

ANNUAL REPORT
08-09

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Director's Statement

Dear IMBS Colleagues and appropriate administrators,

It is time to again review the activities of our IMBS members, and 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 \$78,000,000. During the year our members published over 180 papers (which includes some books), and they gave over 175 invited presentations. (For more specific information about individual activities, please see the Appendices of this report.) Clearly, this has been, again, an active year!

The strength of the IMBS derives 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**, which provides a sample of 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 institute ranges from the practical, such as Keller's exploration of complexity in making decisions, Brueckner's analysis of airport congestion (which all of us have suffered!), Branch's analysis of bubbles and crashes (again, something that has concerned all of us!), Small's study of demand for travel and energy policy, Noymer's work on the spread of diseases (leading to comments about the current worry of H1N1), to the more theoretical such as Xin's and Zhao's mathematical approaches toward hearing, vision and other issues, Frank's analysis of dynamics and information in issues of natural selection, the work of Jameson, Komarova, and Narens on the analysis of color categorization, and on and on. You will also discover how current IMBS research, such as Luce's analysis of individual risk and Hoffman's work on perception probably will force fundamental reexaminations of assumptions and experiments. And, this is just a 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 two major conferences of the 2008-09 academic year took place in January (*Adaptive Systems and Mechanism Design*) and in March (*Human and Machine Learning*). The theme of this first conference is the topic that was recognized by the Nobel Prizes in Economics in 2007 (and two laureates, Kenneth Arrow and Eric Maskin gave major talks during this conference). As the presentations at this conference proved, the notion of combining concepts from game theory with the design organizations (to achieve desired outcomes) now is moving from economics to political science, computer science, and even social networks—these are all areas represented within the IMBS.

The second conference addressed another topic of strength within the IMBS and UCI—learning theory. Here ideas by experts from computer science, statistics, cognitive sciences, psychology, and even from representatives from industry were explored. Other conferences include the two we put on each year for graduate students. The one during fall term is devoted toward describing IMBS supported research that was carried out over the past summer, while the one in the spring 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.

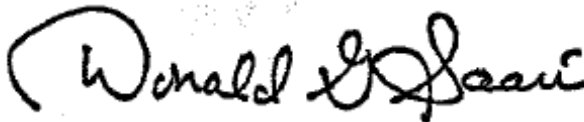
In addition to our active colloquia series (see Section IV E), our subgroups, *Social Dynamics and Complexity* has a weekly series (that involves several other universities), the *Social Networks Research Group* has weekly discussion meetings as does the newly formed *Evolution of Signaling Systems*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

In summary, 2008-09 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 welcome suggestions about what else we could be doing.

Although the financial difficulties were beginning to emerge during the 2008-09 academic year, the IMBS enjoyed a full, active year, and we expect to do the same during 2009-10; indeed, at least four conferences are being planned. As this report proves, the cost of the institute is very 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 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 wish to salute a person who always plays a key and important role for the success of the IMBS: *Janet Phelps*. 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 and a part-time Administrative Assistant. 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
Part-time Administrative Assistant:	Grace Lee

B. Executive Committee

Carter Butts, Associate Professor of Sociology
Marek Kaminski, Associate Professor, Political Science
L. Robin Keller, Professor, Decision Operations
Michael D. Lee, Associate Professor, Cognitive Sciences
Mark Machina, Professor of Economics, UC San Diego
Sergios Skaperdas, Professor of Economics
Brian Skyrms, Professor of Logic and Philosophy of Science

II. RESEARCH

A. Current Research Programs

The 60 members of the Institute for Mathematical Behavioral Sciences (IMBS) and their research interests are listed in Appendix A.

The IMBS is 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, Romney, Sperling, Srinivasan, Wright, Yellott, Xin, and Zhao

Psychophysics and Response Times: 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, Saari, Taagepera, and Uhlener

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

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

B. Publications

The members who have replied report a total 184 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 6 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 176 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

Louis Narens

My research during the past year has been related to three grants on which I am PI or Co-PI. For one of these, a psychophysical grant from NSF with R. Duncan Luce and Ragnar Steingrímsson, my research has consisted in the development of theory and the design of experiments. For the second, an evolutionary game theory grant from NSF with Kimberly Jameson, Natalia Komarova, and Ragnar Steingrímsson, my research has been primarily a revision of an article about the philosophical implications of our research. And for the third, a mathematical logic and foundations of probability grant from AFOSR with Brian Skyrms, my research during the past year has been devoted to writing a new book, *Intuitionistic Probability Theory with Applications to Decisions and Strategic Game Theory*.

Also during the past year, Brian Skyrms and I have been involved in integrating the evolutionary game theory research at Irvine involving the evolution of shared concepts, knowledge, and values. This include Jeff Barrett, Simon Huttegger, and Brian Skyrms from the Department of Logic and the Philosophy of Science, Louis Narens and Ragnar Steingrímsson from the Department of Cognitive Science, Natalia Komarova and Don Saari from the Department of Mathematics, Kimberly Jameson from Mathematical Behavioral Sciences, and graduate students from several departments. Skyrms, Narens, and Jameson have been actively involved in seeking extramural funding for this enterprise, including large scale grants to support this research and funding for a conference to put on at the Center for Advanced Study in the Behavioral Sciences.

Statistical Modeling

Jeff Barrett

I have been thinking about how language and theory might coevolve in the context of cooperative action. As a basic model, I have been running computer simulations of Skyrms-Lewis sender-receiver games. In short, simple signaling languages and simple predictive dispositions can coevolve from random signaling and predicting for agents equipped with only the most basic reinforcement learning.

Decision-Making

Robin Keller

L. Robin Keller, Craig W. Kirkwood (Arizona State University), and Nancy S. Jones, (Baltimore Metropolitan Council). Forthcoming 2009, "Assessing Stakeholder Evaluation Concerns: An Application to the Central Arizona Water Resources System," Systems Engineering. (Expected in Volume 12 (3)), accepted for publication on 8/20/08. Received 7 March 2008; Revised 13 June 2008; Accepted 20 August 2008, published online in advance of printing on Wiley InterScience (www.interscience.wiley.com) DOI 10.1002/sys.20132

Keller et al. (2009) present an approach for efficiently assessing stakeholder evaluation concerns in the first stage of problem structuring for decisions involving complex systems. They used a web survey to assess the appropriateness of a set of evaluation concerns for evaluating

Central Arizona water resources system policies and to gather information on stakeholder priorities. The resulting set of concerns brings a “decision focus” to the modeling efforts of the NSF-funded Decision Center for a Desert City at Arizona State University. This problem structuring approach, the set of evaluation concerns, and the analysis of variations among stakeholder group priorities can serve as a starting point for other similar policy settings.

Vladimir Lefebvre

During the last year I kept developing the theory of reflexive games. This theory considers a subject with a hierarchy of images of himself and others. I am working now on a book describing this theory.

R. Duncan Luce

1) The first project follows up on the decision making insight of Luce (2009a) 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 submitted article Luce (2009c). 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) Ragnar Steingrímsson and I have carried out auditory experiments on the so-called time-order phenomenon, namely that when identical signals are presented successively they do not seem equally loud. Using my global psychophysical theory (Luce, 2004, 2008) in the *Psychological Review*, we arrived at tests of the accuracy of the model. A simple qualitative property shows that when one establishes the match using two interval forced-choice procedures the model seems on average vaguely like the representation, but just how well varies by respondent in none too clear ways. Using an up-down free-adjustment matching procedure the theory accounts very well for all 6 respondents provided we admit that each respondent has an option: Is it that the varied signal matters, in which case certain curves must agree? Or is it the signal that is presented second that matters, in which case the slopes must be of opposite signs. This means the average plot is totally misleading. A joint paper “Evaluation of Time-Order Error Predictions from a Model of Global Psychophysics” is nearing completion and we expect to submit it later in the summer of 2009. Additional brightness studies are underway that use visual equipment purchased under a supplementary grant to the main one.

3) Based on an initial idea of Louis Narens (1996), which I showed also to follow readily from the global psychophysical representation mentioned in (ii), we have begun to collect data. The prediction is that a form of commutativity must be exhibited when scaling data from a ratio scale. In particular, suppose that the respondent reports that “signal z is p times as loud as x ,” and then reports “ u is q times as loud as z .” Then do it with q first and p second leading to u' . Commutativity asserts that $u = u'$. Luce, Narens, and Steingrímsson are testing this property for loudness and, in a second experiment, for brightness. Assuming that these tests work out, we will next ask the empirical question: Does the evidence support 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.

Padhraic Smyth

In joint work with IMBS member Mark Steyvers (Cognitive Sciences), we have developed a new statistical text modeling approach that can learn language models using both large corpora of text data as well as prior human knowledge in the form of taxonomies or concepts. This builds on our earlier work in statistical text mining, where documents are represented as mixture distributions over topics, and topics are multinomial distributions over words. These techniques have been very successful at unsupervised learning of interpretable concepts from large sets of documents – however, these algorithms are purely data-driven and ignore significant aspects of prior human knowledge. In our new approach, we show how to gain the best of both worlds: models that use both human knowledge and data have better predictive power (not surprisingly) than models that rely on either alone. This new framework promises to be a useful starting point as a general framework for addressing a number of problems in computational text analysis, including quantitative evaluation and integration of ontologies and automated tagging with human concepts of large volumes of unlabeled text data.

Perception and Psychophysics

Mike Braunstein

There has been considerable interest recently in the role of the ground plane in the perception of the layout of objects in 3-D scenes. Our current research has been concerned with changes in perception that occur at the horizon. We have found that perceptions of relative size, speed and motion path are altered as objects move above the horizon. When the horizon is not explicitly present in a scene, a "perceptual horizon" is determined by a combination of the vanishing point of converging lines in the scene and the height at which the visible ground surface terminates.

Mike D’Zmura

The rhythmic structure of imagined speech production can be detected in non-invasive brain recordings, providing a step toward the development of an EEG-based system for communicating imagined speech.

Donald Hoffman

A goal of perception is to estimate true properties of the world. A goal of categorization is to classify its structure. Aeons of evolution have shaped our senses to this end. These three assumptions motivate much work on human perception. In my paper "The interface theory of perception" I argue, on evolutionary grounds, that all three assumptions are false. Instead, our perceptions constitute a species-specific user interface that guides behavior in a niche. Just as the icons of a PC's interface hide the complexity of the computer, so our perceptions usefully hide the complexity of the world, and guide adaptive behavior. This interface theory of perception offers a framework, motivated by evolution, to guide research in object categorization. This framework informs a new class of evolutionary games, called interface games, in which pithy perceptions often drive true perceptions to extinction.

A. Kimball Romney

Research with Chuan-Chin Chiao on a color appearance model has the potential to revolutionize color vision theory. The derivation of the model and a description of the four basic equations that constitute the model are presented in, "Functional computational model for optimal color coding" (*PNAS* 2009, 106:10376–10381). The model calculates an orthonormal projection matrix from the cone photoreceptors that is used to transform any surface reflectance spectra into a linear combination of the photoreceptors. An estimate of the color appearance structure is obtained by multiplying the reflectance spectra of 1269 Munsell color chips by the projection matrix and representing the result in a three dimensional Euclidean space. The resulting structure is almost the same as the CIE L*a*b* color system, the internationally recognized gold standard. Our model has the advantage that it provides a functional explanation of why the additive colors of red, green, and blue constitute the prime or ideal colors used universally in industry to produce color monitors, high definition color TV, etc. In a second paper Romney demonstrates that virtually all color information contained in the physical reflectance spectra is passed through the projection matrix which transforms spectra into a linear combination of the cone photoreceptors. The variance accounted for when using the model result to predict the actual spectra of 640 color chips is 0.9988. In a third paper Romney and Chiao show how the model applies to any variant genetic photoreceptor types of observers including those with only two spectrally distinct photopigments. Color appearance for such observers has not been precisely modeled in the past. Since the model makes very strong quantitative predictions that can be easily confirmed or disconfirmed we are hoping for an early test of the validity of the model.

