

ANNUAL REPORT

2012-2013

TABLE OF CONTENTS	Page
Director's Statement	1
I. Organization and Administration	5
A. Administration	5
B. Executive Committee	5
II. Research	5
A. Current Research Programs	5
B. Publications	6
C. Public Talks and Colloquia	6
D. Summaries of Research Findings	6
E. Research Seminars and Activities	22
III. Graduate Training	27
A. Ph.D. and MA Students	27
B. Graduate Activities	28
C. Outreach	28
D. Weekly Research Presentations	28
E. Graduate Student Conference	30
F. Jean-Claude Falmagne Dissertation Award	31
IV. Communication	31
A. Conferences	31
B. Conferences/Seminars Organized by IMBS Members	34
C. Future Conferences	36
D. Visitors	36
E. Colloquia Series	37
V. Budget	41
A. Appropriations and Expenditures	41
B. Extramural Funding Activity	42
VI. Appendices	54
A. Current Faculty Members	54
B. Scientific Publications	61
C. IMBS Technical Reports	84
D. Colloquia and Conferences of IMBS Members	86
E. Faculty Awards/Achievements	104
F. Graduate Students Affiliated with the IMBS	110
G. Visitor Letters	112

Director's Statement:

Dear IMBS Colleagues and Selective UCI Administrators,

The 2012-13 academic year started on a sad note with the August 2012 passing of R. Duncan Luce. Duncan was the founding director of the *Institute for Mathematical Behavioral Sciences* (IMBS) and one of our institute's intellectual leaders. Duncan belonged to the handful of pioneers who, after World War II, injected, through mathematical modeling, reasoning, and statistical techniques, an elevated intellectual rigor into the social and behavioral sciences. What powerful contributions! While Duncan will be missed, his legacy will continue to guide and inspire us.

Indeed, the creation of our institute was a shared vision of Duncan and others here at UCI. The objective was to build upon the strong multidisciplinary expertise that had been brought together when the School did not have a departmental structure. This gathered assembly of talent proved to be of world class in exploring how to apply the strengths of mathematical reasoning to the new kinds of pressing concerns coming from the social and behavioral sciences. But with the School's switch to a departmental structure, there was a realistic fear that this UCI research strength could be lost. The IMBS was created, in part, to ensure that this would not happen; the IMBS has the charge to ensure that this UCI intensity and research strength would continue.

This responsibility requires us to constantly explore how mathematical reasoning can be effectively used to address emerging concerns and approaches. In other words, the IMBS must continually reinvent itself in order to keep a leadership role in pushing the rapidly changing research frontiers in these areas. This annual report will describe some of what we have done over the 2012-13 academic year to meet these challenges; my letter serves as an introductory guide.

An important part of our activities is our workshop/conference program. What we do differs from the usual disciplinary conferences where speakers know the work of each other and so presentations tend to emphasize technical details. In contrast, the IMBS program purposely emphasizes a multidisciplinary theme, where speakers, who come from different disciplines, know *of* each other, but most have never met. As we have discovered, such an approach motivates the speakers to emphasize fundamental concepts over technical details, which means that weaknesses and strengths of theories, approaches, assumptions coming from different disciplinary perspectives, and issues are more rapidly exposed. For videos presentations visit: http://www.imbs.uci.edu/imbs_conferencevideos.

As one might expect from the interdisciplinary focus of our conferences, they attract a wide interest across campus and in the local area. An example is our first workshop for the academic year (agendas for conferences are in Sect. IV A) on "*Quantum Thinking*." At differing times during the two days of this lively and exciting conference, over 120 people from the social and physical sciences as well as from computing areas attended. The title of this gathering may be misleading with its oxymoronic suggestion that attempts were made to combine quantum physics with psychology. This was not the objective. Instead, what is

taken from quantum mechanics involves mathematics; it is the nonstandard probabilistic approach developed to handle quantum physics problems. By using this more general probabilistic approach, models are created that empirically explain various cognitive issues (particularly those involving path dependencies) more sharply than appears to be possible with other current models.

To introduce another one of our conferences, recall how at least since the Scottish Enlightenment, it has been known that the aggregate outcome of individual actions can be qualitatively different from, and perhaps better than, that of any individual person. While this theme has been continually present across the social and behavioral sciences, the multidisciplinary mystery and challenge is to understand how and why a group's decision can be more accurate than that of any particular individual. Mathematical explorations of this question date to the 1780s with the pioneering work of the French mathematician Condorcet, where he proved that a jury – a group — is more likely to reach an accurate decision than any one of the participants. The real concern, which cuts across academic disciplines and ranges from the making of military decisions to even that of a hardware chain trying to determine the inventory for the coming year, is to understand how to efficiently design and harness “*The Wisdom of the Crowd*,” this was the theme of our second conference. As expected, this multidisciplinary focus also attracted a large and diverse audience.

These two conferences were main events. For a long list of related conferences organized by IMBS members during this academic year, see Sect. IV B.

Our active IMBS colloquium series (see Sect. IV E) also has a distinct multidisciplinary flavor with speakers representing disciplines within the School as well as developments from other areas (such as Information Systems and Decisions, Mathematics, and Evolutionary Biology). As true with most colloquia series, these presentations have the favor of describing polished, finished works. So, beyond this series, what we need to fulfill the IMBS objectives are outlets to discuss work in progress. To achieve this objective, several of our IMBS subgroups have regular meetings and discussions. Descriptions of these subgroups, along with some of their agendas, are included in this report.

What had been missing was a multidisciplinary outlet where graduate students and faculty could present work still in an early state and receive suggestions from the perspective of other disciplines. *Stergios Skaperdas*, who did an excellent job serving as Interim Director while I was on sabbatical leave, recognized that this gap existed and created a weekly lunch seminar in which graduate students and faculty could present preliminary research. The schedule for talks filled quickly every quarter (see Sect. III D for a list), which underscored the research need that this informal lunch venue filled. The impressive variety of topics is consistent with the multidisciplinary objectives of the institute.

Continuing with graduate students, descriptions of our graduate program, which is directed by *Louis Narens*, are given in Sect. III. Here you will find accounts about how,

freed from the constraints often imposed by individual disciplines, our graduate students are creating new perspectives in a number of areas. This includes *Robert Forbes* (see Sect. III C), who has found how to combine notions developed in various social and behavioral sciences to significantly improve the standard forecasting software that has been used by major Fortune 500 companies. For feedback, he has been running a series of workshops for top executives to explain why what they have been using and doing is dangerously limited. Other work with a broad perspective includes that of *Dan Jessie*, who discovered a new mathematical way to analyze the wide structure of games; games, of course, have become standard modeling approaches for governmental agencies to industry and academic disciplines.

Our graduate student conference has become a firmly established part of the IMBS, and it serves as a model for other UCI groups. (The agenda of this year's conference is in Sect III E.) It is delightful how each year the presentations become more impressive in terms of the quality of research, the helpful comments and suggestions offered by attendees (this year, at various times during the day, over 70 different people attended), and even the quality of presentations that match at least that of second year Asst. Professors. Of particular delight is how the conference attracts graduate students across campus who use mathematics to analyze issues from their particular disciplines. Over the last several years and through word-of-mouth among graduate students, the IMBS has become a haven for some of the UCI students who use mathematics to better understand their particular area.

The true highlights of this last academic year, and all years, come from the research contributions of our IMBS members. I strongly recommend that the reader start with Sect II C (and check out Appendices D and E) to find what has been accomplished research wise over the last year. Without prejudice (because each time I read what has been done, I come up with a different list), let me call attention to the work of *George Sperling* and *Charlie Chubb* in the area of color perception, the work of our new hire *Jennifer Trueblood* in quantum thinking, the pioneering work of another recent hire, *Jean-Paul Carvalho*, in using mathematical game theory to explain contemporary concerns ranging from resisting education to social mobility and other worries coming from the current hot spot of Egypt, the joint work of *Mike McBride* with other IMBS members on the legal system, the work of *Steve Frank* in evolutionary biology, the advances being made by *William Branch* on macroeconomics that is raising serious questions about previous approaches, and on and on.

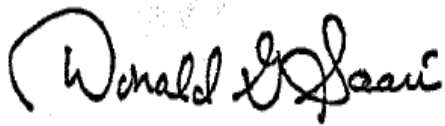
The high level of the research contributions of IMBS members is partly captured by the large number of invited presentations (Appendix D) and awards and achievements (Appendix E), and also by the level of research support (Sect. V B), which (with several multi-year grants) totals over \$56 million. Following procedures recommended by the university and the Vice Provost for Research, we encourage members to seek grants, but not necessarily through the IMBS.

Finally, our warm, warm thanks to *Janet Phelps!* Directors come and go, but the one IMBS constant had been Janet who served as the Administrative Director of the IMBS starting, well, even before there was an IMBS. With her continually excellent work and dedication, which often meant that she spent hours far in excess of the expected 40, she

became the image and institutional memory for the institute, and she played an important role in the development of the IMBS! While we had hoped she would continue, she decided to retire so she could spend time and travel with her husband Joe. Before retiring, however, with her sense of dedication to the IMBS, she gave us still another favor: she played a major role in identifying, and then training, her replacement *Joanna Kerner*, who is proving to be an excellent choice! Janet, for everything, we all thank you!!

In conclusion, my warm thanks to all of our colleagues who continually make the IMBS a vital organization, to *Joanna Kerner* for smoothly and efficiently stepping into running the administrative aspects of the IMBS, to *Louis Narens* for his “mother-hen” approach of embracing our graduate students in a manner that ensures a successful IMBS graduate program, to *Stergios Skaperdas* for his excellent work and willingness to step in as Interim Director while I was on sabbatical leave, to *Janet Phelps* for decades of dedicated, excellent work to advance the IMBS, and to the memory of *Duncan Luce*, who made all of this possible!

Sincerely,

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

Donald G. Saari
Director, IMBS

I. ORGANIZATION AND ADMINISTRATION

A. Administration

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

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

Director:	Donald G. Saari, 2003-present
Previous Directors:	R. Duncan Luce, Founding Director, 1989-1998 William H. Batchelder, 1999-2003
Graduate Director:	Louis Narens
Administrator:	Joanna Kerner

B. Executive Committee 2012-13

Carter Butts, Professor of Sociology
Michelle Garfinkel, Professor of Economics
Geoff Iverson, Professor of Cognitive Sciences
Michael D. Lee, Professor and Chair, Cognitive Sciences
Mark Machina, Professor of Economics, UC San Diego
Anthony McGann, Associate Professor of Political Science
Brian Skyrms, Professor of Philosophy

II. RESEARCH

A. Current Research Programs

There are 67 members of the Institute for Mathematical Behavioral Sciences (IMBS) and their research interests are listed in Appendix A.

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

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

2. ***Statistical Modeling:***
Cognitive: Baldi, Batchelder, Doshier, Eppstein, Falmagne, Lee, Iverson, Pearl, 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, Machina, Narens, Saari, and Trueblood
4. ***Perception and Psychophysics:***
Vision: Braunstein, Chubb, DeFigueiredo, D’Zmura, Hoffman, Iverson, Palais, Romney, Sperling, Srinivasan, Wright, Yellott, Xin, and Zhao
Psychophysics and Response Times: Brownstone, Falmagne, Iverson, Jameson, Narens, and Yellott
5. ***Social and Economic Phenomena:***
Economics and Game Theory: Branch, Brownstone, Brueckner, Burton, Carvalho, Frank, Garfinkel, Komarova, Kopylov, Levin, McBride, Poirier, Skaperdas, Skyrms, Saari, and Small
Public Choice: Carvalho, Cohen, Glazer, Grofman, Kaminski, Keller, McGann, Taagepera, and Uhlener
Social Networks: Batchelder, Butts, Boyd, Faust, Freeman, Noymer, Romney, and White
Social Dynamics and Evolution: Butts, Frank, Johnson, Huttegger, Narens, Romney, Saari, Skyrms, Smyth, Stern, and White

B. Publications

The members who have replied report a total of 254 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 17 technical reports issued during the academic year. Technical reports since 1993 can be found under “printed resources” on the Institute’s web site at http://www.imbs.uci.edu/imbs_technical.

