and President of National Academy of Sciences.
2. Committee on Ranking FDA Product Categories Based on Health Consequences, Phases I & II, 2008-10. Under the Board on Environmental Studies & Toxicology in the Studies under the IOM Executive Office, Institute of Medicine of the National Academies; the IOM is the health arm of the National Academy of Sciences.

Appointed Scientific Advisory Committee member, Homeland Security Center for Risk and Economic Analysis of Terrorist Events (CREATE), at USC, June 2005-.

UC Santa Cruz (Proposed) School of Management Academic Advisory Group, 2007-2010.

Nominated for Recognition in Who's Who in Science and Engineering.

UC Service Roles:

The Paul Merage School of Business at UCI:

Director, Doctoral Program, 7/2009-6/2011

Economics/Public Policy Faculty Recruiting committee (2010-2011)

Operations and Decision Technologies Area. Area Coordinator, Spring 2010; ODT Faculty Recruiting Committee (2009-2010).

Michael Lee

President, Society for Mathematical Psychology

Guest editing special issue of Journal of Mathematical Psychology on Hierarchical Bayesian Methods, following a symposium I organized on the topic.

Vladimir Lefebvre

Invited to become a member of the editorial board of the International Journal of General Systems.

Simon Levin

Honorary Doctor of Science, Michigan State University, 2009.

Eminent Ecologist Award, Ecological Society of America, 2010.

R. Duncan Luce

Elected Fellow of the Econometric Society.

Penelope Maddy

How applied math became pure (*Review of Symbolic Logic* 1 (2008), pp. 16-41) was chosen one of the ten best philosophy papers published in 2008 by *The Philosophers Annual* (<http://www.philosophersannual.org/>).

Michael McBride

Excellence in Refereeing Award, American Economic Review, 2009.

Andrew Noymer

Who's who in America, 64th edition. Marquis Who's Who.

Public service: Member, Metrics Subcommittee, Healthcare Advisory Committee, California Department of Public Health, 2010.

Dale Poirier

Served as Director of Graduate Studies in Economics.

Brian Skyrms

SYNTHESE Distinguished Paper Award for 2010.

Ken Small

Excellence in refereeing ward, American Economic Review, 2009.

Consultant for US General Accountability Office (unpaid), July 09.

Jack Xin

2009-2010 CSC/PIMS Distinguished Speaker, Canada.

APPENDIX F
GRADUATE STUDENTS AFFILIATED WITH IMBS

(i) Current Student Participants and their IMBS Advisors
(* advanced to Ph.D. candidacy; ** received Ph.D. during year)

<u>Student</u>	<u>Advisor</u>
* Ryan Acton	Butts
Kalin Agrawal	Batchelder
* Christopher Balding	Grofman
* Jerry Benzl	Kaminski
Jonathan Cook	McBride
Adrian de Froment,	Levin
Steve Doubleday	White
** Stephanie Drew	Sperling
John Enschede	Taagepera/Grofman
Michael Ernst	Maddy
Amy Escobar	Hoffman
* Iris Franz	McBride
** Shaw Gillespie	Braunstein
Matthew Glass	Maddy
Giorgio Gosti	Batchelder
* Diego Grijalva	Skaperdas
* Assal Habibia	Hoffman
Christian Herrera	Chubb
David Hewitt	McBride
* Arvin Hsu	Sperling
Jason Hsu	Kaminski
* Lorien Jasny	Butts
Dan Jessie	Saari
* Steven Kies	Chubb
* Jinwon Kim	Brueckner
** Rueben Kline	Grofman/Kaminski
* Vimal Kumar	Garfinkel/Skaperdas
* Julie Kwak	Hoffman
Frederico Llarena	de Figueiredo
Ester Li	Poirier
* Phillip Li	Poirier
* Ling Lin	Sperling
* Shiau Hua Lin	Dosher
Kate Longo	Komarova
* Son-Hee Lyu	Sperling
* Brian Marion	Hoffman
Justin Mark	Hoffman
* Ray Mendoza	Komarova
* Hyeok Ki Min	Skaperdas
Arshad Mohammad	Poirier

*	George Ng	Skaperdas
*	Kerem Ozkan	Braunstein
	A. J. Packman	Maddy
	Darren Peshek	Hoffman
*	Petrescu-Prahova	Butts
	James Pooley	Lee
*	John Pyles	Hoffman
	Ashish Rajbhandari	Poirier
*	John Rapalino	Maddy
*	Brian Rogers	Maddy
	Nilopa Shah	Brueckner
*	Kejun Song	Small
*	Hisaaki Tabuchi	Sperling
	Samuel Thorpe	Srinivasan
*	Bao Truong	Hoffman
*	Yogesh Uppal	Grofman
*	Elliott Wagner	Skyrms
	Dan Wolf	Kaminski
	Julian Yarkony	Hoffman
*	Mike Yi	Steyvers
*	Matthew Zeigenfuse	Lee
*	Shunan Zhang	Lee

(ii) MA Degrees in Mathematical Behavioral Science during academic 2009-10

Gregory Ferenstein
 Dan Jessie
 Elliott Wagner

APPENDIX G VISITORS' LETTERS

Donald G. Saari, Director
Institute for Mathematical Behavioral Sciences
University of California
Irvine, Ca 926797-5100

Dear Don,

Below are my activities while at UCI in January 2010.

Met regularly with junior faculty in EEB to discuss common interests, and ways to build activities on campus.

Met with a range of other faculty, especially Saari, Frank, Lander and Nie, to discuss common research interests and explore collaborations.

Agreed to join Leadership Council for UCI initiative, *Smart Energy, Sustainable Environment*, Chaired by Dean Rafael Bras.

Co-organized and delivered a paper (Sustainability and the Robustness of Ecosystem Properties) at the 2nd UC Irvine Mathematical Systems Biology symposium, *Collective Dynamics in Biological Systems*, held on January 11th and 12th, 2010 at the Beckman Center. Also participated in a follow-up meeting January 25 with Terence Hwa, Qing Nie, Arthur Lander and Steve Frank in which we agreed to explore a series of collaborative activities.

Delivered a colloquium to IMBS, Intergenerational and Intragenerational Equity and the Problem of Discounting, on January 14.

Advised on the organization of, and co-delivered (with Avinash Dixit), two papers at IMBS workshop on Public Goods in Ecology and Economics, Jan 22-23. These were entitled "*Evolution and Public Goods*" and "*Using national pro-social preferences to provide global public goods.*" Also chaired final session and led discussion session.

Spoke in regular EEB graduate student discussion group led by Jennifer Martiny and Kailen Mooney. Also met with Complex Biosystems grad student Victor Quintana-Zilinskas to provide career advice.

Attended various seminars and classes (Skyrms-Saari-Narens).

Led DARPA investigator meeting on Fundamental Laws in Biology, at Dana Point.

Simon Levin
Professor, Ecology and Evolutionary Biology
Princeton