Jack Xin

Main Findings: (1) Develop soft-constrained dynamic iterative method for blind source separation, study its stability and convergence; (2) Design a class of Nonlocally Weighted Soft-Constrained Natural Gradient Algorithm and Blind Separation of Reverberant Speech Mixtures; (3) Successfully separated recorded sound mixtures in strongly reverberant room conditions, and achieved higher signal-to-interference ratio than existing methods in the literature; (4) Authored an invited Springer book entitled "An Introduction to Fronts in Random Media, Surveys and Tutorials in the Applied Math Sciences, Vol. 5, Springer, July, 2009.

(1)-(3) are research advances towards solving the "cocktail party problem" in hearing science via the so called Blind signal processing. "Blind" refers to no a priori knowledge of

environments of sound mixing. The methods developed in fact apply to a broad range of problems related to the sensing, imaging, recognition and learning processes in the brain. (4) is a first introductory user-friendly entry-level graduate tutorial book on dynamics of interfaces (flames, shocks, moving boundaries) in random environment. A real-world example is forest fire or turbulent combustion in rockets and auto turbines.

Hong-kai Zhao

We developed the following theory and computational algorithms:

- (1) classification, segmentation and visualization of point clouds using principal component analysis.
- (2) for photon propagation in tissue based on radiative transfer equation and for molecular imaging using visible or near infrared light.
- (3) for moving interface and free boundary problem.
- (4) for optimal control and Hamilton-Jacobi equations.

Social and Economic Phenomena

(a) Economics and Game Theory

William Branch

The conventional view of financial markets holds that stock prices should reflect all publicly available information and that the efficient operation of markets will lead a stock's price to equal the present value of expected future dividends. Two noteworthy empirical facts cast doubt on this hypothesis: stock market returns are often predictable and stock prices exhibit recurrent bubbles and crashes. In two recent papers, I employ models of bounded rationality and learning to explain how bubbles and crashes might arise in a conventional model of stock prices and to generate predictable stock market returns.

Jan Brueckner

My recent work on different approaches to airport congestion management showed the superiority of quantity-based over price-based approaches. Under congestion pricing, airlines must be charged different congestion tolls depending on their flight share at an airport. The reason is that large airlines internalize (take into account) a greater share of the congestion they create than do small airlines, a consequence of the fact that most of the congestion is self-imposed. As a result, the congestion toll (which charges for uninternalized congestion) can be relatively small for a large airline, with small airlines paying larger tolls. Unfortunately, this asymmetric structure would be politically unpopular, and a more politically palatable uniform toll will distort the traffic levels of the carriers away from the optimum. However, a quantity-based approach, either a slot auction or a trading system with free distribution of slots to the airlines, overcomes these drawbacks (slots confer landing rights at a congested airport). Mathematically, the source of the difference is that, with the total quantity of slots (and thus flights) announced head of time, each carrier views total airport congestion as fixed. As a result, despite use of a uniform price under the auction or trading schemes, traffic is allocated correctly across the

carriers. The remaining challenge, though, is to choose the total slot quantity correctly, so as to maximize social welfare.

Steve Frank

a). Biology, information flows from the environment to the genome by the process of natural selection. However, it has not been clear precisely what sort of information metric properly describes natural selection. Here, I show that Fisher information arises as the intrinsic metric of natural selection and evolutionary dynamics. Maximizing the amount of Fisher information about the environment captured by the population leads to Fisher's fundamental theorem of natural selection, the most profound statement about how natural selection influences evolutionary dynamics. I also show a relation between Fisher information and Shannon information (entropy) that may help to unify the correspondence between information and dynamics. Finally, I discuss possible connections between the fundamental role of Fisher information in statistics, biology and other fields of science.

One interesting aspect of this concerns the relation between dynamics and information. For example, one can think of natural selection as a force, and the resulting change (dynamics) of a population as accumulation of information. People have long recognized this relation, but there has never been a clear formal understanding of this basic issue. Fisher information turns out to be the key, because it relates a force (in statistics a parameter) to an acceleration (in statistics, a second derivative describing the change in a probability distribution). This force-acceleration relation can also be related to dynamics. One can consider three aspects of dynamics: initial condition, outcome, and rules (forces) that determine the change. Classically, one takes the initial conditions and rules as given and deduces the outcome. But one can also take the initial condition and outcome as given, and induce the underlying force--that is, one can take the observed patterns (measured as acceleration) and obtain information about the unobserved force. For more information, see the paper: <http://stevefrank.org/abstracts/09JEBftns.html>.

b). We typically observe large-scale outcomes that arise from the interactions of many hidden, small-scale processes. Examples include age of disease onset, rates of amino acid substitutions, and composition of ecological communities. The macroscopic patterns in each problem often vary around a characteristic shape that can be generated by neutral processes. A neutral generative model assumes that each microscopic process follows unbiased or random stochastic fluctuations: random connections of network nodes; amino acid substitutions with no effect on fitness; species that arise or disappear from communities randomly. These neutral generative models often match common patterns of nature. In this paper, I present the theoretical background by which we can understand why these neutral generative models are so successful. I show where the classic patterns come from, such as the Poisson pattern, the normal or Gaussian pattern, and many others. Each classic pattern was often discovered by a simple neutral generative model. The neutral patterns share a special characteristic: they describe the patterns of nature that follow from simple constraints on information. For example, any aggregation of processes that preserves information only about the mean and variance attracts to the Gaussian pattern; any aggregation that preserves information only about the mean attracts to the exponential pattern; any aggregation that preserves information only about the geometric mean attracts to the power law pattern. I present a simple and consistent informational framework of the common patterns of nature based on the method of maximum entropy. This framework

shows that each neutral generative model is a special case that helps to discover a particular set of informational constraints; those informational constraints define a much wider domain of non-neutral generative processes that attract to the same neutral pattern.

Natalia Komarova

With my IMBS colleague K. Jameson I have continued to work on problems of color categorization. We have investigated how realistically-modeled abnormal observers impact population color categorization. We showed that even a small fraction of abnormal observers leads to a strong anchoring of color category boundaries to a subset of locations in the color space. 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. Another topic of my research has been cross-resistance in leukemia drug treatments.

Igor Kopylov

Ideas: I have formulated a model that explains why people may be willing to pay for flexibility that they do not plan to use afterwards. For example, there is ample evidence in the literature that people often pay high annual gym membership fees, but then choose not to go to the gym or go very rarely. I argue that such behavior can be rationalized if it is mentally costly for the decision maker to reject a menu that contains a very appealing normative option even if she knows that she will not choose this option because of future temptations. This mental cost can arise because of various emotions, such as guilt, anger, shame etc.

In another research paper (joint with Jawwad Noor), I use menus framework to model *self-deception* that is driven by cravings for future consumption, but also requires a façade of rationality to disguise itself. One implication of our model is that people may benefit from casino zoning laws and ABC liquor regulation because it can be harder for them to practice self-deception when the vice products (i.e. gambling or liquor) are available, but are provided separately from 'innocent' goods (i.e. shows, restaurants, or groceries).

Michael McBride

With Stergios Skaperdas, I completed a study of an under-explored reason for conflict, namely that conflict arises in the present when it can significantly enhance the bargaining position of the winner. We developed a formal theoretical model of our argument and then conducted a laboratory experiment to test the main predictions of the model. Consistent with our predictions but contrary to standard intuitions, we found that conflict is more likely as likelihood of future periods increases. We plan to build on this in the future.

Dale Poirier

Hal White's 1980 *Econometrica* paper is the paper most cited by others in peer-reviewed economics literature since 1970. Despite this popularity, its rationale from the Bayesian perspective has been unclear. My paper "Bayesian Interpretations of Heteroskedastic Consistent Covariance Estimators Using the Informed Bayesian Bootstrap" aims to fill this noticeable void.

Donald Saari

Several advances were made. A continuing theme is to extend my earlier results about social choice (i.e., the mathematics of understanding group decision processes such as voting) to other disciplines. As an example, Kenneth Arrow discovered an influential result over 50 years ago showing that it is impossible to create a voting system that satisfies some generally accepted properties. Arrow's result strongly depends on the structure of individual preferences. I discovered how to drop that restriction; as such, the new result is applicable to a wide range of issues in the social and behavioral sciences, engineering, and even physics. (Indeed, these results inspired an approach to examine the question of dark matter; a paper on this topic is currently under review.)

Another advance is that I discovered a way to decompose profiles for n-candidate elections into component parts. To explain, for over two centuries, the area of voting theory has discovered all sorts of mysteries and paradoxes. The approach I am creating should completely explain a sizeable portion of these mysteries.

Kenneth Small

Work with graduate student Kent Hymel and former faculty colleague Kurt Van Dender has disentangled two distinct ways that expanded infrastructure can alter people's amount of motor vehicle travel. One is by giving them more destinations by extending a transportation network; the other is by reducing the congestion they encounter. We have measured both, and shown how the second is a facet of the well-known elasticity of demand for travel, which expresses how responsive travelers are to the cost of travel. Furthermore, we show that all three effects can be measured consistently within a single multi-equation framework.

Earlier work with Kurt Van Dender on the "rebound effect" in energy policy has played a significant role in guiding the US federal government in setting new fuel efficiency standards for cars and light trucks. The National Highway Traffic Safety Administration issued its proposed rules governing model years 2011-2014, and discussed at length the problem of the "rebound effect", namely that by making it cheaper to drive, the new rules may create more travel and thereby undermine some of the energy savings and also create congestion or other adverse spillover effects. However, the empirical findings by Small and Van Dender that the rebound effect is small and declining with income were singled out for special attention, providing an important supporting empirical basis for the regulations. "NHTSA tentatively attaches greater significance to studies that allow the rebound effect to vary NHTSA also tentatively attaches greater significance to the recent study by Small and Van Dender (2005), which finds that the rebound effect tends to decline..." (US Federal Register 73(86), p. 24409).

(b) Public Choice

Bernard Grofman

Political party competition is a key element of democracy, but how do we measure the competitiveness of an election? The standard answer to this question is to look at the difference between the winner and the loser, with the idea being that smaller this difference the more competitive is the election. That works fine if there is only one position to be filled, but what about contests, such as those in multi-seat proportional representation systems, where multiple candidates are elected at the same time? Previously, the winner versus loser difference was generalized by comparing the vote share of the lowest scoring winner with the vote share of the highest scoring loser, but that solution has a number of problems. In a forthcoming paper in *Electoral Studies*, my co-author and I offer a way to better measure of political competitiveness that satisfies a number of desirable normative properties, including being identical to the standard measure when there is only one seat to be filled.

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

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. It remains to be seen if the current influenza pandemic (SO-A/H1N1) will show a similar pattern, a question to which I am paying close attention as this pandemic unfolds in real time.

Douglas White

In a series of articles in kinship groups and organizations over time, and at the historical dynamics of monetized commodity exchange, cities, states and empires, the empirical data on dynamics points to distinct types of metastable dynamics in the various systems based on monetized commodity exchange, i.e., characterized by partially coordinated tendencies (not

states) in which individual coordinating elements are neither completely independent of each other (locally segregated) nor fully linked in a fixed mutual relationship (globally integrated). These are characterized by fluctuations of varying periodicities, depending on scale. Our recent publications on economic networks (Science, SFI Working paper) start to show how our group is studying these phenomena dynamically. Without monetized commodity exchange social dynamics often has different dynamical tendencies.