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 211 talks listed in Appendix D. Their awards and achievements for this year can be found in Appendix E.

D. Summaries of Research 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

Jeff Barrett

This last year, I have been working primarily on the evolution of concepts and rule-following in the context of Skyrms-Lewis signaling games.

Vladimir Lefebvre

I was working on the extension of the reflexive game theory on a case when group members intend to predict their leader's decision.

James Weatherall

This year, I published a book called *The Physics of Wall Street*, which is a narrative history of how ideas have moved from physics into financial modeling over the last hundred years. I argue that this history reveals how powerful ideas from physics and higher mathematics can be for understanding markets---but only if you understand their limitations. In particular, the practitioners on Wall Street who use mathematical models most effectively think about them very differently from other investors: they "think like physicists", in the sense that they recognize that their models are at best approximate tools that can help them gain information about markets, and not perfect predictors of market behavior.

Statistical Modeling

William Batchelder

In the past year, our laboratory has concentrated on Cultural Consensus Theory (CCT). This is a popular methodology in the social sciences, especially in cultural anthropology. It was invented in the late 1980s by Professor A. Kimball Romney and myself, and it has in the past year or two undergone a modernization using hierarchical Bayesian modeling. We have recently published applications in anthropology, sociology, and psychology, and a number of invited conference presentations on our recent work.

David Eppstein

A major result of this period, published in the annual ACM Symposium on Computational Geometry held in June 2013 in Rio de Janeiro, concerns the combinatorial patterns formed by two-dimensional soap bubbles. These may be represented mathematically as systems of circular arcs, meeting at 120 degree angles, with the curvature of each arc proportional to the difference in pressure between the bubbles it separates. Analogously to the famous Steinitz theorem (according to which the graphs of convex polyhedra are exactly the 3 vertex-connected planar graphs) I showed that the graphs formed by two-dimensional bubbles are exactly the 2-vertex-connected 3-regular planar graphs. To prove this result I show how to construct a soap bubble from any graph meeting these conditions by a method

combining the Koebe-Andreev-Thurston circle packing theorem with three-dimensional hyperbolic Voronoi diagrams.

Jean-Claude Falmagne

In collaboration with Cristina Videira Lopes, professor of informatics, and Matthew Beckmann, associate professor of political science, I am developing an educational internet game closely mimicking the election of a president in the US. We recently hired a highly competent software engineer who will complete the development of the game, a version of which we expect to be available on the internet later this year.

Katherine Faust

I continue to work on comparative models for network structure. One line of inquiry addresses the structure of triads in social networks using a corpus of over 200 networks from various animal species. In contrast to findings on physical and biological networks, my preliminary results indicate that the different social networks in this corpus are not characterized by distinctive triadic structural signatures. I have also been working on network models for multirelational asymmetry. Currently I am using the model to examine longitudinal trends in hierarchy in global trade networks. Results indicate that the hierarchy detected in the skew-symmetric portion of international trade does not resemble the traditional ordering of countries found by world system researchers.

Lisa Pearl

One set of important findings concerns the biological underpinnings of the human language faculty. The knowledge of how to use *one* referentially in English (e.g., Look - an important finding! Here's another *one*!) is one linguistic example previously thought to implicate innate knowledge of language in humans. Specifically, since experimental data demonstrates that young infants seem to have correct intuitions about how to interpret *one*, it was thought that only by having innate knowledge of how to interpret *one* could children learn this knowledge as quickly as they do. However, my mathematical model demonstrates that this is not necessary - the same behavior can be generated by using probabilistic learning abilities applied to infants' linguistic input. In addition, the modeling work highlights that acquisition of the adult intuitions may in fact be a two stage process, with the experimental data available marking the end of the first acquisition stage rather than the end of both acquisition stages.

Another finding in a similar vein involves the structure of linguistic dependencies, such as "What do you think ___ convinced them?" where "what" seems to be understood also as the subject of the embedded clause "convinced them". Adult intuitions about the full range of grammatical and ungrammatical linguistic dependencies were thought to require innate knowledge of language in humans. However, a mathematical model based on very simple premises (none of which necessarily involve innate knowledge of language) can produce the observed adult intuitions. This suggests that knowledge of linguistic dependencies is not something that must be part of a biological endowment for language in humans.

A third finding is that the cognitively immature minds of infants and children may be more suited to the initial tasks involved in native language learning. One of these tasks is word segmentation, which is identifying individual words in fluent speech. As anyone who has ever listened to a foreign language knows, there are rarely any overt markers of word boundaries - it often sounds like one long stream of sounds. Instead, listeners who know the language impose word boundaries to identify the words being spoken. We find that a Bayesian learning strategy does quite well at this task, even when it begins with no knowledge of where the words are. But, most surprisingly, we find that this mathematical strategy fares better when memory and processing constraints are present, due to the structure of the word segmentation task. This suggests that young minds - which also have significant memory and processing constraints, compared with adult minds - may be especially well equipped to accomplish word segmentation.

A fourth finding concerns the automatic identification of the tone of text, using linguistic cues within the text (rather than non-verbal cues such as voice pitch or facial expression). For example, "C'mon - you should read this!" is clearly persuasive, and some distinctive cues include the use of the contracted form "c'mon" and the use of a second person pronoun ("you") followed by the modal verb "should". This kind of automatic tone detection could be quite useful in email and text messages, where something like a "tonechecker" could be developed to accompany the already existing spellchecker and grammarchecker software that is standard. Using only shallow linguistic features (such as the ones above for a persuasive tone), we were able to identify a message's tone correctly 70% of the time, which is nearly as good as humans are able to reliably do. To improve tone detection further (beyond human levels), we plan to use more sophisticated linguistic features in future research that may tap into the deeper levels of linguistic knowledge that humans use when generating messages.

Decision-Making

Robin Keller

Sometimes people judge the value of a lottery with two outcomes to be less than the value of the lottery's worst outcome. This irrational valuation has been designated as the "uncertainty effect". We explore the boundary conditions of the uncertainty effect by investigating a plausible underlying process and proposing two possible methods to counteract the bias. First, we examine how providing an exogenous evaluation opportunity prior to judging the value of the lottery affects individuals' judgments, and find that first valuing the worst outcome and then the lottery eliminates the uncertainty effect. Second, we explore if introducing additional cognitive load dampens how far decision makers correct their initial evaluations, and find that additional cognitive load is able to eliminate the uncertainty effect.

Mark Machina

During the past year, I have continued my research on the properties of ambiguity and ambiguity over prospects which involve three or more outcomes. This sounds trivial, but

the classic Ellsberg Urn paradoxes which initiated and continues to motivate research on ambiguity aversion all involved two possible payoffs (Ellsberg used \$0 and \$100 in his 1961-1962 work, but the actual amounts don't matter). Standard models of ambiguity aversion, such as the Rank-Dependent, Multiple-Priors, 'Smooth Preferences,' and Variational Preferences models are all based on aspects of ambiguity aversion revealed in these two-outcome examples. It turns out that, as in the case of risk and risk aversion under objective uncertainty, choice situations involving three or more possible payoffs allow for aspects of ambiguity and ambiguity aversion which are not able to reveal themselves in two-outcome prospects. Examples include attitudes toward different sources involving different amounts of ambiguity, 'Allais-Paradox' difficulties under purely subjective uncertainty (this problem was believed to only occur under objective uncertainty), and ambiguity attitudes involving different wealth or outcome levels.

This year's research has involved a paper which explores these aspects, and evaluates how well existing models can accommodate them (the news is pretty bad). My paper on this under review by the *American Economic Review*, and has good prospects for acceptance (I am currently preparing the second revision).

I continue my editorial work as a Co-Editor of *Economic Theory* and the *Journal of Mathematical Economics*, and a member of the editorial boards of the *Journal of Mathematical Psychology*, *Mathematical Social Sciences* and *Theory and Decision*.

Louis Narens

During the past year almost all my research effort has been put into a new book, "Probabilistic Lattices with Applications to Decision Theory", intended for publication, Fall 2013. The research for this book is supported by a \$388,187 AFOSR grant, "Modeling Behavioral and Decision Behavior through Systems of Observers," that I received this year. It investigates generalizations of standard probability theory and applies them to behavioral science situations, particularly decision theory. Through a mathematical analysis involving the mathematical properties of lattices, it is argued that there are two types of generalizations that preserve enough of traditional probabilistic concepts to have potential scientific applicability.

One of these is a modest generalization of the probability theory used in quantum mechanics. It is shown that this generalization nicely models psychological experimentation and context effects. Unlike in quantum mechanics, it is a form of probability theory that share many of the probabilistic methods of modeling and inference used by traditional probability theory while capturing much of the "quantum-like thinking" and logic employed in quantum mechanics. The book argues that for behavioral science it is this kind of "thinking" that is important instead of the kind of additional assumptions special for physical phenomena that are used to derive quantum physical laws.

The other generalization generalizes the event space so that it has events that can be vague or ambiguous. For some situations, the probability theory for this event space satisfies the ideas contained in the rationality requirements that are often assumed by economists and

philosophers, and it provides an alternative foundation for describing often puzzling human decision phenomena.

During the year, I co-organized with Jennifer Trueblood a very successful international conference on Quantum Thinking. This conference brought together researchers from a number of fields to discuss the potential of using methods similar to those from quantum mechanics for developing new behavioral science paradigms and theories.

During last year, I served on three Ph.D. dissertation committees of students who completed their Ph.D. degrees. I also advised two Ph.D. students and served as Graduate Director of the MBS Graduate Program in Mathematical Behavioral Science.

Donald Saari

My research efforts involved three areas. The first concerns a problem from astronomy: dark matter. Because of the complexity of the equations, astrophysicists replace the equation for the N-body problem with a continuum approximation. Then, this approximation is used to predict how much mass there should be in a galaxy. The difference between predictions and observations is called “dark matter.” As I proved, mass predictions coming from continuum approximations, which means that the amount of dark matter is exaggerated. I then created two different approaches to determine (either from observed rotational velocity curves or from standard astronomical assumptions) how much mass there must be. The answers differ radically from what is commonly claimed.

A second approach is joint work with IMBS graduate student Dan Jessie (who just received his PhD in June) on the structure of games. “Games” turn out to be complicated; they are attacked by competitive (strategic), cooperative, side payments, repeated, and all sorts of other approaches. Our goal was to find a simple explanation for all of this. So, by use of symmetry properties of games and representation theory (from mathematics), it was shown how to decompose a game into its strategic and its cooperative components. In this manner, several new results are emerging.

A third area concerns group decision analysis as captured by voting rules. To provide a flavor of what was done here, a Condorcet winner is a candidate that beats all other candidates in a paired comparison majority vote. Although flawed, this concept remains a standard to measure other voting rules; e.g., positional rules, where ballots are tallied by assigning specified weights to candidates depending on how they are positioned on the ballot. Previously, only limited results were known about when a positional rule could elect a Condorcet winner. With IMBS graduate student Tomas McIntee, all possible three-candidate relations were derived.

Jennifer Trueblood

In collaboration with Scott Brown and Andrew Heathcote at the University of Newcastle, Australia, I have been studying context effects in multi-alternative choice behavior. A

decision context effect occurs when the introduction of a third option (which doesn't get chosen) causes a change in preference between two original options. In two papers, we show that context effects occur not only in consumer decisions but also in simple perceptual decisions and inference. We presently are revising a paper that has been invited for resubmission at *Psychological Review*, describing a new theory of these effects, the MLBA model.

This year, I have also been working with Jerome Busemeyer at Indiana University and Emmanuel Pothos at City University London on a quantum model of similarity. This work has led to a paper in *Psychological Review* and a grant from the Leverhulme Trust. I have also been applying the quantum approach to causal reasoning and have received a new grant from NSF to continue this work. The quantum approach uses quantum probability theory to develop formal models for social and behavioral sciences. This approach was the focus of the IMBS conference "Quantum Thinking" held in February, which I co-organized.