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]
Stochastic Processes [Batchelder]
EEG-Based BCIs [D'Zmura]
Topics in Evolution [Frank]
Public Choice/Political Economy III [Grofman]
Mind-body problem [Hoffman]
Face Perception [Hoffman]
Introduction to Game Theory [Kaminski]
Public Choice I [Kaminski]
Decision Theory [Keller]
Decision Analysis [Keller]
Experimental Learning class, (technical advisor), FTMBA field study team with Hoag Hospital for Business Plan for Mary and Dick Allen Diabetes Center [Keller]
Probability Seminar [Komarova]
Bayesian Cognitive Modeling [Lee]
Applied Economics [Poirier, Ragusa]
Social Dynamics [Saari, Narens, Skyrms]
Methods and Models [Saari, Narens]
Signaling Seminar, Stanford [Skyrms]
Colloquium in Transportation Science [Small]
Artificial Intelligence/Machine Learning [Smyth]
Human Social Complexity [White]
Equisalience Function Analysis [Wright]

EVOLUTION OF SIGNALING SYSTEMS

Kimberly Jameson (Project Scientist, IMBS), Natalia 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.

This NSF funded research project has also given rise to a new 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 group 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 2008-2009 funding period are found at:

Spring 2009:

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

Winter 2009:

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

Fall 2008:

<http://aris.ss.uci.edu/~kjameson/ColorCogFALL2008.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, Kim Romney, Doug White, and Andrew Noymer). During the 2008-2009 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:

- Focused Discussion: Time Scales in Relational Processes
- Political Community and Mutual Trust Between EU Nations [Ryan Acton]
- Relational Event Models for Email Networks [Chris DuBois]
- Patterns of Coordination: Brokerage Roles in the Immediate Wake of Hurricane Katrina [Emma Spiro]
- Relational Aspects of Time Use Data [Chris Marcum]
- Update on Triad Research [Katie Faust]
- The Responder Improvisation Data Set - A First Look [Lorien Jasny]
- Large-scale Spatially Embedded Networks from GIS Data [Carter Butts, Ryan Acton, and John Hipp]
- Brokerage in the Wake of Hurricane Katrina [Emma Spiro]

- A Sneak Peek at the Spatial Networks Project [Carter Butts and John Hipp]
- Networks of Trust [Stewart Gordon]
- Dynamic Modeling of Organizational Coordination over the Course of the Katrina Disaster [Zack Almquist]
- Geography and Meeting Co-Attendance [Adam Boessen]
- Residential Settlement Models [Miruna Petrescu-Prahova]
- Cigarette Smoking Among Adolescents: Social Networks, the Neighborhood, and the Role of Social Support [Cynthia Lakon]
- Previews of presentations for the Sunbelt Conference [Katie Faust, Zack Almquist, Samantha Cross]
- (More) Social Networks [Katie Faust]
- Online Networks on [last.fm](#) [Ryan Acton]
- ERG Parameterization from Potential Games [Carter Butts]
- The Intellectual History of SNA [Lin Freeman]
- New Methods for Studying Core-Periphery Structure [John Boyd]
- Entailment Relations in Political Participation [Lorien Jasny]
- Brokerage as Process Rather than Structure [David Obstfeld]
- Sunbelt Abstract Presentations – abstracts presented for discussion by the group!
- The Mentorship Tie: Sources and Implications for Economic Life [Denis Trapido]

SOCIAL DYNAMICS AND COMPLEXITY RESEARCH GROUP

GOALS. The disciplinary goals of SD&C are eclectic, that is transdisciplinary, with an aim to (a) expand the anthropological sciences, network economics, political economy, network sociology, and historical dynamics, (b) reconfigure comparative social science within the context of modern network autocorrelation and autoregressive studies, (c) continue helping to introduce complexity sciences, dynamics and network sciences into the social science disciplines generally. The educational goals are to spawn a variety of new open source open data open instruction modules for the types of work done within our network of scientific collaborators as a publically available means of instruction in theoretical and methodological advances in the social sciences. The research goals are to continue to advance along these interdisciplinary frontiers. These goals are advanced with cost-free open access eJournals and ePublication wikiMedia in which we have pioneered. These also allow young scientists access to peer review publication and allow all contributors to benefit, including learning facilities for the retooling of skill sets, software usage, and improvement of data sets (e.g., through imputation of missing data).

UC-WIDE FACULTY AFFILIATES include Professors Adams, Algaze, Kronenfeld, Manlove, Maoz, Read (UCSD, UCSD, UCR, UCB, UCD, UCLA), all in Anthropology except for Maoz (Political Science). In addition to our UCI members and affiliates, our intercampus affiliates serve as editors for our journals and mediawikis, suggest speakers, and provide vital linkages to programs on other campuses with similar goals. Especially important in this regard is our long-term linkage and collaboration with the UCLA Human Complex Systems instructional and research programs headed by Professor Dwight Read. Our broader-range affiliates include European and Asian networks and complexity centers and researchers.

ACTIVITIES. In the current year, core members of our faculty have contributed articles to the Sage Handbook of Social Networks, Blackwell Companion to Cognitive Anthropology, Springer Encyclopedia of Complexity and Systems Science, Springer Methodos Series, and Science Magazine "Perspectives." Members of the program have submitted a new NSF grant (Bell and White), produced two and sponsored three other eJournal issues in the UC eScholarship Repository, the latter a new eJournal supervised under SD&C/IMBS auspices. Doug White completed a 3-year ANR (French NSF) grant with a final conference at the new Branly Museum of Anthropology, and published datasets in the new British KINSOURCE eRepository for network data resulting from this project. Douglas White and Katie Faust joined other UC faculty (Davis, San Diego, Irvine, Berkeley) in submitting to UCOP a proposal for an intercampus center for Network Sciences. White participated in the founding of a Network Sciences center at Central European University, Budapest, and helped found their new networks and complexity emphasis and summer school in the School of Public Policy and Administration, Xi'an Jiaotong University. A survey of all members and our affiliates would show a wide variety of other contributions. One collaboration in particular, anthropologist Bonnie Nardi in Computer Science, with her Bren ICS student Yong Ming Kow, did a study of MODDing behavior in the gaming user community (i.e., modification of game options) that inspired the name one of our new projects this year, EduModd.

EduMODD is our newest experimental site to be unveiled in July 2009 as an enhanced and reedited subset of InterSciWiki. Doug White and his students discovered in live and computer interactive courses using InterSciWiki instructions that students could easily do complex analyses using open source R software with internal url links to our on-line datasets. They could follow and MODDify prototypes (see MODDing above) to get new scientific results for quantitative models and visualizations. Examples including fitting complex functions to distributions, analysis, display and simulation with kinship or social networks, autoregressive analysis comparative data in spreadsheet formats for R along with network matrices of real-world interdependencies, and a host of other problems (see items 1-13 above and consult the wiki for faculty and student contributors). We have sent a modding site experiment to our Chinese colleagues at Xi'an Jiaotong technical university for their use with their graduate students. Papers by our own students using these approaches will appear as academic research publications in one of our eJournals following our review and revision processes.

Special funding from a non-profit corporation provided financial support for the following four programs: SD&C grad student training, intercampus videoconference seminars and our two eJournals, and also for faculty and student research travel. Support monies, however, go a very long way compared to normal university expenditures because most of our implementations use open and publically available resources and low demands for labor (e.g., proof editing), supplies, equipment, and administration. More money goes directly into student training. Next year additional funding will go into EduModd documentation and 5-minute Educational YouTube editing by Career Center undergraduates.

The 2008-2009 Structure and Dynamics E-Journal edited and peer reviewed articles are

Issue 3#1 2008

pp. 1-22 Duran Bell - Marriage Payments: A fundamental reconsideration

pp. 23-59 Giovanni Bennardo & Charles Cappell Influence Structures in a Tongan Village: 'Every Villager is not the Same!'

Issue 3#2 2009 <http://repositories.cdlib.org/imbs/socdyn/sdeas/vol3/iss2/art1/>

pp. 60-63 David Kronenfeld - Formalization as a Tool for Empirical Research

pp. 64-80 Giovanni Bennardo - Familiar Space in Social Memory

pp. 81-122 Murray Leaf - Indigenous Algorithms, Organizations, and Rationality

pp. 123- 140 Dwight Read - Formal Models and Explanatory Arguments

pp. 141- 154 F. K. L. Chit Hlaing (Kris Lehman) - Formalism and Empiricism: On the Value of Thinking Mathematically About Social Grouping and Corporateness

pp. 155-172 Michael Fischer - Cultural dynamics: formal descriptions of cultural processes

pp. 173- 194 Alan G. Fix - Genetic Dendrograms and Malaysian Population History

pp. 195- 207 David B. Kronenfeld - What Diagrams as a Formal Model Can and Cannot Represent; Examples from Language Family Trees

pp. 208- 222 Anthon Eff - Weight Matrices for Cultural Proximity: Deriving Weights from a Language Phylogeny

The e-Journals can be found on the web site:

http://intersci.ss.uci.edu/wiki/index.php/Structure_and_Dynamics_contents#Issue_3.233_2008_.28forthcoming.29

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 50 Ph.D. students, 16 of whom 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
Dan Jessie
Ray Mendoza
Laurent Tambayong
Sam Thorpe

Two new students, Thomas McIntee and Heidi Tucholski, will be entering the program in fall.

Besides the students in our program, there are students who are closely affiliated with IMBS and who actively engage in our seminars, colloquia, and conferences. Some of these students are: Jay Simon and Ofer Mintz (Merage School of Business), Rory Smead and Elliott Wagner (Logic and Philosophy of Science), Reuben Kline and Daniel Wolf (Political Science), and Matthew Zeigenfuse (Cognitive Science).

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.

A condition of the support is that the student gives a talk during the academic year on their research. This year it was decided to host a "poster session" rather than a one-day conference. The idea was that faculty and students could informally view the poster and talk with the student about their research. Below is the list of the 15 students who received support in summer of 2008 and the topics of their poster:

2008 Graduate Poster Session

Dan Jessie – Possible new mathematical techniques in the analysis of problems in the social sciences
Reuben Kline – Exploring the nature of the banks set using CyberSenate
Brian Marion – Investigating issues of perception and the evolution of sensory and perceptual systems
Ofar Mintz – Modeling the propensity to buy of online consumers
Ray Mendoza – From syntax to semantics
Brendan Purdy – Multinomial Tree Processing
Jay Simon – Multi-attribute utility applications
Rory Smead – Adaptive strategies and the social sciences
Laurent Tambayong – Dynamics of network formation processes in the co-author model
Sam Thorpe – "Physiological models to explain brain dynamics
Elliott Wagner – Signaling on networks
Matt Zeigenfuss – Modeling individual differences in memory retention via Dirichlet process mixtures
Yitong Wang – A behavioral model of consumption under anticipated health and income risks
Dan Wolf – Political economy and comparative politics
Sunan Zhang – Understanding human performance on bandit problems

B. Graduate Advisory Council

Council Members:

Rory Smead - LPS
Sam Thorpe - IMBS

This is the fifth year since the formation of the IMBS Graduate Advisory Council. The Council's purpose is to foster interaction between graduate students in research areas similar to MBS.

This past year the IMBS Graduate Council organized student meetings with colloquia speakers. This gave students an opportunity to interact and network with professors. One of the goals of the graduate council is to gain some insight into how students perceive IMBS and how to facilitate more involvement of the social science student body. The Council also held a

student/faculty barbeque on May 29 and cooperated with other graduate students in putting on the 7th Annual Graduate Student Conference. Below is the conference agenda:

7th ANNUAL GRADUATE STUDENT CONFERENCE

(9:00am) Opening Remarks

(9:15am) Ofer Mintz (with Imran S. Currim and Ivan Jeliaskov), Marketing, “Consumer pattern of information search and propensity to buy in a field setting”

(9:45am) George Ng, Economics. “Self-Control and Sophistication”

(10:15am) 15-minute Break

(10:30am) Bennett Holman, Logic and Philosophy of Science, “Controlling for Expectation in Evidence Based Medicine”

(11:00am) Jonathan Cook, Economics, “Implementing the Best Public Health Money Can Buy”

(11:30am) Tim Rubin, Cognitive Sciences, “Modeling Movie Choices and Ratings”

(12:00pm) Break for Lunch

(1:00pm) Giorgio Gosti, Institute for Mathematical Behavioral Sciences, “Solving Constraint Satisfaction Problems using an Argumentation Game Algorithm”

(1:30pm) Rueben Kline (with Bernard Grofman, James Fowler, Natalie Masuoka and Scott L. Field), Political Science, “Exchange Networks as Social Hierarchies: Evidence from the Vertical Organization of Faculty Placements in U.S. Political Science Departments”

(2:00pm) 15-minute Break

(2:15pm) Elliott Wagner, LPS, “The Dynamics of Job Market Signaling”

(2:45pm) Michael Ernst, LPS, “Playing the Favorite”

(3:15pm) 15-minute Break

(3:30pm) Kenny Vaden, Cognitive Sciences, “Phonological speech activity in cortex: similarity, density, and phonotactic frequency”

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 Susan Weinfurther, an undergraduate student in Economics. Last year's intern was economics undergraduate student Patrick Banks. This year's first-place winner for the "Excellence in Economics Writing" award was James Bono and he received \$500. The title of his paper was, "Coral Games and the Core of Cores". Second and third place winners were Hao Jia, whose paper was titled, "An Empirical Study of Contest Success and functions: Evidence from the NBA", and Vivek Pai, "On the Factors that Affect Airline Flight Frequency and aircraft Size".

IV. COMMUNICATION

A. Conferences

The IMBS held conferences on various topics. Below are the conference agendas. Videos of all the talks delivered at the following two conferences can be found on the IMBS web site: <http://www.imbs.uci.edu>.

INSTITUTE FOR MATHEMATICAL BEHAVIORAL SCIENCES CONFERENCE ON ADAPTIVE SYSTEMS AND MECHANISM DESIGN

January 23, 24 & 25, 2009

Friday, January 23

- 1:30 – 1:40** Opening Remarks by DONALD SAARI, Director of IMBS
- 1:40 – 2:30** KENNETH ARROW, Economics, Stanford
"Questions about adaptation"
- 2:30 – 2:40** DISCUSSION
- 2:40 – 3:00** BREAK IN SSPA 2142
- 3:00 – 3:50** JOHN LEDYARD, Humanities and Social Sciences, Caltech
"Mechanism Design: New Challenges"
- 3:50 – 4:00** DISCUSSION

Saturday, January 24

- 9:00 – 9:50** DIRK BERGEMANN, Economics, Yale

“Robust Mechanism Design and Implementation”

9:50 – 10:00 DISCUSSION

**10:00 – 10:50 ERIC MASKIN, Institute for Advanced Study, Princeton
“Elections and Strategic Voting: Condorcet and Borda”**

10:50 – 11:00 DISCUSSION

11:00 – 11:15 BREAK IN SSPA 2142

**11:15 – 12:05 JOHN DUGGAN, Political Economy, Rochester
“Political mechanism design”**

12:05 – 12:15 DISCUSSION

12:15 – 1:45 LUNCH BREAK

**1:45 – 2:35 TIM ROUGHGARDEN, Computer Science, Stanford
“Intrinsic Robustness of the Price of Anarchy”**

2:35 – 2:45 DISCUSSION

**2:45 – 3:35 SIMON LEVIN, Ecology and Evolutionary Biology, Princeton
“Complex adaptive systems, the Global Commons, and mechanism design”.**

3:35 – 3:45 DISCUSSION

3:45 – 4:00 BREAK in SSPA 2142

**4:00 – 4:50 ASU OZDAGLAR, Department of Computer Science, MIT
“Spread of Information and Misinformation in Social Networks”**

4:50 – 5:00 DISCUSSION

Sunday, January 25

9:00-12:00 GENERAL DISCUSSION

**INSTITUTE FOR MATHEMATICAL BEHAVIORAL SCIENCES
CONFERENCE ON HUMAN AND MACHINE LEARNING**

March 13-15, 2009

Friday, March 13

- 1:30 – 1:40 Opening Remarks by DONALD SAARI, Director of IMBS
- 1:40 – 2:40 WILLIAM H. BATCHELDER, Cognitive Sciences, UCI
"Learning Theory: History, Formalisms, and Perennial Issues"
- 2:40 – 2:50 DISCUSSION
- 2:50 – 3:05 BREAK IN SSPA 2142
- 3:05 – 3:55 MICHAEL JORDAN, EECS & Statistics, UC Berkeley
"Combinatorial Stochastic Processes and Nonparametric Bayesian Modeling"
- 3:55 – 4:05 DISCUSSION

Saturday, March 14

- 9:00 – 9:50 MICHAEL LITTMAN, Computer Science, Rutgers
"Initial explorations of cognitive reinforcement learning"
- 9:50 – 10:00 DISCUSSION
- 10:00 – 10:50 TOM GRIFFITHS, Psychology, UC Berkeley
"Connecting human and machine learning via probabilistic models of cognition"
- 10:50 – 11:00 DISCUSSION
- 11:00 – 11:15 BREAK IN SSPA 2142
- 11:15 – 12:05 TONY JEBARA, Computer Science, Columbia
"Learning Networks of Places and People from Location Data"
- 12:05 – 12:15 DISCUSSION
- 12:15 – 1:45 LUNCH BREAK
- 1:45 – 2:35 DELIANG WANG, Computer Sci. & Engineering, and Cognitive Sci, Ohio State
"Cocktail Party Processing"
- 2:35 – 2:45 DISCUSSION
- 2:45 – 3:35 JEAN CLAUDE FALMAGNE, Cognitive Sciences, UCI

“Learning Spaces--Concepts, Results, Applications”

3:35 – 3:45 DISCUSSION

3:45 – 4:00 BREAK in SSPA 2142

**4:00 – 4:50 LI DENG, Speech Research Group, Microsoft
“Acoustic Modeling in Automatic Speech Recognition Overview of Current
State and Research Challenges”**

4:50 – 5:00 DISCUSSION

Sunday, March 15

9:00 - 12:00 GENERAL DISCUSSION

B. Conferences/Seminars organized by IMBS Members

Bernard Grofman

Co-Organizer of the Conference on “Reforming the French Presidential Election System: Experiments on Electoral Reform.” June in Paris, France.

Robin Keller

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, will organize the conference in the framework of the COST Action IC0602 on Algorithmic Decision Theory (www.algodec.org), to be held April 2010.

Michael Lee

Co-organizer of “Formal Models of Natural Language Concepts” workshop held in University of Leuven, Belgium, (with G. Storms and D. Navarro), July 2009.

Donald Saari

American Math Society Program Committee; Joint International Meeting (AMS, SMM), Berkeley June 2010.

Institute for Mathematical Behavioral Sciences conferences (organized with others): “Adaptive Systems and Mechanism Design”, January 2009; “Human and Machine Learning”, March 2009; Annual Graduate Student Conference, May 2009.

Brian Skyrms

Game Theory & Social Contract Workshop, Beckman Center UCI, March 2009.

Padhraic Smyth

Organized the Center for Machine Learning and Artificial Intelligence Distinguished Speaker Series in 08-09.

Jack Xin

Organizer at IMBS Conference on “Human and Machine Learning”, March 2009.

Organizing committee of SIAM “Conference on Analysis of PDEs”, Miami, December 2009.

Hong-Kai Zhao

Organizer for “Interdisciplinary Workshop on Mathematical Problems, Models and Methods in Biomedical Imaging”, IPAM, UCLA to be held in 2010.

Organizer for “Workshop on Recent Developments in Numerical Methods for Nonlinear Hyperbolic Partial Differential Equations and their Applications”, Banff International Research Station, Banff Canada, September 2008.

C. Future Conferences

The Institute is planning several conferences next year. One of them will be on “Inference and Imaging”, to be held in November, and another on “Conflict and its Governance”, to be held in February. Other conference topics are in discussion.

D. Visitors

The Institute hosted 2 visitors during the year. Any letters received can be found in Appendix H.

Simon Levin
Moffett Professor of Biology
Princeton University

Anthony A. J. Marley
Department of Psychology
McGill University

Next year the Institute will again sponsor the visit of Professor Simon Levin, as well as Professor Stefano Vannuci, Dept. of Economics at the University of Siena, and a postdoctoral student from Mexico, Joss Sanchez-Perez.

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.

The focus group in Human Sciences and Comp. also held regular colloquia and these events are listed on their web site at <http://eclectic.ss.uci.edu/ResFocusGrp>.

Listed below are the IMBS colloquia as well as those in Social Dynamics and Complexity.

IMBS FALL COLLOQUIA 2008

October 9

MICHAEL ROSE, Department of Ecology and Evolutionary Biology, UCI
"How a Dominant Eigenvalue and Two Differentials Revolutionized Aging Research"

October 16

SHELDON ROSS
Industrial and Systems Engineering, USC
"Random Permutations and Optimal Selling"

October 23

MARTIN EVERETT
The Vice Chancellor, University of East London
"Let's get negative: social networks and negative data"

October 30

DAVID NEUMARK
Department of Economics, UC Irvine
"Measuring the Importance of Labor Market Networks"

November 6

MICHAEL BIRNBAUM
Department of Psychology, CA State University, Fullerton
"Testing Among Classes of Decision Models by Evaluating Critical Properties"

November 13

W. GARRETT MITCHENER
Department of Mathematics, The College of Charleston
"Using mathematical models to understand language change"

November 20

TOM SCHWARTZ
Department of Political Science, UCLA
"Three Itty Bitty Oral Essays on Rational Choice"

December 4

MARK STEYVERS

Department of Cognitive Sciences, UCI

“Combining unsupervised statistical topic models and human-defined knowledge databases”

IMBS WINTER COLLOQUIA 2009

January 8

SIMON LEVIN

Department of Ecology and Evolutionary Biology, Princeton University

“The challenge of sustainability and some implications for mathematical behavioral sciences”

January 15

SHLOMO BENARTZI

Anderson Graduate School of Management at UCLA

“Choice Architecture and Retirement Saving Plans”

January 22

A. KIMBAL ROMNEY

Department of Anthropology, UC Irvine

“Color Coding in the Retina”

January 29

CHARLESS C FOWLKES

Department of Computer Sciences, UCI

“Ecological Statistics and Figure-Ground Organization”

February 5

CRAIG TOVEY

School of Industrial & Systems Engineering and College of Computing Georgia Tech.

“A smallest tournament graph that cannot be the result of 2/3-majority voting”

February 12

MAREK KAMINSKI

Department of Political Sciences, UCI

“Generalized Backward Induction”

February 19

NORMAN SCHOFIELD

Department of Economics, Washington University

“Application of a Theorem in Stochastic Models of Elections.”

February 26

DREW FUDENBERG

Department of Economics, Harvard University

“Imitation, Evolution and Cooperation”

March 5

SIMON HUTTEGGER

Logic & Philosophy of Science, UCI
“Structural Stability and Signaling Games”

March 12

ROBERT TRAGER

Department of Political Science, UCLA
“Diplomatic Calculus in Anarchy”

IMBS SPRING COLLOQUIA 2009

April 2

CHRISTOPHER P. CHAMBERS

Department of Economics, Div. of the Humanities & Social Sciences, CALTECH
“When does aggregation reduce uncertainty aversion?”