Perception and Psychophysics

Charles Chubb

We (Christian Herrera, Peng Sun, Kier Groulx, Charles Wright, Charlie Chubb, George Sperling; reported at the annual meeting of the Vision Sciences Society, 2013) have made an important discovery in the field of color perception. The prevailing model of chromatic processing proposes that color information is sorted into 3 channels by low-level vision, (1) a channel sensitive to the difference between L-cone activation vs. M-cone activation, (2) a "luminance" channel sensitive to the sum of L-cone activation plus S-cone activation, and (3) a channel sensitive to the difference between the S-cone activation vs. luminance. Using new methods, we have discovered that the sensitivity of the luminance channel, as measured using the "minimum motion technique" varies strongly depending on the intensity of the light to which the observer is adapted. When the photometric luminance (i.e., the luminance as measured with a photometer) is equal to 15 cd/m², L- and M-cones contribute approximately equally to minimum-motion-luminance; however, when the photometric luminance (i.e., the luminance as measured with a photometer) is equal to 30 cd/m², the L-cones contribute to minimum-motion-luminance 4 times more strongly than the M-cones. This finding emphatically rejects the idea (long taken as axiomatic in the field of color processing) that human sensitivity to luminance is invariant with respect to the observer's level of adaptation.

Mike D'Zmura

Work continues on EEG measurement of mental activity, including imagined speech and the covert direction of attention. We have found that one can detect the loudness envelope of imagined speech using EEG. One can use the envelope information to determine which sentence, chosen from a small set of sentences with differing envelopes, has been imagined. We have also developed brain-computer interface methods for walking human subjects, and have demonstrated the use of EEG measures of attention to control robot

navigation while walking. Finally, we have shown that one can use EEG to determine which speaker one is paying attention to in a cocktail-party situation.

Donald Hoffman

We propose that evolution by natural selection does not, in general, favor perceptions that are true descriptions of the objective world. Instead, research with evolutionary games shows that perceptual systems tuned solely to fitness routinely outcompete those tuned to truth. Fitness functions depend not just on the true state of the world, but also on the organism, its state, and the type of action. Thus fitness and truth are distinct. Natural selection depends only on expected fitness. It shapes perceptual systems to guide fitter behavior, not to estimate truth. To study perception in an evolutionary context, we introduce the framework of *Computational Evolutionary Perception* (CEP). We show that CEP subsumes Bayesian Decision Theory approaches to perception, and reinterprets them as evaluating expected fitness rather than estimating truth.

Kimberly Jameson

Jameson continues as PI funded by the UC Pacific Rim Research Program grant to develop a new color categorization database with colleagues at UC Berkeley's International Computer Science Institute.

Jameson describes the central question of the project as the following: Perceptual color experience is universally appealing – without it our visual lives would consist of monochrome shades of gray. But despite many similarities, a number of linguistic societies categorize and apply meaning to perceived color in ways that differ from the familiar associations learned by English language speakers. This raises the question: What are the cognitive factors that influence the assignment of linguistic categories to conceptual domains such as everyday color experience? Jameson explains, the ways individuals classify color depends on, among other things, the uses and importance of color in our everyday visual processing environments and the ways different societies of people develop meaning systems on the rather uniform domain of color perception can tell us a lot about cognition, communication, perceptual processing and environmental color salience and utility.

Jameson was awarded this grant in 2011 from the UC Pacific Rim Research Program to compile data and study variations in color categorization among Pacific Rim cultures. This region is of particular linguistic interest and is in the spotlight because an archive of raw data by the late cognitive anthropologist, Dr. Robert E. MacLaury, will through this project be made accessible for the first time to the general research community. This unique archive includes the Mesoamerican Color Survey, which draws from interviews with 900 speakers of some 116 Mesoamerican languages. With UC funding and newly granted access to MacLaury's archive, Jameson will lead the effort to create a publically accessible, analyzable database of MacLaury's color survey in conjunction with consulting scientists Paul Kay, Terry Regier and Richard S. Cook, of the International Computer Science Institute at UC Berkeley. The resulting extensive web accessible database will be made

available to scientists alongside the existing *World Color Survey* database. The *World Color Survey* (2005, 2009) and its sister publication *Basic Color Terms: Their Universality and Evolution* (1969) by Brent Berlin and Paul Kay, are currently the most cited references for color categorization, and, according to experts in cognitive anthropology, may be the most influential research of the last fifty years carried out by social anthropologists.

According to Jameson: In general, large-scale cross-linguistic comparisons of cognitive representation of meaning are often difficult to undertake because of the rarity of this kind of data. Pairing the World Color Survey with this new database will make available, in digital format, a mountain of data to interdisciplinary researchers of color categorization, naming and cognition. With these funds Jameson has supported Lisa Guo (IMBS graduate student) and Ayden Parish (UC Berkeley, Linguistics undergraduate) on this project, with whom she is exploring aspects of (1) rapid database transcription using the power of the internet and procedures involving crowd-sourcing and the quantitative modeling of shared information, (2) development of coding and syntax for large scale numerically-addressable database metadata, and (3) the timely transcription of the color content of the raw data from the survey.

George Sperling

Background: There is enormously more visual information in the environment than humans (or any other creature) can possibly process. Information is spatially selected by body and eye movements, and further by the distribution of attention to different retinal areas within a single eye fixation. The computational description of the limitations of spatial attention within a fixation is a relatively recent development, previously carried out in great part by my lab PIs (e.g., Gobell et al). The selection in information according to its content is called feature attention and also has been very extensively studied. So far, the computational description of feature-attention has been primarily in terms of the priority of different features for eliciting eye movements or directing implicit search processes to spatial areas that contain high-priority features (e.g., Wolfe, Itti, Geisler). Gobell, J. L., Tseng, C.-h., & Sperling, G. (2004). The spatial distribution of visual attention. *Vision Research*, 19, 1273-1296.

New work. Charlie Chubb and I have developed a related but significantly different conceptualization of feature-attention, namely that it is a collection of filters that selectively attenuate the retinal input thereby making it differentially available to subsequent processes. Such filters undoubtedly occur at different levels of visual processing. So far, we have concentrated on the earliest processing levels that are controllable by attention. We developed new, highly efficient measurement procedures that make it possible to precisely measure attention filters, and we demonstrated these measurements in several domains. For example, in attending to a color, our experiments showed how attention to that particular color attenuates other colors. We were able to describe the perceptually achieved attention filter for that color as accurately and in the same terms as a physicist might describe a color filter for a camera. The aim of these experiments was to determine the attention filters that observers can actually achieve--initially the attention filters that are already available to them as they enter the experiment, eventually attention filters they can acquire through

training. The experiments so far show that the methods are applicable to study attention of elementary visual properties such as color (i.e., hue, saturation, contrast), line slant, and motion direction. The work in progress aims to determine the range of visual properties for which these filter-discovery methods are useful.

More (for your information only) from a grant proposal. In addition to the top-down attention filters described above, there is also bottom-up filtering of information. Visual spatial frequency channels are, of course, very well known, and there already excellent models of early visual processing based on computational analogs of V1 cortical "simple cells." However, in the context of our experiments, some surprisingly complex bottom-up visual processes have emerged that we propose to study with the same methodology. The interplay of bottom-up and top-down processing has emerged as a primary principle of neural brain activity, and is emerging here as a critical component of the algorithmic description of visual information processing. Details are in the full report.

In the future. Although this research is unashamedly basic research, we believe that the precise measurement and computational description of how the brain can use attention to filter information is essential for understanding higher level visual processes such as object recognition, and it is useful for better conceptualizing tasks such as driving and viewing complex displays, and optimizing the tasks for human performance. Insofar as attention filters represent a critical, basic brain process, it subsequently will be useful to study their development in children, and their later vulnerability to disease and aging.

Jack Yellott

During 2012 I completed a project with Andrew Watson (NASA Ames Research Center) in which we developed an empirical formula for pupil size (diameter) as a function of stimulus luminance and size, observer age, and monocular vs. binocular viewing. My research is mainly focused on mathematical modeling, analysis and developing computational methods for applications in science and engineering.

We developed a few imaging algorithms for biomedical applications. For example we designed a 4D (space + time) cone beam CT (CBCT) reconstruction algorithm using low-rank matrix factorization. The new algorithm has demonstrated the capability to construct better images and reduce radiation dose by exploring sparsity and coherence/redundancy of these CBCT images.

We proposed and developed geometric and computational tools to process and analysis point cloud data. These tools can be used for shape modeling and analysis for 3D point cloud data from 3D laser scanner and printer or for high dimensional data mining.

Jack Xin

I worked and published papers on blind and semi-blind source separation methods for recovering signals from their mixtures (blind means no knowledge of the mixing conditions), sparse recovery from redundant representations of data (e.g. when the number

of basic functions exceed the dimensions of data space for robustness), and analysis/computation of turbulent flame speeds in level-set Hamilton-Jacobi equations and advection-reaction-diffusion equations related to the understanding how fast fires spread in the winds.

Hongkai Zhao

My research is mainly focused on mathematical modeling, analysis and developing computational methods for applications in science and engineering.

We developed a few imaging algorithms for biomedical applications. For example we designed a 4D (space + time) cone beam CT (CBCT) reconstruction algorithm using low-rank matrix factorization. The new algorithm has demonstrated the capability to construct better images and reduce radiation dose by exploring sparsity and coherence/redundancy of these CBCT images.

We proposed and developed geometric and computational tools to process and analysis point cloud data. These tools can be used for shape modeling and analysis for 3D point cloud data from 3D laser scanner and printer or for high dimensional data mining.

Social and Economic Phenomena

(a) Economics and Game Theory

William Branch

Two enduring questions in macroeconomics are: what types of policies does the Federal Reserve follow and what policies *should* they follow? Up until the Great Recession and Financial Crisis (2007-2009), there was a consensus that the Federal Reserve set interest rates according to a simple rule, known as the Taylor Rule. The Taylor Rule says that the Federal Funds rate (the interest rate on interbank lending that is the policy instrument of the Fed) should be adjusted whenever inflation rises above, or falls below, two percent and whenever the level of activity is higher or lower than its potential level. In most macroeconomic models, the Taylor rule also helps ensure the economy stays near the target inflation rate of 2% and the economy grows along its efficient growth path. However, during the 2003-2005 period the Federal Reserve held the federal funds rate at 1% even though the Taylor rule called for higher rates. Some Federal Reserve critics blame this “too low for too long” period as a factor in inflating the housing bubble. In recent research, I show that the “too low for too long” period can be consistent with a Taylor rule provided that there is some uncertainty by the Federal Reserve about the current state of the economy. In particular, I provide evidence that the 2003-2005 period can be characterized by a time of heightened uncertainty about the possibility of very low inflation rates. This uncertainty led policymakers to exercise caution when adjusting the federal funds rate target, thereby, providing a justification for holding interest rates “too low for too long.”

David Brownstone

I have been working on a project to analyze the new US vehicle fuel economy standards. These standards require knowing very detailed information about vehicle attributes such as weight, horsepower, etc. As a result, there is no way to exactly identify vehicles chosen by households from standard household survey techniques. We have therefore developed statistical techniques to deal with this uncertainty and applied these techniques to estimate the demand for hybrid fuel vehicles purchased between 2006-2009. We find that the impact of uncertainty in vehicle identification is large (resulting in increasing confidence bands by a factor of more than 4 in some cases), but we are still able to find that households have a strong preference for higher fuel economy but also have a strong aversion to hybrid vehicle technology.

Jan Brueckner

Negative campaigning has become an increasingly common feature of electoral contests in the US, with the recent presidential campaigns of Barack Obama and Mitt Romney offering the latest examples. A small theoretical literature analyzes negative campaigning using a spatial median-voter model. Under this approach, a candidate's negative campaign spending serves to push the perceived policy position of the opponent toward a more-extreme location, shifting votes toward the candidate. "Positive" campaign spending by the opponent attempts to offset this effect, preventing the loss of votes. My research with coauthor Kangoh Lee extends this spatial approach by using a probabilistic voting model, which has recently become a popular analytical tool, rather than the traditional median voter model to analyze negative campaigning. Under the probabilistic voting model, individual vote outcomes are stochastic due to the presence of a random, idiosyncratic "valence" effect (which shifts a candidate's attractiveness) along with other shocks that affect all voters in common. The main finding of our analysis concerns the effect of a candidate's relative centrism on her level of negative campaign spending. We show that the more-centrist candidate has the higher level of negative spending, with the opponent emphasizing positive spending. This result may at first seem counterintuitive: a centrist candidate might seem to have little incentive to make her less-centrist opponent seem even more extreme through negative spending. The explanation, however, involves the central feature of the probabilistic voting model, as explained in the paper. We test this prediction using data from US Senatorial elections and find support for it. Centrist candidates (Democrats running in Democratic states or Republicans running in Republican states) run campaigns that are more negative than those of their opponents.