April 9

MICHAEL CHWE

Department of Political Science, UCLA
“A Robust and Optimal Anonymous Procedure for Condorcet’s Model”

April 16

GREG ASHBY

Department of Psychology, UC Santa Barbara
“A Neurocomputational Theory of Context Learning During Skill Acquisition”

April 23

GEORGE LOEWENSTEIN

Herbert A. Simon Professor of Economics and Psychology, Carnegie Mellon
“Behavioral Economics and Conflicts of Interest”

April 30

GIACOMO RONDINA

Department of Economics, UC San Diego
“Design Limits and Dynamic Policy Analysis”

May 7

PATRICK SUPPES

Lucie Stern Professor of Philosophy, Emeritus, Stanford University
“Neglect of Independence and Randomness in the Axioms of Probability”

May 14

INDRIDI INDRIDASON

Department of Political Science, UC Riverside
“Proportional Representation, Majoritarian Legislatures & Coalitional Voting”

May 21

STEPHEN FIENBERG

Maurice Falk University Professor of Statistics and Social Science, Carnegie Mellon University
“*From Here to Eternity: Developing Dynamic Network Models*”

SOCIAL DYNAMICS AND COMPLEXITY COLLOQUIA 2008-09

October 10

BRIAN SKYRMS

UCI IMBS, Distinguished Professor, Depts. of Logic, Philosophy of Science, & Economics.
“Signals: Common Knowledge, the Cooperative Principle, and Adaptive Dynamics”

October 24

DOUGLAS WHITE

Professor, Anthropology Dept., UC
“Kinship Computing and Complexity: Cohesion, Class and Community” Discussant Dwight
Read

November 7

ALICIA JUARRERO

Professor, Philosophy Dept, Prince George's Community College
“Dynamics in Action, Intentional Behavior as a Complex System: Dynamical systems account of
mental causation”

November 21

TODD PRESNER

Assoc. Prof. UCLA, Germanic Languages, Jewish Studies, and Comparative Literature. Faculty
Chair, UCLA Center for Digital Humanities
“HyperCities: Building A New Learning Environment”

January 9

DONALD SAARI

Director, Institute Mathematical Behavioral Sciences; UCI Distinguished Professor: Departments
of Economics and Mathematics
“Complexity -- seemingly everywhere! ”

February 6

DWIGHT READ

Anthropology Dept., UCLA, Director, Human Complex Systems program. “From Experiential-
Based to Relational-Based Forms of Social Organization: A Major Transition in the Evolution of
Homo sapiens”

February 20

CARTER BUTTS

Associate Professor, Sociology Dept., UC Irvine
“Responding to Complex Problems: Emergent Networks During Disasters”

March 6

JAMES FOWLER

Associate Professor, Political Science Dept., UCSD

“The genetic basis of human social networks”

V. BUDGET

A. Appropriations and Expenditures

Appropriations:

IMBS 2008-09 Budget allocation	\$ 94,964
IMBS 2007-08 Carry Forward	\$ 51,595

Total budget for 08-09 **\$146,559**

Expenditures:

Salaries (Director, Staff)	\$ 45,532
Benefits	\$ 13,918
School Administrative Support	\$ 7,500
Conference/Colloquia/Meetings	\$ 30,589
Equipment	\$ 847
Supplies & Expenses	\$ 7,171
Graduate Student Support	\$ 15,000

Total Expenditures: **\$120,557**

Carry Forward to 2009-10: **\$ 26,002**

2009-10 Encumbrances:

Graduate Student Support \$14,000

B. Extramural Funding Activity

IMBS faculty research was supported by 43 current research grants totaling \$78,941,177.. Following is a detailed breakdown of the extramural funding, including pending grants.

GRANTS AWARDED AND ACTIVE:

<u>PI</u>	<u>Source</u>	<u>Amount</u>	<u>Dates</u>
Batchelder	NSF	\$240,000	7/06-8/09
<i>Multinomial processing Tree Models: New projects and Implementations, with X. Hu.</i>			
Batchelder	Air Force	\$200,000	7/09-8/11
<i>Statistical Development and Application of Cultural Consensus Theory.</i>			
Brownstone	NSF	\$550,000	10/05-9/08
<i>AOC: Globalization and Offshore Sourcing of Knowledge Work: Economic, Relational and ICT Dynamics, with K. Kraemer, et al.</i>			
Braunstein	NIH/NEI	\$499,579	10/07-8/12
Subaward from UCR			
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>			
D'Zmura	Army Research Off.	\$2,388,887	7/08 – 5/11
<i>Silent spatialized communication among dispersed force.</i>			
Frank	NIGMS	\$1,000,000	2/06-1/11
<i>Computational Models of Pathogen Evolution and Vaccination Strategies. This project develops computational models of infectious disease. R. Bush, PI.</i>			
Frank	NIH MIDAS	\$200,000	2/06-1/11

Modeling Influenza Outbreaks. Co-PI; Robin Bush, PI.

Frank NSF \$230,000 2/09-1/11
Theoretical Biology

Frank J.S. McDonnell Foun. \$50,000 2/09-1/10

Hoffman Proctor & Gamble \$100,000 1/09-12/10
Vision Research

Keller UCI Environ. Inst. \$48,000 Winter 2009
Using IT to Compress Perceived Time and Space in How People Think About Global Change: A Step Towards Behavioral Change. PIs: Bill Tomlinson, Brett Sanders, and Robin Keller. \$12,051 to Keller and RAs, total \$48,000 = \$38,000 from Institute + \$10,000 from UCI UWR.C.

Keller NSF \$6,900,000 7/04-6/09
Decision Center for a Desert City. Keller serves on decision research team with Craig Kirkwood of ASU, 2004-2009. National Science Foundation, Research Center to Arizona State University.

Komarova NIH \$1,500,000 7/08-4/13
Measuring Methylation Kinetics in Cancer Cells: Computations and Experiments

Komarova NIH \$375,000 7/05-3/10
Mathematical Models of Programmed CTL Proliferation. D. Wodarz, PI

Komarova NIH \$1,130,573 7/05-6/10
Specificity and Spatial Dynamics of Cell Signaling: Theory and Experiment. Qing Nie, PI

Komarova NIH \$14,534,542. 7/05-6/10
Systems Biology of Morphogenesis and Spatial Information Flow. Arthur Lander P.I.

Komarova NSF \$498,000 7/07-6/10
Evolutionary Game Theoretic Investigations into Color Category. With K. Jameson, L. Narens and R. Steingrimsson as Co-PIs.

Lee Air Force \$450,000
Modeling Exploration and Exploitation in Structured Environments. With Mark Steyvers.

Lee Alzheimer's Assoc. \$80,000
Bayesian Methods for the Detection, Diagnosis and Treatment of Alzheimer's (with Rod Shankle).

Lee AFRL/AFOSR \$456,000 1/07-1/09
Modeling Exploration and Exploitation in Structured Environments. Co-PI, M. Steyvers.

Luce NSF \$350,000 9/07-8/10
Empirical and Theoretical Studies of Psychophysical Phenomena. Co-PIs L. Narens and R. Steingrimsson.

Narens	Air Force	\$376,626	7/08-5/11
<i>Foundational Issues in the Measurement of Belief and Uncertainty.</i> Co-PI with B. Skyrms			
Saari	NSF	\$100,000	8/06-7/08
<i>SGER / Collaborative Research: Multiscale Modeling: Finding Strengths, Avoiding Weaknesses.</i>			
Saari	NSF	\$300,000	9/06-9/10
<i>A Mathematical Foundation for Voting and Decision</i>			
Smyth	Office of Naval Res.	\$3,358,578	9/08-5/11
<i>Scalable methods for the analysis of network-based data, Office of Naval Research: Multidisciplinary University Research Initiative.</i> Principal Investigator: P. Smyth, coinvestigators include IMBS members C. Butts and D. Eppstein.			
Stern	NIH - NCRR	\$25,000,000	10/05-9/09
<i>Functional Imaging Research on Schizophrenia Testbed.</i> Chair of Statistics Working Group. S. G. Potkin (PI).			
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.</i> Co-PI with G. Magnusdottir, P. Smyth.			
Steyvers	NSF-DARPA-NSA	\$391,000	7/08-6/09
<i>Statistical Topic Modeling of Documents, Entities, and Network Data.</i> P. Smyth PI.			
Steyvers	Australian Research Council	\$657,000	7/08-6/12
<i>A new kind of dynamics for psychology.</i> PI Scott Brown.			
White	Agency National de Recherche (France)	\$218,825	1/06-12/08
<i>Informatic Treatment of Kinship Phenomena: An Integrated Approach in Anthropology and History.</i> With Michael Houseman, Cyril Grance and others.			
Xin	NSF	\$300,000	7/07-6/10
<i>Dynamic Algorithms for Blind Separation of Convolutional Sound Mixtures.</i>			
Xin	NSF-ADT	\$705,508	7/09-8/12
<i>Sparse Blind Separation Algorithms of Spectral Mixtures and Applications</i>			
Xin	NSF-PRISM	\$1,950,566	9/09-8/14
<i>Interdisciplinary Computational and Applied Mathematics Program.</i>			
Zhao	NSF, PRISM	\$2,000,000	9/09-8/14
<i>UCI Interdisciplinary computational and applied mathematics program</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>			
Zhao	ONR	\$577,217	3/08-3/09
Model based image analysis.			

PENDING GRANTS

Komarova	NASA	TBD	TBD
<i>Charged particle radiation and resultant oxidative stress elicit deleterious functional changes in the central nervous system.</i> Greg Nelson, PI			

Stern	NSF	\$900,000	9/09-8/11
<i>Enhanced EOF Representations and Dynamic Models for Climate Patterns with Application to the North Atlantic Oscillation.</i> Co-PIs: G. Magnusdottir, P. Smyth, Y. Yu.			

Lee	NIH	\$577,217	--
<i>Optimizing Alzheimer's Healthcare Using Hierarchical Bayesian Cognitive Models.</i> , NIH, \$400K (with R. Shankle)			

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). Assistant 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). Hired as Assistant Professor to begin term at UCI Department of Sociology in Fall 2009. 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.

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), Associate 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), Moffett 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). Assistant Professor of Economics. Research areas: Microeconomics, game theory, and political economy.

Anthony McGann, (Ph.D. Political Science, Duke University). Assistant 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). Associate 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.

Hong-kai 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 2008-09¹

William Batchelder

Batchelder, W.H. (2009) .Cultural consensus theory: Aggregating expert judgments about ties in a social network. In H. Liu, J. Salerno, and M.J. Young (Eds.). *Social Computing, Behavioral Modeling, and Prediction*. New York: Springer. pp. 24-32.

Batchelder, W.H. (2009). Cognitive Psychometrics: Using Multinomial Processing Tree Models as Measurement Tools. S. Embretson (Eds.) *New Directions in Psychological Measurement with Model Based Approaches*. American Psychological Association Books, in press.

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

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

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

Batchelder, W.H., Hu, X., and Smith, J.B. Multinomial processing tree models for district choice. *Zeitschrift für Psychologie*, 217, in press.

Jeff Barrett

The Role of Forgetting in the Evolution and Learning of Language (with Kevin Zolman). *Journal of Experimental and Theoretical Artificial Intelligence*, forthcoming.

Descriptive Faithfulness and the Incommensurability of Evolved Languages. *Philosophical Studies*, forthcoming.

William Branch

A New Keynesian Model with Heterogeneous Expectations, (with Bruce McGough) *Journal of Economic Dynamics and Control*, May 2009.

Asset Return Dynamics and Learning, (with George W. Evans) *Review of Financial Studies*, forthcoming.

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

Mike Braunstein

Ozkan, K., & Braunstein, M.. Background surface and horizon effects in the perception of relative size and distance, *Visual Cognition*, in press.

Ozkan, K., & Braunstein, M. Predominance of ground over ceiling surfaces in binocular rivalry, *Attention, Perception & Psychophysics*, in press.

Jan Brueckner

Brueckner, J. & Largey, A. (2008). Social Interaction and Urban Sprawl, *Journal of Urban Economics* 64, 18-34.

Brueckner, J. & Van Dender, K. (2008). Atomistic Congestion Tolls at Concentrated Airports? Seeking a Unified View in the Internalization Debate, *Journal of Urban Economics* 64, 288-29.

Brueckner, J. & Glazer, A. 2008. Urban Extremism, *Journal of Law, Economics and Organization* 24, 307-318.

Brueckner, J. & Pai, V. (2009). Technological Innovation in the Airline Industry: The Impact of Regional Jets, *International Journal of Industrial Organization*, 27, 110-120.