Michael Burton

I had been working on a book about the uses of statistics in anthropology. I have decided to put that on hold and work instead on a book about changes in the food systems in Micronesia. That would be based on data that Karen Nero and I collected 20 years ago in 4 Micronesian societies. There is now more interest than ever in the topic of the ways the industrial foods are changing local food habits. Those changes have significant effects on health, on culture change, and on the environment. Karen and I collected a vast amount of

high-quality data. We then went off track with respect to the kinds of measures that we developed. To be brief, we over-aggregated. We were also working on a two-society comparison (Yap and Kosrae). The reason for doing that was that the two societies are in the same nation. However, that nation is an artificial construct that may fall apart at any time, and N=2 comparisons don't usually go well. So, the next shift was to decide to just write a book about Kosrae, which is a small island state (7000 people) that had the world's second highest level of food-related disorders (obesity, diabetes, etc.) when we collected our data.

Jean-Paul Carvalho

Resisting Education (with Mark Koyama): Oppositional attitudes toward education tend to emerge amidst rising returns to education. We show that this is a natural outcome of the interaction between economic and cultural incentives for education. When education makes individuals more receptive to mainstream culture, minority groups underinvest in education as a form of cultural resistance. Low-ability minority types do not just fail to increase educational attainment in response to an Islamic revival. Rather than undermining religious belief and participation, our analysis suggests that by raising aspirations economic development can make societies more prone to religious revivals.

Natalia Komarova

With Dominik Wodarz, I worked on the mathematical modeling of gun control policies. We created several stochastic and deterministic models of gun attacks, and investigated how changes in gun control may affect the frequency of gun-related homicide. We identified key parameters that can inform us on the effectiveness of gun control.

With my IMBS colleague K. Jameson I have continued to work on problems of human color perception. In particular, we studied perceptual models of color spaces, and their relevance for high-level human cognitive tasks, such as odd-one-out triad choices. Such tests commonly used in color research allow for an interesting geometric interpretation. Using K. Jameson's human observer data, we showed that the usual CIE color model can be modified to include perceptual biases (such as the categorization bias, and the lightness-saturation bias) to incorporate a systematic variation in the human responses observed.

In collaboration with D Wodarz I worked on the interesting problem of cooperation in the context of division-of-labor games. We were able to show that cooperation can increase the speed of evolution (that is, increase the rate at which fitness valleys are crossed). Moreover, we showed that the presence of defectors helps accelerate evolution even more.

Other topics of my research have been co infection and synaptic transfer of viruses, habitat fragmentation in host-pathogen systems, and stochastic modeling of stem cell dynamics.

Igor Kopylov

There is strong empirical evidence of *partition dependence* where subjective beliefs and attitudes towards ambiguity depend on the problem-specific partition of the state space. This effect has been observed both for individual decision makers in laboratory experiments and for market prices of some heavily traded financial securities.

I have found a general way to apply some well-known models of ambiguity aversion, such as maxmin or Choquet expected utilities, to a situation where the utility parameters (subjective probabilistic beliefs, sets of beliefs, non-additive capacities etc.) may depend on how the state space is partitioned. More precisely, I show that in the well-known Anscombe-Aumann framework, partition dependence can be obtained just by relaxing transitivity and continuity in the existing models.

Simon Levin

My research program has long been centered on understanding the dynamics of biological diversity at all levels, from the molecular diversity of diseases to the diversity of global ecological and cultural systems; the importance of that diversity for humans; and the interactions of that diversity with human social and ecological systems. Some accomplishments in the past year have been:

The Dynamics of Biodiversity and Biocomplexity

- (1) Completed and published the Second Edition of the *Encyclopedia of Biodiversity*, with more than 400 articles on all aspects of biodiversity, including management.
- (2) With former graduate student Carla Staver, published a paper in *The American Naturalist*, expanding the modeling of savanna-forest systems, and the role of fire in mediating critical transitions between savannas and forests. This paper demonstrates a range of complex dynamics beyond what was previously established; current work, with Emmanuel Schertzer, couples this to a fire-spread percolation model and will be reported next year.
- (3) With postdoctoral fellow Juan Bonachela and others, published a manuscript in the *BioGeoSciences* on a model for variable phytoplankton stoichiometry based on cell protein regulation. We are currently incorporating this work into models of the regulation of element cycles, in work with various collaborators. Indeed, with Adam Martiny and others, published a paper in *Nature Biogeosciences* on latitudinal gradients in elemental ratios
- (4) With former graduate student Caroline Farrior and others, published two papers (one is in press) on rainfall, nutrients, and the dynamics of forests.
- (5) With former postdoc Sally Thompson and Ignacio Rodríguez-Iturbe, published a paper on precipitation and plant fungal disease risk, incorporating rainfall models, pathogen dynamics and the responses of plants to fungal threats.
- (6) With former graduate student Carey Nadell and others, published a paper on collective phenomena in bacterial populations, coupling experimental results and modeling.
- (7) With former undergraduate student Madelon Case and Charles Halpern, published a paper (in press) on the dynamics of grasslands, and the effects of gopher disturbance. This

work is really an extension of work I did many years ago with various collaborators in Jasper Ridge, California, and broader theoretical work on patch dynamics.

(8) With former graduate student Allison Shaw, published a paper in the *Journal of Mathematical Biology* explaining the observation of intermittent breeding in various biological populations, and why organisms might skip breeding in some years.

The Interactions between Ecological Systems and Socioeconomic Systems, and the Management of Natural Resources

(1) With postdoctoral fellow Erol Akçay and others, published a paper in *PNAS* on mechanism design in relation to the establishment of cooperation when individuals have imperfect information about the outside options others possess.

(2) With Ilan Fischer and others, published a paper (in press in *PNAS*) on optimal strategies in public goods games.

(3) Published various papers on cooperation, discounting and sustainability in a variety of venues, such as the *Bulletin of the American Mathematical Society*, the popular journal *Solutions*, and the *Encyclopedia Britannica*.

(4) With Kenneth Arrow and Paul Ehrlich, completed a manuscript on the management challenges posed by complex adaptive systems, and the linkages between ecological and socio-economic systems.

(5) With Avinash Dixit and Dan Rubenstein, published in *Theoretical Ecology* a manuscript on sharing of the Commons among East African herdsmen. We compute the collective optimal arrangement, examine its stability from a game-theoretic perspective, and, when it fails, compute the second-best solution that can be sustained. Furthermore, a paper is in press in *Theoretical Ecology* with Steve Lade and others, on the fragility of cooperation in the sharing of common pool resources, where cooperation is maintained by an ostracism norm. This work relates closely to work on regime shifts with Marten Scheffer, reported last year, and to the paper in *BioScience* with Ann Kinzig and others, listed below, on social norms and global environmental challenges, and to the paper (Levin et al.) reported below, published in *Environment and Developmental Economics*, on social and environmental systems as complex adaptive systems.

(6) With postdoctoral fellow Colin Torney and Iain Couzin, published a paper continuing our work on collective decision-making and the role of unopinionated individuals in achieving consensus.

Michael McBride

In work joint with Stergios Skaperdas and Pi-Han Tsai, I studied the likelihood that legal disputes go to trial rather than reach settlement before trial. Why legal disputes ever go to trial is a perplexing question, as standard theories predict that the costs and risks of trial will lead litigants to reach settlements. Using a dynamic incomplete-contracting framework, we provide an overlooked rationale for going to court. Even though risky and costly, going to court can be both rational and socially efficient when a court decision enhances property rights and deters future costly litigation. Experimental evidence supports these predictions. Our findings provide new insights into the incidence of litigation and trial.

Dale Poirier

Over the 2012-2013 academic year I continued my research in the areas of Bayesian econometrics and statistics. In February I was a Distinguished Visiting Scholar at the University of Technology Sydney.

Kenneth Small

Kenneth Small and his coauthor, Chen Feng Ng, extend the traditional road investment model, with its focus on capacity and congestion as measures of capital and its utilization, to include free-flow speed as another dimension of capital. This has practical importance because one can view free-flow speed as a continuous proxy for road type (e.g. freeway, arterial, urban street). They estimate cost functions empirically, and find suggestive evidence that representative freeways in most large urban areas provide too high a free-flow speed relative to capacity. This makes the case for reexamination of typical design practice, perhaps leading to less intrusive types of highways for dense urban areas.

(b) Public Choice

(c) Social Networks

John Boyd

I've developed a faster way of measure the statistical significance of network measures. For example, comparing a social network of dolphins with that of boys in a karate class, I've found that dolphins have no significant inclination to interact with the high ranking dolphins, while boys of low degree want to associate with those of higher degree. On the other hand, friendship among dolphins tends to be transitive, where a friend of a friend is a friend; while the boys have no significant tendency toward transitive.

Andrew Noymer

I work on epidemiology, the area where two complex systems interface (pathogens and human society). While 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 the empirics of social and historical epidemiology, though some of my work straddles this area and methodology/modeling. I continue to do much work on influenza pandemics, the subject of my PhD dissertation (2006). I am also branching out to the seasonality of all-cause mortality and other topics in medical demography.

(d) Social Dynamics and Evolution

Steve Frank

Abstract of Natural selection V (see listing): The equations of evolutionary change by natural selection are commonly expressed in statistical terms. Fisher's fundamental theorem emphasizes the variance in fitness. Quantitative genetics expresses selection with covariances and regressions. Population genetic equations depend on genetic variances. How can we read those statistical expressions with respect to the meaning of natural selection? One possibility is to relate the statistical expressions to the amount of information that populations accumulate by selection. However, the connection between selection and information theory has never been compelling. Here, I show the correct relations between statistical expressions for selection and information theory expressions for selection. Those relations link selection to the fundamental concepts of entropy and information in the theories of physics, statistics, and communication. We can now read the equations of selection in terms of their natural meaning. Selection causes populations to accumulate information about the environment.

Douglas White

The Wiley Companion by White, Dow and Eff (2013) provides a book contract for original articles on the transformation of cross-cultural research using the new approaches of the last five years, including the work of the WGRSS, which will also include computer-based instructional packages (White 2012b), network approaches to comparative study (White 2011a, 2011b), and the links between human cognition and social networks (White 2011c). Previous papers by White and WGRCSS (draft 1) examines the evolution of human cooperation in forager societies; (draft 2) examines the evolution of ethics in monotheistic religions, given unpublished findings of our SFI WGRCSS (White, Oztan, Gosti, Wagner, and Snarey 2011) which included an invitational meeting at the Leipzig Max Planck Institute for Mathematics and the Sciences in 2012.

E. Research Seminars and Activities

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

Mathematical Models in Cognitive Processes (Batchelder)
Theory, History and Development Seminar (Carvalho)
Face Perception (Hoffman)
The Development of Inductive Logic (Huttegger/Skyrms)
Introduction to Game Theory (Kaminski)
Decision Theory for doctoral students (Keller)
Decision Analysis (Keller)
Language Acquisition (Pearl)
Computational Models of Language Learning (Pearl)
Topics in Econometrics (Poirer)
Public Choice I (Skaperdas)
Psychology 217 (Sperling)
Psychology 211 (Sperling)
Gauge Theories (Weatherall)

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

May 28 Syntax + semantics
May 14 Regularization
April 30 Word segmentation
April 16 Phonotactic learning
March 11 Hierarchy in language learning
February 25 Statistical learning
January 28 Language universals
January 14 Mathematical language learning
November 28 Probabilistic learning
November 14 Natural language learnability
October 24 Learning word meaning
October 10 Learning sounds + words

<http://www.socsci.uci.edu/~lpearl/colareadinggroup/#topics>

SOCIAL DYNAMICS AND COMPLEXITY RESEARCH GROUP

The focused research group in Social Dynamics and Complexity, headed by Professor Douglas White, has a mediawiki InterSciWiki web site for complexity, dynamics, network sciences, and causal modeling. The number of its original 16 core members and 13 affiliates is dwindling but MBS graduate students involved in the groups research programs is growing (Oztan, Doubleday) while others have gone on to jobs (Wagner) and postdocs (Gosti). The group peer-reviewed World Cultures eJournal of Cross-Cultural Research: [eScholarship] has published seven issues and with 34 articles (including legacy issues, up one from last year and up from 22 articles last year) but already has 75,700 Google:hits and 4,300 of its peer-reviewed articles on Google scholar. The peer-reviewed eJournal of Anthropological and related sciences, Structure and Dynamics, continues, and has now published 61 open access articles, and is widely cited (58,500, Google:hits), 191 Google Scholar listed articles, and 62,140 downloads. The group eJournals were the subject of last year's featured article by UCOP and the President's Office of Berkeley electronic Press, and was featured in the Anthropology News (AN) newsletter. The group has initiated EduMod sites (integrating supercomputing with wiki-based and UCI online courseware) hosted by our MBS InterSciWiki for open access instruction in a variety of research methodologies, from structural cohesion in social networks to causal analysis with Peer effects. This year the group's Societal Study Initiative and Working Group on Robust Causality in the Social Sciences projects have been funded extensively by NSF and SFI.

WORKING GROUP ON ROBUST CAUSALITY IN THE SOCIAL SCIENCES

The past few years have led to unprecedented breakthroughs in the mathematics of data analysis with open source modifiable software that allowed research, publication, and grant proposals on improvements in Bayesian and inferential statistics to support testing of networks of causal variables from data on human societies and historical sequence data that have major policy implications (White 2012a). White's SFI Working Group on Robust Causality in the Social Sciences (**WGRCSS**) has made massive progress this year, solving

the 130-year conundrum of nonindependence of cases in survey research, which has plagued anthropology and the social sciences and is known as **Galton's problem**. Our working group has implemented a solution, along with new approaches to complex networks, and with installation of the first general-purpose **Complex Social Science (CoSSci) Supercomputer Gateway** at the San Diego Supercomputer Center (SDSC). The SFI has renewed White's external professorship for 2013-2016, and working group the will meet again at SFI in August 2013. The CoSSci Gateway at <http://socscigate.oit.uci.edu/uci/root> now allows not only a "big data" approach to worldwide sociocultural, political-economic and ecoenvironmental modeling but networked modeling of observational-variable path analyses that incorporate time-series panel data, Bayesian estimation and causal effects of cohesive interaction networks at multiple levels of analysis. A Virtual Machine at UCI, hosted at socscicompute.ss.uci.edu by Irvine's OIT allows open access to modelers (researchers and students in online courses) to complete each iterative stage in model improvement in less than two minutes, whereas (1) analysis of results may require a half hour, (2) a dozen iterations may be required for completion of a given model and (3) models linked by sharing of independent and/or dependent variables for a path analysis may require weeks. In contrast, a "big data" analysis of many linked models may require several days of supercomputer time at the Trestles Supercomputer at UCSD.

As of now (June) CoSSci has: four major databases that cover the gamut of human societies from a foragers sample (N=339 societies V=850 variables), to the EthnoAtlas world sample (N=1287 V=92), Standard Cross-Cultural Sample (N=186, V=2800+) and Western North American Indian sample (N=172, V=289), and will encompass more world databases in the future, each equipped for missing data imputation. The working group has included MBS graduate students Tolga Oztan, Giorgio Gosti, Elliott Wagner, and Steve Doubleday, SFI postdocs Marcus Hamilton and Laura Fortunato, SFI external faculty Henry Wright and Peter Turchin, and invitees Chris Boehm and Amber Johnson. The SDSC contingent (Gosti, Oztan and Doubleday), working with White and SDSC scientist Robert Sinkovits, distinguished themselves as one of three outstanding supercomputer projects in the yearly NSF report on Gordon Research Highlights (June 6 2013) for solution and computation for vertex-connectivity structures, measuring large-network subgroup cohesiveness according to the Menger Theorem and as initially developed by White, Frank Harary, James Moody and Mark Newman. Tolga Oztan gave the group's presentation at the International Network for Social Network Analysis (INSNA) in Hamburg, 2013. These accomplishments of the proposed Social Science Initiative Project (White 2012b) round out the assembly and analysis of major comparative and historical databases on human societies and in the assembly, theory development for societal processes and network analysis, and robust causal modeling and model testing using social science and environmental databases (White 2012b).

Working Group on Robust Causality in the Social Sciences (WGRCSS). The group has developed open source R software for robust causal analysis using Social Science datasets, codebooks, and primary source bibliographies for the N individual cases and V variables in societal samples such as:

Ethnographic Atlas (N=1287 Murdock 1967)

Standard Cross-Cultural Sample (N=186 Murdock and White 1969,2006)

Forager Database (N=339 Binford 2001)

Western North American Indians (N=172 Jorgensen 1980,1987)

Equestrian Indians of North America (N=90 White 1969)

Kinsources Network Sample (N=85), with M nodes in a larger social unit
(ANR-Kinsources 2012)

One or more Cross-Polity Databases (N=ca.212)

Chiefdoms and Early Empires Data (N=ca.25 Wright 2009)

Longitudinal Empires Database (N=ca.35, with many time-steps) (Turchin 2005)

World Environmental Databases (meteorological

Three books (above) are currently being written using these data.

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 (SNRG) meets weekly during the academic year, and serves as an open forum for research presentations, meetings with visiting researchers, and discussion of current research. The group consists of a mix of faculty, students, and non-student researchers from the UCI community, as well as outside visitors, and is open to all interested parties. More information and past agendas can be found at: http://lakshmi.calit2.uci.edu/cnra/index.php/?page_id=205.

In addition to open discussions, the following research presentations were given this year:

FALL 2012

October 2

Welcome Back/ Agenda Meeting

October 9

Social Network Methods and Health (Cynthia Lakon)

October 16

Online Communication Dynamics during Disaster Response and Recover (Emma Spiro)

October 23

Clustering Algorithms (Cheng Wang)

October 30

Presentation (Zack Almquist)

November 6

Cliques of LA (Emma Smith)

November 20

Exploiting Context in Topic Models (Jimmy Foulds)

November 27

Twitter Activity (Ben Gibson)

December 11

Presentation Ulrik Brandes

WINTER 2013

January 8

Welcome Back/ Agenda Meeting

January 15

National Research University- Higher School of Economics (Discussion with Daniel Alexandrov and Alexander Dolgin)

January 22

Presentation (Zack Almquist)

January 29

Presentation (Emma Smith)

February 5

Presentation (Emma Spiro)

February 12

Presentation (Ben Gibson)

February 19

Challenges and Directions in Network Modeling (Carter Butts)

February 26

Presentation (Wang Cheng)

March 5

Presentation (Cynthia Lakon)

March 12

Presentation (Emma Spiro)

March 19

Presentation (Fitzhugh)

SPRING 2013

April 3

Welcome Back/Agenda Meeting

April 12

Linear Operator Theory for Feedback Centrality (Carter Butts)

April 18

Estimating Active User Population Dynamics in Online Social Networks (Ben Gibson), and Understanding the Job Lead Ties of Los Angeles (Emma Smith)

April 25

Presentation (Emma Spiro)

May 2

Presentation (Zack Almquist)

May 9

Presentation (Sean Fitzhuh)

May 16

Presentation (Emma Smith)

May 30

Presentation (Daiki Hiramori)

June 6

Presentation (Rupa Jose and Cheng Wang)

June 13

Presentation (Adam Boessen)

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 14 Ph.D. students, of whom 5 have advanced to candidacy, and 4 have graduated this academic year. Of the 4 who have finished: Samuel Thorpe (William Batchelder, Chair; currently Post Doc at the University of Maryland); Daniel Jessie (Don Saari, Chair; currently Lecturer in the Department of Mathematics, UC Irvine); Ray Mendoza (Natalia Komarova, Chair; currently on the job market); Giorgio Gosti (William Batchelder, Chair; Post Doc, Department of Physics, Rome University).

The following is our current roster of students enrolled in the Ph.D. program in Mathematical Behavioral Sciences during the current academic year. It is worthwhile to note that of these 14 students, 6 have entered our Ph.D. program with masters degrees; 2 in Operations Research, 1 in Economics, 1 in Electrical and Computer Engineering, 1 in Physics, and 1 in Mathematics. They are listed in Appendix F.

Kalin Agrawal
Steven Doubleday
Robert Forbes
Giorgio Gosti
Santiago Guisasola
Lisa Guo
Dan Jessie
William Leibzon
Tom McIntee
Ray Mendoza
Bahattin (Tolga) Oztan
Samuel Thorpe
Heidi Tucholski

Dan Wolf

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. We were expected to enroll one graduate student for the coming academic year, and we met this target.

Insofar as the Institute's budget allows, students in MBS as well as other students whose research relates to MBS are awarded summer stipends. This summer the IMBS awarded summer research funds to 10 students; 7 IMBS students, and 3 students from other programs. In addition, additional IMBS students were supported on research

Last year we sent five students to the Santa Fe Institute; this year one student.

B. Graduate Activities

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

C. Outreach

One of our Ph.D. students—Robert Forbes, under the direction of Louis Narens; has made presentations to groups of CEOs, CFOs, and members of Boards of Directors of major Orange County corporations about how to improve their forecasting through the amelioration psychological distortions. Forbes has found a way to incorporate mathematical modeling techniques developed by MBS faculty and other researchers—most notable ideas from Prospect Theory (for which the Psychologist Daniel Kahneman received the Nobel prize in economics—into the standard forecasting software developed by Palisade's Corporation and used by all Fortune 500 companies. In addition Forbes has been featured in presentations this year, cosponsored by Palisades Corporation, in Silicon Valley in San Francisco.

D. Weekly Research Presentations

This year, the IMBS held weekly research meetings at Noon on Fridays for graduate students and faculty to introduce research they are working on by giving one hour presentations. Below is the list of the 23 presentations for the year:

October 5 – Daniel Jessie: "The Structure and Analysis of Games"

October 12 – Giorgio Gosti: "Reasoning, Learning and Games theory: The Power Grid Game"

October 19 – Hao Gia: "Endogenous Occupational Choice and Social Networks"

October 26 – Andrew Colopy: "Contracting Leviathan: endogenous third party enforcement in the shadow of conflict"

November 2 – Rein Taagepera: "People, Skills and Resources: An Interaction Model of World Population, Technology and Earth's Carrying Capacity, CE 400-2100"

November 9 – Ryan Kendall: "Preference Formation in 2x2 Games: An Informational Approach"

November 16 – Blake Allison: "Players Prefer Not to Bargain "Fairly" in the Shadow of Conflict: A Comparison of Cooperative and Noncooperative Mechanisms"

November 30 – Lisa Guo: "Scientific Studies on Visual Aesthetic Judgments"

December 7 – Mike Caldara: "Inter-generational Group Conflicts"

January 11 – Steve Doubleday: "Modeling the Solution of Complex Problems"

January 18 – Rein Taagepera: "Share of the largest component in national assemblies, federal countries and languages of the world. From population size to national assembly size, effective number of parties, and cabinet duration. Exponential decrease in the effective number of polities over 5000 years"

January 25 – Blake Allison: "Stable Coalitions and Patterns of Aggression: A Model of Youth gangs"

February 14 – Stergios Skaperdas: "Modeling the rise of Extremism"

March 1 – Andrew Colopy: "Contests under incomplete information"

March 7 – Jean-Paul Carvalho: "Resisting Education"

April 5 – Giorgio Gosti: "The Power Grid Game" Strategic Reasoning over Hard Games"

April 12 – Justin Bruner: "David Lewis in the Lab: Experimental Results on the Emergence of Meaning"