Brueckner, J. (2009). Partial Fiscal Decentralization, *Regional Science and Urban Economics* 39, 232-32.

Brueckner, J. & Selod, H. (2009). A Theory of Urban Squatting and Land-Tenure Formalization in Developing Countries, *American Economic Journal: Economic Policy* 1, 28-51.

Brueckner, J. (2009). Price vs. Quantity-Based Approaches to Airport Congestion Management, *Journal of Public Economics* 93, 681-690.

Brueckner, J. Schedule Competition Revisited, *Journal of Transport Economics and Policy*, forthcoming.

Michael D'Zmura

D'Zmura, M., Deng, S., Lappas, T., Thorpe, S. & Srinivasan, R. (2009). Toward EEG sensing of imagined speech. Jacko, J.A. (Ed.), *Human-Computer Interaction, Part I, HCII 2009, LNCS 5610* (Berlin: Springer) 40-48.

Srinivasan, R., Thorpe, S., Deng, S., Lappas, T. & D'Zmura, M. (2009). Decoding attentional orientation from EEG spectra. Jacko, J.A. (Ed.), *Human-Computer Interaction, Part I, HCII 2009, LNCS 5610* (Berlin: Springer).

Jean-Claude Falmagne

J.-Cl. Falmagne, Y.-F. Hsu, F. Leite, and M. Regenwetter. 2008. Stochastic applications of media theory: Random walks on weak orders or partial orders. *Discrete Applied Mathematics*, 156(8):1184—1196.

D. Eppstein and J.-Cl. Falmagne. 2008. Algorithms for media. *Discrete Applied Mathematics*, 156(8): 1308—1320.

J.-Cl. Falmagne. 2008. Projections and symmetric expansions of a learning space. arXiv:0803.0575v1 [math-CO]. Submitted for publication in a volume honoring George Sperling.

J.-Cl. Falmagne and Jean-Paul Doignon. Axiomatic derivation of the Doppler Factor and related relativistic laws. [arXiv:0806.0831v2](https://arxiv.org/abs/0806.0831v2) [math-ph].

D. Eppstein, J.-Cl. Falmagne and H. Uzun. (2009). On verifying and engineering the wellgradeness of an union-closed family. *Journal of Mathematical Psychology*, 53(1): 34-39.

J.-Cl. Falmagne and S. Ovchinnikov. (2009). Mediating graphs. In Steven J. Brams, William V. Gehrlein, and Fred S. Roberts, editors. *The Mathematics of Preference, Choice and Order. Essays in Honor of Peter C. Fishburn*. Springer.

Steve A. Frank

Frank, S. A. (2009). Natural selection maximizes Fisher information. *Journal of Evolutionary Biology* 22:231-244.

Frank, S. A. (2009). The common patterns of nature. *Journal of Evolutionary Biology*, in press.

Frank, S. A. (2009). Evolutionary foundations of cooperation and group cohesion, in *Games, Groups, and the Global Good*. S. A. Levin, ed. Springer-Verlag.

Michele Garfinkel

Garfinkel, Michelle R., Skaperdas, Stergios, and Syropoulos, Constantinos. (2008). Globalization and Domestic Conflict, *Journal of International Economics*, December 76(2), 296- 308.

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

Bernard Grofman

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H. Gao & H. Zhao. A Fast Forward Solver of Radiative Transfer Equation in Optical Imaging. *Transport Theory and Statistical Physics*, forthcoming.

S. Leung & H. Zhao. A Grid Based Particle Method for Evolution of Open Curves and Surfaces. *Journal of Computational Physics*, forthcoming.

APPENDIX C
IMBS TECHNICAL REPORTS, 2008-09

[MBS 08-04](#)

Evolutionary Models of Color Categorization: Investigations based on Realistic Population Heterogeneity

Kimberly A. Jameson and Natalia L. Komarova

[MBS 08-05](#)

Utility of Gambling When Events Are Valued: An Application of Inset Entropy

C.T. Ng, R.Duncan Luce, & A. A. J. Marley

[MBS 08-06](#)

Interpersonal Comparisons of Utility for People With Non-trivial p-Additive Joint Receipts

R. Duncan Luce

[MBS 08-07](#)

Utility of Gambling Under p-Additive Joint Receipt and Segregation or Duplex Decomposition

C. T. Ng, R. Duncan Luce, A.A.J. Marley

[MBS 09-01](#)

Backward Induction and Subgame Perfection. The justification of a "folk algorithm."

Marek M. Kaminski

[MBS 09-02](#)

Behavioral Assumptions for a Class of Utility Theories: A Program of Experiments

R. Duncan Luce

APPENDIX D
COLLOQUIA AND CONFERENCES OF IMBS MEMBERS, 2008-09²

William Batchelder

Some Recent Developments in Choice Theory. Paper read at International Conference on memory, Decision Making, and Choice, Mannheim Germany, July 2008.

Detecting and Modeling Heterogeneities in Multinomial Processing Tree Modeling. Batchelder, W.H. and Smith, J.B. Paper Read at International Congress of Psychology, Berlin, Germany, July 2008.

Detecting and Modeling Heterogeneities in Categorical Data. Paper read at Colloquium in the Psychology Department, Indiana University, October 2008.

Statistical Development and Application of Cultural Consensus Theory. Invited paper read at AFOSR Program Review of Mathematical Modeling of Cognitive and Decision Processes. Arlington VA, January 2009.

Learning Theory: History, Formalisms, and perennial Issues. Invited paper read at Conference on Human and Machine Learning, Institute for mathematical behavioral Sciences, Irvine, CA, March 2009.

Cultural Consensus theory: Aggregating Expert Judgments about Ties in a Social Network. Invited paper Read at 2ND Annual Workshop on Social Computing, Behavioral Modeling, and Prediction. Phoenix, Az. April 2009.

Jeff Barrett

"The Coevolution of Theory and Language", Western Division meeting of the American Philosophical Association. Vancouver, Canada, April 2009.

William Branch

Conference on Business Cycle Research, CEPR EABCN and ECB, March 2009.

Goethe University of Frankfurt, March 2009.

Econometric Society North American Winter Meetings, January 2009.

Department of Economics, Claremont McKenna College, October 2008.

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

Workshop on Diverse Beliefs, Stanford, August 2008.

CeSiFO, Munich, July 2008.

Mike Braunstein

Discriminating curved from straight motion trajectories in 3D scenes. Gillespie, S., Braunstein, M. L., & Andersen, G. J. Vision Sciences Society, Sarasota, FL, May, 2009.

Change detection for objects on surfaces slanted in depth. Ozkan, K., & Braunstein, M. L. Vision Sciences Society, Sarasota, FL, May 2009.

Jan Brueckner

National Bureau of Economic Research Conference on Competition and Government Intervention in the Airline Industry, Cambridge, May 2009; UC Berkeley, April 2009.

International Seminar on Airport Congestion Issues: Theory and Practice, Tokyo, March 2009. UCLA, February 2009; UC Riverside, January 2009.

Econometric Society Meetings, San Francisco, January 2009.

American Real Estate and Urban Economics Association Meetings, San Francisco, January 2009.

Technical University of Dresden, December 2008.

WZB, Berlin, December 2008.

Regional Science Association International Meetings, New York, November 2008.

University of Illinois at Urbana-Champaign, November 2008.

U.S. Department of Justice Antitrust Workshop on Airline Competition, Washington, D.C., October 2008.

University of British Columbia, September 2008.

Academia Sinica, Taiwan, September 2008.

2nd Technion-TAU-UBC-UCLA Israel Real Estate and Urban Economics Symposium, Tel Aviv, July 2008.

Air Transport Research Society World Conference, Athens, July 2008.

3rd Kuhmo-Nectar Transport and Urban Economics Conference, Amsterdam, July 2008.

Michael D'Zmura

Silent spatialized communication among dispersed forces, ARO Workshop on Neuroergonomics and Neuromorphics, University of Maryland, College Park, October 24, 2008.

Steve Frank

Sackler Symposium on Evolutionary Medicine at the National Academy of Sciences in Washington, DC, April 2009.

Michelle Garfinkel

Globalization and civil war. Discussion at the Workshop on "Conflicts, Globalization and Development" CEPR, Paris, France, November 2008.

Bernard Grofman

Talks on electoral systems and models of party competition for economics Ph.D students associated with the Institute for Globalization and Economic Research (IRGEI), University of Paris, II. May 2008.

Chair, Panel: "Re-Examining Strategic Voting." Annual Meeting of the American Political Science Association, Boston, August 2008.

Do British Politics Exhibit Cycles? Presented at the Annual Meeting of the American Political Science Association, Boston, Illinois, August 2008.

Comparing Electoral Systems in Italy and Japan. Conference on 'Long Term Consequences of Electoral Rules Change: Bologna Italy, November 28-29, 2008.

Putting Critical Elections in the U.S. House of Representative in Historical Context, 1954-2006. Presented at the Annual Meeting of the Public Choice Society, March 6-8, 2009, Las Vegas, Nevada.

Donald Hoffman

EBF Networks for ARPDD. Naval Research Labs, Washington, DC, 2008.

Quantum Cognitive Science. Institute for Mathematical Behavioral Sciences, UC Irvine, 2008.

Visual Intelligence. VF Outdoor, Inc. San Leandro, CA, 2008.

Particle Filters for Geophysical Aided Navigation. Lockheed Martin, Long Island, NY, 2008.

Consciousness Is Fundamental. Five day workshop. Esalen Institute, Big Sur, CA, 2008.

The User Interface Theory of Perception. Waldzell Meeting, Melk Abbey, Austria, 2008.

Consciousness Is Fundamental. Waldzell Meeting, Melk Abbey, Austria, 2008.

Visual Intelligence. VF Corporation Marketing Summit, Greensboro, NC, 2008.

The Interface Theory of Perception. Universita ca'Foscari Venezia, Venice, Italy, 2008.

Automated Periscope Discrimination Using Radar. Naval Research Labs, Washington, DC, 2008.

How Do We See? How Can We Visualize? Center for Transformative Scholarship, USC, 2008.

The Interface Theory of Perception. Psychology Department, UC Santa Barbara, 2009.

The Interface Theory of Perception. Mellon Workshop on Science and the Arts, UC Riverside, 2009.

Geoff Iverson

Why some of us believe in the significance fallacy. Annual meetings of the Society for Mathematical Psychology. Washington DC, July 2008.

Integrating jnds to recover an affine representation for discrimination probabilities. Iverson, G., Hsu, Y-F & Doble, C. Annual meetings of the Society for Mathematical Psychology. Amsterdam, August, 2009.

Adding some color to data analysis. Annual meetings of the Society for Mathematical Psychology. Amsterdam, August, 2009.

Kimberly Jameson

Using Evolutionary Game Theory to Investigate Color Category Evolution in Artificial Agent Populations. See <http://www.santafe.edu/events/abstract/1402>, Santa Fe Institute, Santa Fe, NM., September 2008.

Marek Kaminski

Generalized Backward Induction. Public Choice Society Annual Meeting, Las Vegas, March 6, 2009; University of California, Los Angeles, June 4, 2009; International Conference in Game Theory SING 4, June 28, 2008, Wroclaw, Poland.

Robin Keller

Decision Analysis for Multiple Objective Decisions Involving Multiple Stakeholders. INFORMS Practice tutorial, Phoenix, April 2008.

Decisions with Health Outcomes. Presented by co-author Jay Simon (not attended by Keller), INFORMS Western Regional Conference, Arizona State University, April 2009.

Effective Decision Making. MBA update, executive education seminar, UC Irvine, February 2009.

Participant in invitation-only conference on “The Irrational Economist”, in celebration of Howard Kunreuther’s 70th birthday, at Wharton, bringing together researchers in Decision Sciences and Economics of Information and in Catastrophe Risk Management & Insurance, December 2008.