April 26 - Mark C. Wilson, "Electoral engineering via simulation"

May 3 – Xiyan (James) Wang: "The Impact of Beijing's subway lines on housing prices"

May 10 – Dan Wolf: "Abstraction in Roth-Erev Bounded Rationality: How the Ability to Abstract Improves Reinforcement Learning"

May 17 – Kip Jackson: "Experimental Evidence of the Effect of Social Information on Charitable Giving"

May 24 – Brian Asquith: "Beggar Thy Neighbor, Beggar Thy Neighborhood"

May 31 – Blake Allison: "Endogenous Consumer Rationing: A theoretic Foundation for the Proportional Rationing Rule"

E. Graduate Student Conference

Each year the IMBS holds a graduate student conference where students in the MBS program, as well as other students whose research interests are related to MBS, give presentations on their research. The graduate organizers were: Giorgio Gosti, Daniel Jessie, and Tomas McIntee. The 11th Annual Graduate Student Conference and the presentations are listed below:

The 11th Annual IMBS Graduate Student Conference

Thursday, May 23rd, 2013

Session I: Coalitions

Session Chair: Giorgio Gosti

9:20 **Michael Caldara**, Economics

The Origin of the State as a Stationary Bandit

9:50 **Blake Allison**, Economics

Race, Ethnicity and the Code of the Streets: the role of homophily in understanding the composition of urban street gangs and their violence

10:20 **Fan Jiang**, Economics

Defensive Extremism

10:50 Ten Minute Break

Session II: Experimental Game Theory

Session Chair: Tomas McIntee

11:00 **Garret Ridinger**, Economics

Control, Reciprocity, and Inequity Aversion in a Sequential Prisoner's Dilemma with Nature

11:30 **Erick Peterson**, Economics

Group Size, Cooperation, and the Surfers Dilemma

12:00 Lunch Break

Session III: Models of Decision-Making

Session Chair: Giorgio Gosti

12:50 **Robert Forbes**, IMBS

Cognitive Forecasting

1:20 **Daniel Jessie**, IMBS

The Structure and Analysis of Games

1:50 **Ryan Kendall**, Economics

Decomposing Social Awareness: A New Experimental Approach

2:20 Ten Minute Break

Session IV: Systems Analysis

Session Chair: Ryan Kendall

2:30 **Giorgio Gosti**, IMBS

Language Enclaves and Social Networks

3:00 **Andrew Colopy**, Political Science

Generalized Contests Under Incomplete Information: Interdependent Valuations and Correlated Types

3:30 **Steven Doubleday**, IMBS

Building Computer Systems: Knowing when to Pull the Plug

4:00 Ten Minute Break

Session V: Decisions and Aggregation

Session Chair: Daniel
Jessie

4:10 **Lisa Guo**, IMBS/Statistics

Affective Decision-making

4:40 **Tomas McIntee**, IMBS

A Geometric Approach to Voting Paradoxes

5:10 **Dr. Donald Saari** - Closing Remarks

F. Jean-Claude Falmagne Dissertation Award

Each year, the IMBS gives the “Jean-Claude Falmagne dissertation award” to a graduate student for the best dissertation that uses mathematics to develop conceptual advances for issues coming from the social and behavioral sciences. Going beyond the use of mathematics for computational purposes, the intent is to award a dissertation that uses concepts from mathematics to reach new conclusions. The prize is \$1,500. Last year the award was given to Elliott Wagner, Logic and Philosophy of Sciences Ph.D. student for his dissertation “The Dynamics of Information Transfer”.

This year the committee decided to co-award the award to Daniel Jessie, MBS, for his dissertation “Applied Algebraic Systems: New Tools for the Social Sciences” and Ryan Kendall, Economics, for his dissertation, “Behavioral Models of Competition: A Theoretical, Empirical, and Experimental Analysis”.

IV. COMMUNICATION

A. Conferences

The IMBS held 2 conferences this academic year on “Quantum Thinking”, and “Wisdom of the Crowd”. Below are this year’s conference agendas:

INSTITUTE FOR MATHEMATICAL BEHAVIORAL SCIENCES
“QUANTUM THINKING”

FRIDAY, FEBRUARY 22

- | | |
|--------------------|---|
| 1:00 – 1:10 | Opening remarks - DONALD SAARI
UCI Distinguished Professor, Director of IMBS |
| 1:10 – 2:00 | JOYCE WANG - School of Communication, Ohio State “ <i>An a priori and Parameter-Free Quantum Model for Cognitive Measurement Order Effects</i> ” |
| 2:00 – 2:10 | Discussion |

- 2:10 – 3:00 JEROME BUSEMEYER - Psychological & Brain Sciences,
Indiana "*Quantum Reasoning About Sequences of Events*"
- 3:00 – 3:10 Discussion
- 3:10 – 3:25 BREAK
- 3:25 – 4:15 JENNIFER TRUEBLOOD - Cognitive Sciences, UC Irvine
"*A Quantum Model of Order Effects in Inference and Causal Reasoning*"
- 4:15 – 4:25 Discussion
- 4:25 – 5:15 DONALD HOFFMAN and JENNIFER TRUEBLOOD –
Cognitive Sci. – UCI "*Quantum Game Theory*"
- 5:15 – 5:25 Discussion

SATURDAY, FEBRUARY 23

- 9:00 – 9:50 DONALD HOFFMAN - Cognitive Sciences, UC Irvine
"*And the Truth Shall Make You Extinct: Perception, Evolution
and Quantum Measurement*"
- 9:50 – 10:00 Discussion
- 10:00 – 10:50 NOAH GOODMAN, Psychology, Stanford
"*The Probabilistic Language of Thought*"
- 10:50 – 11:00 Discussion
- 11:00 – 11:15 BREAK
- 11:15 – 12:05 EHTIBAR DZHAFAROV - Psychological Sciences, Purdue
"*All-Possible-Couplings Approach to Context and Determinism*"
- 12:05 – 12:15 Discussion
- 12:15 – 1:45 LUNCH
- 1:45 – 2:35 EMMANUEL HAVEN - School of Management, University of
Leicester "*Quantum-likeness' in Economics and Finance*"
- 2:35 – 2:45 Discussion
- 2:45 – 3:35 LOUIS NARENS - Cognitive Sciences, UC Irvine
"*Alternative Probability Theories for Cognitive Psychology*"
- 3:35 – 3:45 Discussion
- 3:45 - 4:15 GEOFFREY IVERSON - Cognitive Sciences, UCI *Commentary*
- 4:15 - 5:35 Discussion and Closing

CONFERENCE ON “WISDOM OF THE CROWD”

April 18 & 19, 2013

Sponsored by the Institute for Mathematical Behavioral Sciences

Location: LUCE CONFERENCE ROOM, SSPA 2112

Thursday, April 18

1:00-1:10	Opening Comments by Stergios Skaperdas & Mark Steyvers
Session Chair	Michael Lee – Cognitive Sciences, UCI
1:10-1:50	Jack Soll – Fuqua School of Business, Duke “The Wisdom of Small Crowds”
1:50-2:00	Discussion
2:00-2:40	David Pennock – Principal Researcher & Asst. Managing Dir., Microsoft “TBA”
2:40-2:50	Discussion
2:50-3:10	Break
3:10-3:50	Seyda Ertekin – Sloan School of Management, MIT “TBA”
3:50-4:00	Discussion
4:00-4:40	Casey Lichtendahl – Business Administration, University of Virginia “The Wisdom of Competitive Crowds”
4:40-4:50	Discussion
4:50-5:10	Break
5:10-5:50	Mark Steyvers – Cognitive Sciences, UCI “The Wisdom of Crowds in the Aggregation of Rankings”
5:50-6:00	Discussion

Friday, April 19

Session Chair	Mark Steyvers – Cognitive Sciences, UCI
9:00-9:40	Tom Wallsten – Psychology, University of Maryland

	“How Wise is the Crowd: Aggregating, Improving and Evaluation Probabilistic Forecasts of Future Events”
9:40-9:50	Discussion
9:50-10:30	David Budescu – Psychology, Fordham University “Identifying Expertise and Using it to Extract the Wisdom of the Crowds”
10:30-10:40	Discussion
10:40--11:20	Michael Lee – Cognitive Sciences, UCI
11:20-11:30	Discussion
11:30-1:30	Lunch – on your own
1:30-2:10	Stefan Herzog – Max Planck Institute “The Wisdom of Crowds Within a Single Mind”
2:10-2:20	Discussion
2:20-3:00	Robert Winkler
3:00-3:10	Discussion
3:10-3:50	William Batchelder, Cognitive Sciences, UCI “Cultural Consensus Theory”
3:50-4:00	Discussion

B. Conferences/Seminars organized by IMBS Members

William Batchelder. Organizer for the Invited Special Session on the Cultural Consensus Theory. Annual Meeting of the Classification Society of North America. University of Wisconsin, Milwaukee. June 2013.

Michael Birbaum. Co-organizer with D. Cavagnaro. Edwards Bayesian Research Conference. Cal State Fullerton. February 2013.

William Branch. Program Committee, 19th International Conference on Computing in Economics and Finance. Vancouver, British Columbia, Canada. July 2013.

Bernard Grofman. Co-organizer with Dr. Bernhard Wessels. Co-funded by the Peltason Chair and the Wissenschaft Centrum Berlin. International Conference on New Developments in Modeling Party Competitions. WZB-Social Science Research Center, Berlin, Germany. July 2013.

Simon Huttegger. Social Dynamics Conference. Beckman Center, University of California, Irvine. March 2013.

Robin Keller. Merage PhD Program Brown Bag lunch research seminar series and the annual Merage PhD Research Fest. University of California, Irvine. April 2013.

Robin Keller. Merage School Operations and Decision Technologies with Prof. Shuya Yin, area coordinator and conference chair. Organized the Annual Southern California Operations Research/Operations Management Day 2013. This annual conference rotates between UCI, UCLA, and USC. May 2013.

Michael Lee, with Mark Steyvers. IMBS Workshop, Wisdom of the Crowd. University of California, Irvine. April 2013.

Simon Levine. Co-organizer, BESTNet Workshop: Modeling Species Dispersal & Ecosystem Services. Princeton University. April 2013.

Simon Levine. Co-Organizer, Social-Ecological Complexity and Adaptation in Marine Systems (NSF-Coupled Natural-Human Systems Grant) Meeting/Workshop, Princeton University. November 2012.

Michael McBride. Organizer, Experimental Social Science Laboratory Experimental Workshop. University of California, Irvine. June 2013.

Louis Narens. Co-Organizer with Jennifer Trueblood and Stergios Skaperdas, Quantum Thinking, University of California, Irvine. February 2013.

Stergios Skaperdas, Co-Organizer with Louis Narens and Jennifer Trueblood, Quantum Thinking. IMBS, University of California, Irvine. February 2013.

Stergios Skaperdas, with Charles Knoeber, Dan Kovenock, and Theofanis Tsoulouhas. Contests, Tournaments, and Relative Performance Evaluation, Fresno Center. University of California, Merced. March 2013.

Stergios Skaperdas, with Michael Lee and Mark Steyvers. The Wisdom of the Crowd. IMBS, University of California, Irvine. April 2013.

Brian Skyrms. Organizer, Evolution, Game Theory and the Social Contract, Beckman Center of National Academy, University of California, Irvine.

Kenneth Small. Conference Planner, Annual Conference of the International Transportation Economics Association, of which K. Small is president. Kuhmo Nectar conference on Transportation Economics, Northwestern University. July 2013.

Kenneth Small. Thirty-Eighth Annual Interdisciplinary Conference, Teton Village, Wyoming, January 2013.

Jennifer Trueblood, Co-Organizer with Stergios Skaperdas and Louis Narens, Quantum Thinking, IMBS, University of California, Irvine. February 2013.

James Weatherall, with Penelope Maddy and Sean Walsh. Category Theoretic Foundations of Mathematics. Department of Logic and Philosophy of Science, University of California, Irvine. May 2013.

James Weatherall, with H. Halvorson, M. Miller, and G. Valente. Irvine-Pittsburgh-Princeton Conference on the Mathematical and Conceptual Foundations of Physics, University of Pittsburgh. April 2013.

James Weatherall, with J. Earman and G. Valente. Relativistic Causality between Quantum Field Theory and General Relativity. Center for Philosophy of Science, University of Pittsburgh, April 2013.

Douglas R. White, Organizer. Causality/Robustness Working Group, Meeting 5. Santa Fe Institute, Santa Fe, New Mexico. September 2012.

Douglas R. White, with Tolga Oztan, Peter Turchin, Amber Johnson, Henry Wright, Marcus Hamilton, Laura Fortunato, and Karolina Safarzynska. (unable to attend: Chris Boehm, Scott White, John Snarey). Santa Fe Institute. August 2013

Jack Xin. Organizer, International Conference on "Recent Developments in Applied Mathematics", Stanford University. January 2013.

C. Future Conferences

For the coming year, we are exploring conferences that will explore three different themes. A continuing strength of the IMBS is the research on decisions – how decisions are made and how they should be made. A multidisciplinary conference on this is being explored for late fall.

A second area of IMBS expertise involves social choice; this is the mathematical study of how group decisions are made. Recently, results, primarily developed at the IMBS, have been used by the law profession to understand mysteries of court decisions and peculiarities of laws. A conference exploring the multidisciplinary connection is being considered.

As with the physical sciences, the social and behavioral sciences are based on carefully designed models. An issue, recently explored by an NRC committee, involves the lack of adequate knowledge about validation methods. Indeed, this proves to be a concern for federal agencies such as NIH, FDA, etc. A workshop exploring this topic is being planned.

D. Visitors

The Institute hosted Princeton Professor Simon Levin, Moffett Professor of Biology, Princeton University during the academic year. His activities letter can be found in Appendix G.

Next year the Institute will again sponsor the visit of Professor Levin. In addition, Researcher Tim Satalich, will be working with Professor Kim Romney, and Alissa Winkler will be working with Project Scientist Kimberly Jameson.

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 http://www.imbs.uci.edu/imbs_colloquia.

Following are the speakers and their presentations:

FALL 2012

OCTOBER 11

DOUGLAS R. WHITE

Department of Anthropology, UCI

"Simulation, Networks, Comparative Data, and Evolution of Human
(Forager) Cooperation"

OCTOBER 25

ANTHONY MCGANN

Department of Political Science, UCI

"Estimating the Position of the Median Voter: Item Response Theory and Dyad Ratio
Approaches"

NOVEMBER 1

IGOR KOPYLOV

Department of Economics, UCI

"Hard and Soft Commitments: Self-Control in the Presence of Self-Deception"

NOVEMBER 8

JENNIFER TRUEBLOOD

Department of Cognitive Sciences, UCI

"Modeling Human Judgments with Quantum Probability Theory"

NOVEMBER 15

NAGEEB ALI

Department of Economics, UCSD

"Enforcing Cooperation in Networked Societies"

NOVEMBER 29

KIMBERLY A. JAMESON
Institute for MBS, UCI and
NATALIA KOMAROVA
Mathematics, UCI

“A Quantitative Theory of Color Appearance Similarity Relations”

DECEMBER 6

MIGUEL GARCIA-PEREZ
Dept. of Psychology

Universidad Complutense de Madrid

“Indecision in psychophysical judgments: A solid source of artifacts”

WINTER 2013

JANUARY 17

SIMON LEVIN

Dept. of Ecology and Evolutionary Biology, Princeton

“Critical Transitions in Ecological and Complex Adaptive Systems”

JANUARY 24

MAREK KAMINSKI

Dept. of Political Sciences, UCI

“‘Host Effect’ and other paradoxes in FIFA’s soccer rankings”

JANUARY 3

M. SCOTT TAYLOR

Dept. of Economics, University of Calgary

“Back to the Future of Green Powered Economies”

FEBRUARY 7

JUN ZHANG

Dept. of Psychology, University of Michigan

“Topological Characterization of Interval and Semi-Orders”

FEBRUARY 14

SIMON HUTTEGGER

Dept. of Logic and Philosophy of Science, UCI

“Pattern Learning in Games”

FEBRUARY 21
W. GARRETT MITCHENER
Dept. of Mathematics, College of Charleston
"How is the acquisition of raising and control verbs possible?"

FEBRUARY 28
ZYGMUNT PIZLO
Dept. of Psychological Sciences, Purdue
"The role of a priori constraints in veridical perception of 3D shapes"

MARCH 7
TIM SATALICH
Researcher, Blue Ciphers Research
"Modeling Color Appearance Space Using Reflectance Spectra"

MARCH 14
MICHAEL WOODFORD
Political Economy, Columbia University
"Efficient Perceptual Coding and Reference-Dependent Choice"

SPRING 2012

APRIL 11
SOO HONG CHEW
Department of Economics
National University of Singapore
"Ambiguity, Familiarity, and the Equity Home Bias Puzzle: Theory and Evidence from Choice Experiments involving Neuroimaging and Molecular Genetics"

APRIL 18
CONFERENCE ON "WISDOM OF THE CROWD"
(Agenda is listed under Communication, Section IV A).

APRIL 25
MILIND TAMBE
Computer Science and Industrial and Systems Engineering
UCLA
“Security and Game Theory: Key Algorithmic Principles, Deployed Applications,
Lessons Learned”

MAY 2
DAN CAVAGNARO
Department of Information Systems and Decisions
Cal State Fullerton
“Discriminating Among Probability Weighting Functions Using Adaptive
Design Optimization”

MAY 16
ED HOPKINS
School of Economics
University of Edinburgh
“Inequality and Risk Taking Behavior”

MAY 23
GRADUATE STUDENT CONFERENCE
(Agenda is listed under Graduate Training Section III E)

MAY 30
NICK WELLER
Dept. of Political Science
USC
“Consistent Inconsistency: Beliefs and Behavior Across Game Theoretic Situations”

A. Appropriations and Expenditures

V. BUDGET

Appropriations:

IMBS 2012-13 Budget allocation	\$ 83,282.00
IMBS 2011 Carry Forward	\$ 19,488.00
Visitor Allocation	\$ 12,090.00
Total budget for 2012-13:	<u>\$114,840.00</u>

Expenditures:

Salaries (Director, Staff, Visitor)	\$38,690.00
School Administrative Support	\$ 7,500.00
Conference/Colloquia	\$29,349.00
Equipment	\$ 2,393.00
Supplies & Expenses	\$ 3,520.00
Graduate Student Support	\$18,000.00
<u>Total Expenditures:</u>	<u>\$99,452.00</u>
<i>Carry Forward:</i>	<i><u>\$15,388.00</u></i>

2013-14 Encumbrances:

B. Extramural Funding Activity

GRANTS AWARDED AND ACTIVE:

IMBS faculty research was supported by research grants totaling \$56,817,270 with pending grants totaling \$1,032,721. Following is a detailed breakdown of the extramural funding:

William H. Batchelder

Source of Support: Oak Ridge Institute for Science and Education (ORISE)

Amount: \$75,000

Award Period: 7/12-8/13

Title: Fellowship Award

Source of Support: Department of Interior National Business Center contract number D11PC20059

Amount: \$293,000

Award Period: 7/11– 8/13

Title: Intelligence Advanced Research Projects Activity (IARPA)

Co PI with M. Lee and M. Stevyers

Source of Support: Army Research Office

Amount: \$355,000

Award Period: 7/10 – 8/13

Title: Statistical Inference for Cultural Consensus Theory

Michael Birnbaum

Source of Support: NSF

Amount: \$162,130

Award Period: 2007-2013

Title: Advanced Training Institutes: DRMS Research via the WWW

David Brownstone

Source: Brookings Institute

Amount: \$30,000

Award Period: 12/12- 8/13

Title: Evaluation of California High Speed Rail Demand Projections

Source: UC Sustainable Transportation (MRPI)

Amount: \$55,000

Award Period: 1/12 – 12/12

Title: Potential Design, Implementation and Benefits of a Feebate Program for New Passenger Vehicles in California.

Charles Chubb

Source: NSF BCS-0843897
Amount: \$419,781
Award Period: 9/9 – 8/13
Title: Preattentive Visual Sensitivity
CoPI: G. Sperling

Source: EPSRC
Amount: £541,000,
Award Period: 2/11 – 2/14
Title: Efficiency of Visual Statistics
PI: J. Solomon, and CoPI's: M.J. Morgan, C. Chubb, K. May.

Mike D'Zmura

Source: Army Research Office
Amount: \$4,100,000
Award Period: 7/08-12/13
Title: Silent Spatialized Communication among Dispersed Forces

David Eppstein

Source: National Science Foundation
Amount: \$400,000
Award Period: 2008-2011, extended to 2012
Title: Collaborative Research: Algorithms for Graphs on Surface

Source: Office of Naval Research
Amount: \$529,152
Award Period: 2008-2013
Title: Scalable Methods for the Analysis of Network-Based Data: Multidisciplinary University Research Initiative (MURI) Award

Source: National Science Foundation
Amount: \$388,861
Award Period: 2012-2015
Title: Geometric Graph Algorithms

Steve Frank

Source: National Science Foundation
Award Amount: \$275,000
Award Period: 2013 – 2017
Title: Models of Natural Selection, Development, and Life History.

Bernard Grofman

Source: Sloan Foundation

Award Amount: \$119,756

Award Period: 2011– 2012

Title: Monitoring the Nature and Impact of Public Input into the Legislative and Congressional Redistricting Process.

Donald Hoffman

Source: VF Corporation

Award Amount: \$81,730

Award Period: 2012– 2013

Title: Vision Research

Simon Huttegger

Source: National Science Foundation

Award Amount: \$275,000

Award Period: 7/10 – 6/13

Title: Collaborative Research: Dynamic Perspectives on Costs and Conflict in Signaling Interactions. Co-PIs: Kevin Zollman (Carnegie Mellon) and Carl Bergstrom (U.Washington).

Kimberly Jameson

Source: UC Pacific Rim Program

Award Amount: \$46,616

Award Period: 7/11 – 6/13

Title: Faculty initiative grant: Investigating concept formation and the linguistic processing of natural categories across Pacific Rim ethnolinguistic groups.

Marek Kaminski

Source: Center for the Study of Democracy

Award Amount: \$2,500

Award Period: 2012 – 2013

Source: Center for the Study of Democracy

Award Amount: \$2,500

Award Period: 2012

Robin Keller

Source: USC CREATE Center, (subcontract from Department of Homeland Security fund)

Award Amount: \$15,000

Award Period: 2011 – 2012

Title: The Effects of Time on Anticipated Consequences of Risks
Keller (PI), Candice Huynh and Yuhong He (student investigators).

Source: The John S. and Marilyn Long Institute for U.S.-China Business and Law

Award Amount: \$5,000

Award Period: 7-2-2011

Title: A Cross-national Study of Food Safety Management: Comparisons between the United States and China

Tianjun Feng (Fudan University), L. Robin Keller, and Yitong Wang (Tsinghua University).

Natalia Komarova

Source: NIH

Award Amount: \$1,211,630

Award Period: 2011 – 2015

Title: Virus Dynamics and Multiple Infection of Cells: Computational and Experimental Analysis', (with Dominik Wodarz, David Levy, PIs).

Source: NIH

Award Amount: 7/8 – 4/13

Award Period: \$1,554,094

Title: Measuring Methylation Kinetics in Cancer Cells: Computations and Experiments

Michael Lee

Source: National Science Foundation

Award Amount: \$182,000

Award Period: 2013–2015

Title: Classifying categorization using state trace analysis and hierarchical Bayesian modeling.

Co-PI subcontract.