Biases and Patterns in Consumers’ Estimates of Product Health and Safety Risks: The Pet Food and Lead-tainted Toys Cases. Tianjun Feng, L. Robin Keller (poster presenter), Liangyan Wang, & Yitong Wang, Judgment/Decision Making conference, Chicago, November 2008.

Participant, 2008 SJDM Preconference, “Using Human Nature to Improve Human Life,” University of Chicago Graduate School of Business, November 2008.

INFORMS Annual Meeting. 3 papers in session chaired by L. Robin Keller on Decisions and Risk Perceptions involving Ambiguity, Health, Safety, and Savings, Washington DC, October 2008:

- a. Life Decisions with Health Outcomes, Jay Simon (presenter), L. Robin Keller.
- b. Product Quality Risk Perceptions and Decisions: Pet Food and Lead-tainted Toys. L. Robin Keller (presenter), Tianjun Feng, Liangyan Wang, Yitong Wang.
- c. A Behavioral Model of Consumption under Anticipated Health and Income Risks. Yitong Wang (presenter), Tianjun Feng, L. Robin Keller.

Decision Research, presentation to External Advisory Committee, Decision Center for a Desert City, Arizona State University, September 2008.

Decision analysis research perspective on opportunities and challenges in dealing with terrorism and security issues. L. Robin Keller (based on discussions with doctoral students Yitong Wang and Jay Simon), talk at Behavioral Economics and Terrorism Risks Workshop, August 2008 at Homeland Security Center for Risk and Economic Analysis of Terrorist Events (CREATE), USC.

Predicting Future Product Failures: The Effects of Mental Unpacking and Regulatory Focus. Dipayan Biswas (presenter), L. Robin Keller, Bidisha Burman. Session on Regulatory Focus and Luxury Consumption in Consumer Behavior Track, American Marketing Association Summer Educator's Conference, San Diego, Sheraton San Diego, August 2008.

Natalia Komarova

Probability Seminar, Dept of Math, UCSD, Spring 2009.

Igor Kopylov

Self-Deception Choice. Southwestern Economic Theory Conference, Caltech, March 2009.

Choice deferral and ambiguity aversion. .Boston University, Oct 2008; Washington University, Nov 2008; UC Davis, Dec 2008.

Choice Defferal and Ambiguity Aversion. Brey Seminar, Caltech, December 2008.

Risk, Uncertainty and Decisions Conference, Duke University, Jun 2009.

Michael Lee

Finding Feature Representations for Natural Kinds, Workshop on Formal Models of Natural Language Concepts, University of Leuven, Belgium, July 2009.

Bayesian Modeling in Cognitive Science, Invited Keynote Presentation, Meeting of Psychometric Society, Durham NH, July 2009.

Hierarchical Bayesian Modeling of Category Learning Using ALCOVE, Society for Mathematical Psychology, Washington DC, August 2008.

Multiple Personality Disorder, Children's Development of Number Concepts, and Bayesian Inference, Departmental Seminar, Psychology Department, University of Adelaide, Australia, October 2008.

Understanding Human and Optimal Behavior on Bandit Problems Using Heuristic Models", Workshop on Problem Solving, Purdue University, West Lafayette IN, November 2008.

A Cyclic Sequential Sampling Model of Bistable Auditory Perception, Annual Interdisciplinary Conference, Jackson Hole WY, February 2009.

A Bayesian Model of Knower Level Behavior, Workshop on Probabilistic Models of Cognitive Development, Banff, Canada, May 2009.

R. Duncan Luce

One talk "Interpersonal Comparisons for 2 of 3 types of people" was given at two conferences:

Foundation of Uncertainty and Risk Conference XIII, Barcelona, Spain, July 3, 2008,

Edwards' Bayes Conference, California State University at Fullerton, January 10, 2009.

Penelope Maddy

Thin realism, University of Indiana, Bloomington, October 2008.

Thin realism, UCLA, January 2009.

Thin realism, Perimeter Institute, March 2009.

Naturalism, transcendentalism and therapy, University of Rochester, March 2009.

Naturalism, transcendentalism and therapy, University of Waterloo, March 2009.

Michael McBride

Conflict and the Shadow of the Future: An Experimental Study, Chapman University, Economic Science Institute, 2008.

Conflict and the Shadow of the Future: An Experimental Study, Loyola Marymount University, Department of Economics, 2008.

Combating Terrorists: A Model of Religion, Suicide Bomber Recruitment, and Interventions, (with Gary Richardson), Association for the Study of Religion Conference, Economics, and Culture, 2009.

Anthony McGann

The Limits of Agenda Manipulation, University of Leiden. Departments of Political Science and Public Administration, March 2009.

Comparing Electoral Systems, Annual Conference of the Penn Program on Democracy, Citizenship, and Constitutionalism, University of Pennsylvania, Philadelphia, PA, May 2009.

Andrew Noymer

Self-rated health: Is happiness the missing link? Andrew Noymer and Leah Ruppanner. Session 166, Population Association of America, 2009 Annual Meeting, Detroit.

Aging and health for racial minorities: An analysis of the double jeopardy hypothesis using the California Health Interview Survey. Daisy C. Carreon and Andrew Noymer. Poster Session 1, Population Association of America, 2009 Annual Meeting, Detroit.

High-stakes collective action, panic behavior, and planning: Insights from sociology for pandemic preparedness. [by invitation] Flumodcont Project Technical Meeting: Survey methods for population behavior during seasonal and pandemic influenza, Istituto Superiore di Sanità, Rome, 2008.

Using routine mortality data to look for pre-pandemic signatures. Abstract 242, poster session 2. Keystone Symposium: "Pathogenesis and Control of Emerging Infections and Drug Resistant Organisms", Bangkok, 2008.

"War, race, and disease: Tuberculosis in black and white troops in the Civil War." Population, Society, Inequality Seminar, UCI.

Dale Poirier

Bayesian Interpretations of Heteroskedastic Consistent Covariance Estimators Using the Informed Bayesian Bootstrap:

Monash University Conference on Bayesian Econometrics, Melbourne, Australia, July 2008.
International Society for Bayesian Analysis World Meeting, Hamilton Island, Australia, July 2008.

Research School of Social Sciences, Australian National University, Canberra, Australia, July 2008.

Department of Economics, University of Queensland, Brisbane, Australia, July 2008.

Econometrics Colloquium, Department of Economics, UC Irvine, October 2008.

All UC Econometrics Conference, Berkeley, October 2008.

Department of Economics, University of Toronto, May 2009.

A Lakatosian Perspective on the Development of Theories of Decision Making Under Risk: Department of Resource Economics and Department of Economics, University of Nevada, Reno, September 2008.

Exchangeability, Representation Theorems, and Subjectivity. Department of Economics, University of Iowa, April 2008.

Why Health Economics Needs Bayesianism, Econometrics Colloquium, Department of Economics, UC Irvine, May 2009.

Keynote Speaker, Canadian Health Economics Study Group, University of Waterloo, May 2009.

Donald Saari

Conference on Games and Social Choice, GATE. "Social choice, and its connection to alcoholism, engineering and nano-technology," Lyon France, September 2008.

International Workshop: New approaches to voting and social choice, Tilberg University, Holland, May, 2009. Two invited talks:

1. Explaining all possible positional and pair wise voting inconsistencies and paradoxes
2. Extending Arrow's Theorem to --- just about everything!

New Developments in Social Choice and Welfare Theories, New ways to examine voting in spatial settings. Caen, France, June 2009.

Plenary talk, "The Chaotic Evolution of Newton's Universe", Mathfest (Math Assoc of Amer. National meeting) Madison, WI, July 2008.

Mathfest, Invited hour talk, Short Course "A qualitative approach to evolutionary game theory". Madison, WI, July 2008.

Mathfest, Invited MAA Minicourse (4 hours). "Mathematics and the Geometry of Voting". Madison, WI, July 2008.

Annual Conference, California Mathematics Council Community Colleges. Keynote Presentation: We vote, we make decisions; so why can the outcomes be so bad? March 2009.

Two colloquia talks, Political Science, University of Turku, Finland, May 2009:

1. "Finesse point as a solution concept in spatial voting"
2. "A qualitative approach toward evolutionary game theory"

Inside Edge Foundation, "Chaotic Elections! A Mathematician Looks at Voting", September 2008.

Distinctive Voices, NAS lecture series; "Chaotic Elections! A Mathematician Looks at Voting!", Woods Hole, MA, October 2008.

Scope Academy Distinguished Lecture' (Public lecture), "Chaotic Elections! A Mathematician Looks at Voting". Raleigh, NC, October 2008.

Colloquium, "The chaotic evolution of Newton's universe". Dept. of Mathematics, North Carolina State U., October 2008.

Colloquium, "Mathematics of voting". Dept. of Mathematics, U of Arizona, October 2008.

Colloquium, "Chaotic evolution of Newton's Universe". Dept. of Appl. Mathematics, U of Arizona, October 2008

Santa Fe Institute's *Business Network and Board of Trustees' Symposium*. Invited talk. "The challenge of complexity -- from the perspective of a mathematician", November 2008.

Colloquium, "Mathematics of Voting --- and other implications". Center for Applied Math, USC, November 2008.

Colloquium, "Mathematics of Voting --- and implications about multiscale analysis". Mathematics, UCSC, November 2008.

DARPA, "Impact of mathematics on decision analysis". December 2008.

Joint Colloquium, "Mathematics of voting and social choice; along with implications". (Mathematics, Philosophy, Symbolic Systems Program), Stanford, December 2008.

Humanities, Science and Complexity, Videoconference UCSD, UCI, UCR, UCLA. "Complexity --- seemingly everywhere!". January 2009.

Iowa State University, "The evolution of the universe". Mathematics, February 2009.

Iowa State University, "We vote, we decide; but why can we get bad outcomes?" *Miller Distinguished Lecture* University lecture, February 2009.

Colloquium, “Mathematics and Geometry of Voting”. CSU Long Beach, Dept. of Mathematics, April 2009.

Colloquium, “Mathematics of Dark Matter”. New Mexico State University, Mathematics, April 2009.

University Lecture, “We vote, but do we elect whom we really want?” New Mexico State University, April 2009.

Frontiers in Sciences lecture series, Public Lecture, “What a ‘chaotic’ election year!” Fullerton, October 2008.

Stergios Skaperdas

Powersharing under the Shadow of Conflict, Workshop on Voting and Fighting, Leitner Center for Comparative Political Economy, Yale University, New Haven, CT, May 2009.

Conflict, Settlement, and the Shadow of the Future, Workshop on Rationality and Conflict, Cowles Foundation for Research in Economics, Yale University, New Haven, CT, January 2009.

PSSI session on the costs of conflict, AEA meetings, San Francisco, CA, January, 2009.

Trade and Power, Conference on Conflicts, Globalization, and Development, CEPR and Paris School of Economics, Paris, France, November 2008.

Powersharing under the Shadow of Conflict, Workshop on Post-conflict Reconstruction, (co-organized by the World Bank), McGill University, Montreal, Canada, November 2008.

Persuasion as a Contest, Conference on Advances in the Theory of Contests and its Applications, CESifo Summer Institute, Venice, Italy, July 2008.

Brian Skyrms

Probability Workshop, ANU Canberra, July 2008.

Jack Smart Lecture, ANU Canberra, July 2008.

Signaling Workshop, ANU Canberra, July 2008.

Department Colloquium, U. Sydney Inaugural Lecture Center for Foundations of Science U. Sydney, July 2008.

UCLA, Anthropology Dept., September 2008.

Stanford – Tanner Commentator, October 2008.

Philosophy of Science Association, Pittsburgh, PA, October 2008.

Alberto Coffa Lecture, Indiana University, November 2008.

American Philosophical Assn Pacific Div., Vancouver BC, April 2009.

NIMBios Center for Integration of Biology and Mathematics, Knoxville TN, April 2008.

Kenneth Small

Rena Sivitanidou Annual Research Symposium, Lusk Center for Real Estate, Univ. of Southern Calif., February 2009.

Speaker and panelist, Forum on “Reinventing Los Angeles: Easing Sprawl, Growth, and Gridlock,” Hammer Museum, UCLA, Jan. 2009.

Padhraic Smyth

Recent advances in topic models, Georgia Tech, School of Computing, invited seminar, May 2009.

Modeling the semantic content of documents using unsupervised learning and human knowledge, Information Theory and Applications Workshop, February 2009, invited presentation.

Hal Stern

Applying Bayesian Ideas in a Multisite fMRI Study”, Joint Statistical Meetings, Denver, CO, August 2008.

Department of Statistics, Cal Poly, San Luis Obispo, CA (two seminars: one on sports and one on fMRI analysis), January 2009.

Department of Statistics, University of California, Riverside, CA (seminar on fMRI analysis), May 2009.

Statistics Society of Canada Meeting, Small Sample Statistics in Baseball: The Batter-Pitcher Matchup. Vancouver, BC, June 2009.

Douglas White

The evolution of the medieval world economic network, and the Chinese link. Panel on large scale historical dynamics, Budapest Conference on "The Unexpected Link Using Network Science to tackle social problems" Central European University, June 2009.

Arthur S. Iberall Distinguished Lecture, Series on Life and the Sciences of Complexity, “Social physics: Networks and causal chains”, Center for the Ecological Study of Perception and Action (CESPA), University of Connecticut, December 2008.

CESPA Tutorial: Using R, Pajek, and Spss for Simulation, Estimation, Visualization, and Model Testing, University of Connecticut, December 2008.

Kinship Computing and Complexity: Cohesion, Class and Community. Quai Branly anthropology museum, Paris, “New approaches to computing and kinship” Keynote live videoconference presentation. December 2008.

Kinship network analysis, XXIX Sunbelt INSNA conference, San Diego, March 2009.

Charles (Ted) Wright

Spatiotemporal dynamics of the perception of dot displays. Rubin, T., Chubb, C. F., Wright, C. E., Wong, S. A., Sperling, G. Presented at the annual meeting of the Vision Sciences Society, Naples, FL., May 2008.

Diverse long range configural judgments use a single map of object locations. Chubb, C. F. & Wright, C. E. Presented at the annual meeting of the Vision Sciences Society, Naples, FL, May 2008.

Exploring Violations of Hick’s Law for Aimed Hand Movements. Marino, V. F. & Wright, C. E. Paper presented at the meetings of the Psychonomics Society. Chicago, IL, November 2008.

Jack Xin

Applications to Homogenization, Pacific Inst Math Sciences, International Workshop on Analysis of Nonlinear PDEs and Free Boundary Problems, UBC, Vancouver, Canada, July 2009.

International Conference on Reaction-Diffusion Systems and Viscosity Solutions, Providence University, Taiwan, July, 2009.

International Conference on Engineering and Computational Mathematics, Hong Kong, May 2009.

IMBS Conference on Human and Machine Learning, Co-Organizer, UCI, March 2009.

NSF-DTRA Workshop on Algorithms, Baltimore, November 2008.

MCIAM Conference on Multiscale and Stochastic Modeling, Michigan State University, Michigan, October 2008.

Scientific Committee of the Fifth International Conference of Applied Mathematics and Computing, Plovdiv, Bulgaria, August 2008.

Hong-kai Zhao

Applied Mathematics Seminar, Stanford University, March 2009.

Claremont Colleges Mathematics Colloquium, December 2008.

The First International Conference on Frontiers in Computational Mathematics, Guilin, China, December 2008.

Huangguoshu International Interdisciplinary Conference on Biomedical Mathematics, Guizhou, China, November 2008.

APPENDIX E
FACULTY AWARDS/ACHIEVEMENTS, 2008-09

William Batchelder

Chair of the Selection Committee for the next Editor of Journal of Mathematical Psychology.

Jan Brueckner

Walter Isard Award, North American Regional Science Council, in recognition of distinguished scholarly achievements in the field of Regional Science, 2008.

Michelle Garfinkel

Serve on the following editorial boards: Journal of Conflict Resolution, Journal of Macroeconomics, Journal of Economics and Business, Defence and Economics, European Journal of Political Economy.

Donald Hoffman

UCI Faculty Mentor of the Month, Undergraduate Research Opportunity Program.

Geoffrey Iverson

Added to the editorial board of the Journal of Mathematical Psychology, 2009-

Kimberly Jameson

Two published research articles were honored by being selected for inclusion in *The Virtual Journal of Biomedical Optics* (ISSN: 1931-1532). Consists of selected articles recently published in OSA's peer-reviewed journals. For the virtual journal, biomedical optics is considered to include research involving the interface between light and medicine or biology. Articles are selected for inclusion by the editor, Dr. Gregory W. Faris, on the basis of relevancy using OCIS codes and abstract keywords. The extracted online journal contents is found at: <http://aris.ss.uci.edu/~kjameson/VirtJourBioMedOptics.html>.

Marek Kaminski

Media coverage given during the academic year, including dates and news agency:

Interview for "Forest Fire," March 2009.

Polish TV started shooting a documentary movie based on my book Games Prisoners Play, (director Richard Klosowski).

Angora (interview, published in over 500,000 copies) <http://www.angora.com.pl/>

Akademia Pedagogiki Specjalnej
<https://webfiles.uci.edu/mkaminsk/www/ksiazka/recenzja%20szkola%20pedagogiki%20specjalnej.jpg>.

Focus text (interview, published in about 220,000 copies, cover leading material for September 2007 issue) <https://webfiles.uci.edu/mkaminsk/www/ksiazka/Focus%20wywiad.pdf>.

Forum Penitencjarne (interview) <http://www.sw.gov.pl/index.php/forum/more/227>.

Niezalezna Gazeta Polska text (review)
<https://webfiles.uci.edu/mkaminsk/www/ksiazka/recenzja%20niezalezna%20gazeta%20polska.pdf>

Tygodnik Siedlecki (review)
<http://www.tygodnik.siedlecki.pl/t2162-wiezienie.jako.gra.htm>.

Robin Keller

Editor-in-Chief, *Decision Analysis*, January 2007-Dec. 2009.

National Academies of Science: U. S. National Committee for the International Institute for Applied Systems Analysis (IIASA), appointed as member by President of NAS, January 2007-Dec. 2009.

Committee on Ranking FDA Product Categories Based on Health Consequences, 2008-09.
Nominated/contacted 6/27/08.

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

UC Santa Cruz: (Proposed) School of Management Academic Advisory Group, 2007-2009.

UC Service Roles: IMBS: Executive Committee member of Institute for Mathematical Behavioral Sciences, 1991-December 2009.

The Paul Merage School of Business at UCI: Director, Doctoral Program, 2009-2011
Operations and Decision Technologies Area Area Coordinator, Spring 2009.

Natalia Komarova

An award for excellence in undergraduate teaching, School of Physical Sciences, UCI.

Anthony McGann

Co-Director of Essex Summer School in Social Science Data Analysis and Collection 2008-2009.

Dale Poirier

Director of Graduate Studies in Economics.

Andrew Noymer

By invitation, I attended two workshops as part of the Multinational Influenza Mortality Study (MISMS) run by the Fogarty International Center (FIC) of the US National Institutes of Health, the first in Villamoura, Portugal and the second at NIH in Bethesda, Maryland. I continue to collaborate closely with the Health and Global Change project of IIASA, the International Institute for Applied Systems Analysis in Laxenburg (near Vienna), Austria.

Donald Saari

Selected to be a fellow in the inaugural class of Fellows of the Society of Industrial and Applied Mathematics.

Honorary doctoral degree: University of Turku, Turku, Finland.

Elected to the Finnish “Academy of Sciences and Letters”.

The December 2008 issue of *Discrete and Continuous Dynamical Systems* was dedicated to me in honor of my contributions to dynamics (and celestial mechanics) over the last 40 yrs.

Ken Small

Continuing listings:

Edward Elgar *Who's Who in Economics*

Marquis *Who's Who in Finance and Industry*

Marquis *Who's Who in Science and Engineering*

Marquis *Who's Who in America*

Marquis *Who's Who in the World*

Padhraic Smyth

I received the Association for Computing Machinery (ACM) SIGKDD (Special Interest Group in Knowledge Discovery and Data Mining) Innovation Award. This award “recognizes individuals for their outstanding technical contributions to the field of knowledge discovery in data and data mining that have had lasting impact in furthering the theory and/or development of commercial systems.” The citation stated the award was made for my “contributions to both the theory and application of probabilistic and statistical approaches to data mining.” This is the most prestigious annual award in computer science for research related to data mining.

Hal Stern

Member, Committee on National Statistics (CNSTAT) – Committee of the National Research Council of the National Academies of Science that tries to improve statistical methods and information for public policy.

Member, National Academy of Sciences Panel on Missing Data in Clinical Trials.

Member, NIST (National Institutes of Standards and Technology) / NIJ (National Institute of Justice) Expert Working Group on Latent Print Analysis.

Associate Editor, Annals of Applied Statistics.

Member, Fisher Lecture Committee, Council of Presidents of Statistical Societies (COPSS).

Jack Xin

Editorial Board of SIAM Interdisciplinary Journal: Multi-scale Modeling and Simulations, since Nov, 2005.

Editorial Board of Communications in Math Sciences, since 2003.

Editorial Board of Dynamics of PDE, since 2004.

Editorial Board of Methods and Applications of Analysis, since June 30, 2008.

The International Program Committee (IPC) of the IASTED International Conference on Applied Simulation and Modeling, 2008.

Scientific Committee, Fifth International Conference of Applied Mathematics and Computing, Bulgaria, August, 2008.

Scientific Committee SIAM Conference on Analysis of PDEs in Miami, 2008-2009.

Hong-kai Zhao

Discover the Physical Sciences Breakfast Lecture Series, “How Computers Use Mathematics to Solve Real World Problems”.

Organization Committee member for The Institute for Advanced Study Park City Mathematics Program (PCMI) in 2010.

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
** Royce Anders	Batchelder
** Christopher Balding	Grofman
* Jerry Benzl	Kaminski
** Stephanie Drew	Sperling
* John Enschede	Taagepera/Grofman
Michael Ernst	Maddy
* Amy Escobar	Hoffman
* Shaw Gillespie	Braunstein
* Assal Habibii	Hoffman
* Arvin Hsu	Sperling
* Lorien Jasny	Butts
Dan Jessie	Saari
** Hao Jia	Skaperdas
* Steven Kies	Chubb
* Rueben Kline	Grofman/Kaminski
** Vimal Kumar	Garfinkel/Skaperdas
** Julie Kwak	Hoffman
Frederico Llarena	de Figueiredo
** Byung-Moo Lee	de Figueiredo
** Ling Lin	Sperling
** Shiau Hua Lin	Dosher
Kate Longo	Komarova
* Son-Hee Lyu	Sperling
** Matthew Mahutga	Boyd
Brian Marion	Hoffman
Justin Mark	Hoffman
* Ray Mendoza	Komarova
** Hyeok Ki Min	Skaperdas
** Chen Ng	Small
George Ng	Saari
** Kerem Ozkan	Braunstein
A. J. Packman	Maddy
Darren Peshek	Hoffman
** Miruna Petrescu-Prahova	Butts
James Pooley	Lee
** Brendan Purdy	Batchelder
** John Pyles	Hoffman
* John Rapalino	Maddy
* Brian Rogers	Maddy
** Ian Schofield	Sperling
Negar Sammak-Nejad	Hoffman
** Jay Simon	Keller

**	Rory Smead	Skyrms
*	Kejun Song	Small
**	Laurent Tambayong	White
*	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 2008-09

**Dan Jessie
Gregory Ferenstein
Jibonayan Raychaudhuri**

**APPENDIX G
VISITORS' LETTERS**