Source: Applied Research Associates, Inc. (ARA) – subcontract from IARPA

Award Amount: \$293,000

Award Period: 2011– 2012

Title: Aggregate Contingent Estimation (ACE) Program

Co-PI with W. Batchelder and M. Stevyers

Source: Australian Research Council
Award Amount: \$220,000
Award Period: 2011–2013
Title: Toward a unified account of adaptive decision making: learning to search, stop and decide, co-PI

Source: Air Force Office of Scientific Research
Award Amount: \$222,000
Award Period: 2011–2013
Title: Sequential Sampling Models of Adaptive Human Decision-Making

Simon Levin

Source: The Andrew W. Mellon Foundation
Award Amount: \$295,867
Award Period: 10/01/2008 – 09/30/2013
Title: Dynamics of South African Vegetation
Location of Project: Princeton University

Source: National Science Foundation
Amount: \$119,277
Period: 12/01/2009 – 11/30/2013
Title: Towards a Science of Sustainability
Location of Project: Princeton University
Role: Co-PI with William Clark (Harvard University)

Source: Cooperative Institute for Climate Change (CICS/NOAA)
Award Amount: \$146,907
Award Period: 07/01/2010 – 06/30/2013
Title: Top-Down Controls on Marine Microbial Diversity and Its Effects in Primary Productivity in the Oceans
Location of Project: Princeton University

Source: National Science Foundation
Award Amount: \$497,366
Award Period: 1/11– 12/15
Title: Dimensions: Collaborative Research: Biological Controls on the Ocean C:N:P Ratios.
Role: Co-PI with Adam Martiny (University of California, Irvine)

Source: Army Research Office
Award Amount: \$238,649
Award Period: 08/17/11 – 08/16/13
Title: Coordination and Collective Decision Making
Location of Project: Princeton University
Role: Co-PI with Iain D. Couzin (Princeton University) and Naomi E. Leonard (Princeton University)

Source: National Science Foundation
Award Amount: \$733,625
Award Period: 9/11–8/14
Title: The Evolution of Incentives and Social Structure under Imperfect Information. Role:
PI (Postdoctoral researcher: Erol Akcay)

Source: Soc. for Conservation Bio./David H. Smith
Conservation Res. Fellowship Prog.
Award Amount: \$185,678
Award Period: 9/11– 8/13
Title: Conservation in a Changing Climate: Predicting Range Shifts for Marine Spatial
Planning.
Role: PI (Postdoctoral researcher: Malin Pinsky)

Source: Duke University/DARPA Award Amount: \$200,001
Award Period: 3/12 – 3/13
Title: Biochronicity: Time, Network, Evolution and Function, Role: PI with David Botstein
(Princeton University) and Ned Wingreen (Princeton University)

Source: Arizona State University/National Institutes of Health
Award Amount: \$44,369
Award Period: 09/15/2011 – 06/30/2013
Title: Modeling Anthropogenic Effects in the Spread of Infectious Diseases
Location of Project: Princeton University
Role: Co-PI with Charles Perrings (Arizona State University)

Source: National Science Foundation
Award Amount: \$1,498,902
Award Period: 09/01/2012 – 08/31/2016
Title: CNH: Social-Ecological Complexity and Adaptation in Marine Systems
Location of Project: Princeton University
Role: PI (Postdoctoral researcher: James Watson)

Source: U.S. Department of Homeland Security
Award Amount: \$340,213
Award Period: 09/24/2012 – 09/23/2014
Title: Disease in Motion: Integrating Epidemic and Social Dynamics in the Control of
Infectious Agents
Location of Project: Princeton University
Role: Co-PI with Bryan Grenfell (Princeton University)

Source: The John Templeton Foundation
Award Amount: \$314,854
Award Period: 10/01/2012 – 09/30/2014
Title: Evolutionary Construction and Complexity

Location of Project: Princeton University

Role: PI

Michael McBride

Source: National Science Foundation

Award Amount: \$4,600,000

Award Period: 2013-2019

Title: Low Energy Options for Making Water from Wastewater

S. Grant (Principal Investigator), A. AghaKouchak (Co-PI), R. Ambrose (Sub-Contractor), P. Bowler (Co-PI), W. Cooper (Co-PI), R. Detwiler (Co-PI), S. Elghobashi (Co-PI), D. Feldman (Co-PI), S. Jiang (Co-PI), L. Kohne (Sub-Contractor), R. Lejano (Co-PI), L. Levin (Sub-Contractor), M. McBride (Co-PI), M. Prather (Co-PI), L. Riley (Key Personnel), D. Rosso (Co-PI), B. Sanders (Co-PI), J.D. Saphores (Co-PI), A. Sengupta (Sub-Contractor), Eric Stein (Sub-Contractor), M. Sutula (Sub-Contractor), W. Tang (Co-PI), K. Treseder (Co-PI), J. Vrugt (Co-PI).

Source: Center for the Democracy Seed Grant

Award Amount: \$2,400

Award Period: 2013

Title: Property Rights and Litigation Conflict

M. McBride (Principal Investigator), S. Skaperdas (Co-PI)

Source: U.S. Air Force

Award Amount: \$7,500,000

Award Period: 7/10 – 6/15

Title: Inferring Structure and Forecasting Dynamics on Evolving Networks.

with PI Jeff Brantingham (UCLA), Andrea Bertozzi (UCLA), Ronald Breiger (University of Arizona), Yu-han Chang (USC), Paul Cohen (University of Arizona), Aram Galstyan (USC), Kristina Lerman (USC/ISI), Igor Mezic (UCSB), Brinton Milward (University of Arizona), Allon Percus (Claremont Graduate University), Alexander Tartakovsky (USC), George Tita (UC Irvine).

Source: U.S. Army Research Office

Award Amount: \$3,750,000

Award Period: 2011– 2016

Title: Scalable, Stochastic and Spatiotemporal Game Theory for Real-World Human

Adversarial Behavior, with PI Milind Tambe (USC), Andrea Bertozzi (UCLA), P. Jeffrey Brantingham (UCLA), Vincent Conitzer (Duke), Maria D’Orsogna (CSUN), Richard John (USC), Rajiv Maheswaran (USC), Yoav Shoham (Stanford), Martin Short (UCLA), Richard Dekmejian (USC)

Source: U.S. Army Research Office

Award Amount: \$150,000

Award Period: 2011– 2012

Title: Instrumentation for the UC Irvine Experimental Social Science Laboratory, with Gary Richardson (UCI), Michelle Garfinkel (UCI), Stergios Skaperdas (UCI), Caesar Sereseres (UCI)

Source: Banque de France

Award Amount: \$30,000

Award Period: 2011– 2013

Title: Liquidity and Information: An Experimental Study, co-PI with Aleksander Berentsen (University of Basel), Guillaume Rocheteau (UC Irvine)

Louis Narens

Source: AFOSR

Award Amount: \$388,187

Award Period: 12/12– 12/15

Title: Modeling Behavioral and Decision Behavior through Systems of Observers

Lisa Pearl

Source: NIAA (National Institute on Alcohol Abuse and Alcoholism)

Award Amount: \$3.1 million (UC Irvine amount \$963,871).

Award Period: 2010 – 2015

Title: Automating Behavioral Coding via Text-Mining and Speech Signal Processing
Collaborative effort with University of Washington and University of Southern California.
Co-PI.

Source: National Science Foundation

Award Amount: \$176,713

Award Period: 2009 – 2013

Title: Testing the Universal Grammar Hypothesis. PI with Jon Sprouse.

Donald Saari

Source: National Science Foundation

Award Amount: \$300,000

Award Period: 12/10 – 02/13

Title: Analyzing multi-scale and multi-unit methodologies.

Padhraic Smyth

Source: Office of Naval Research

Award Amount: \$3,359,000

Award Period: 6/08 – 5/13

Title: Scalable Methods for Analysis of Network-Based Data

Source: National Institute of Health

Award Amount: \$953,952
Award Period: 10/10 – 9/15
Title: Automated behavioral coding via text mining and speech signal processing

Source: IARPA
Award Amount: \$1,334,537
Award Period: 4/11– 2/14
Title: Statistical learning algorithms for text and network analysis

Ramesh Srinivasan

Source: National Institute of Health
Award Amount: \$2,360,000
Award Period: 9/09 – 5/13
Title: Dynamic Neuroimaging with High-resolution SSVEPs

Source: Army Research Office
Award Amount: \$4.1 million
Award Period: 8/09 – 7/13
Title: Silent spatialized communication among dispersed forces,
Co-Principal Investigator (PI: D’Zmura M)

George Sperling

Source: National Science Foundation
Award Amount: \$278,915
Award Period: 9/15/09 – 8/3/13
Title: Preattentive Visual Sensitivity
Co-Principal Investigator

Source: National Institute of Health
Award Amount: \$1,756,621
Award Period: 9/01/09- 05/31/13
Title: Dynamic Neuroimaging with High-Resolution SSVEPs.
Key Personnel

Hal Stern

Source: NIMH Conte Center
Award Amount: \$10,000,000
Award Period: 6/13-5/18
Title: Fragmented Early Life Environment and Cognitive and Emotional Vulnerabilitie
(co-PI and Head of Biostatistics Computation and Data Management Core, T Baram, PI)

Source: National Science Foundation
Award Amount: \$626,000

Award Period: 8/10 –8/13
Title: Enhanced EOF Representations and Time-Varying Statistical Models for Climate Patterns
(co-PIs: G. Magnusdottir, Y. Yu)

Source: National Institute of Health – NCRR
Award Amount: \$750,000/yr.
Award Period: 7/10 – 6/15
Title: UC Irvine Institute for Clinical and Translational Science (Head of Biostatistics, Ethics and Research Design Unit; Dan Cooper (PI))

Jennifer Trueblood

Source: Leverhulme Trust
Award Amount: £98 ,962.
Award Period: 2013-2015
Title: Quantum similarity: harnessing the flexibility of human similarity judgments.
Role: Co-PI

Douglas White

Source: Templeton Basic Science
Award Amount: \$200,000
Award Period: 2012 –2014
Title: Cross-cultural adaptive dynamics for theories of evolution of moral gods and ethical principles

Source: National Science Foundation
Award Amount: \$50,000
Award Period: 2013 –2016
Title: Social Study Initiative

Jack Xin

Source: National Science Foundation
Award Amount: 451,109
Award Period: 9/2012
Title: Blind and Template Assisted Source Separation Algorithms with Applications to Spectroscopic Data

Source: National Science Foundation
Award Amount: \$419,691
Award Period: 6/12 – 5/14
Title: Reaction-Diffusion Front Speeds in Chaotic and Stochastic Flows .

Source: National Science Foundation

Award Amount: \$1,950,568
Award Period: 9/09 – 8/14
Title: PRISM: UCI Interdisciplinary computational and applied mathematics program.

Source: National Science Foundation
Award Amount: \$472,566
Award Period: 9/09– 8/12
Title: ADT: Sparse Blind Separation Algorithms of Spectral Mixtures and Applications.

Hongkai Zhao

Source: National Science Foundation
Award Amount: \$2,000,000
Award Period: 09/09-08/14
Title: PRISM: UCI Interdisciplinary computational and applied mathematics program – Co-PI

Source: ONR
Award Amount: \$452,914
Award Period: 05/11-10/14
Title: Image Fusion via Batch Registration from Linear Measurements

Source: National Science Foundation
Award Amount: \$298,511
Award Period: 10/11-09/14
Title: A new approximation for effective Hamiltonians

PROPOSALS PENDING

Kimberly Jameson:

In August 2013 Jameson plans to submit a new 3-year grant proposal to the National Science Foundation to work with Natalia Komarova (IMBS, Mathematics UCI), Dominik Wodarz (Ecology and Evolutionary Biology, UCI), and Louis Narens (Cognitive Sciences, IMBS, UCI) on exciting new approaches to issues related to color space and analyses of color categorization data using evolutionary game theory and mathematical modeling.

Simon Levin

Source: NordForsk/University of Oslo
Award Amount: Approved for funding
Award Period: 01/01/2014 – 12/31/2016
Title: Resource-Based Green Growth Under Climate Change: Ecological and Socio-Economic Constraints (ResGreen)
Location of Project: Princeton University
Role: Node Leader

Michael McBride

Source: National Science Foundation

Award Amount: \$186,133

Award Period: 2013 (Pending)

Title: Bargaining Failure under the Shadow of Trial: Theory and Experiments

M. McBride (Principal Investigator), S. Skaperdas (Co-PI)

National Science Foundation

Lisa Pearl

Source: NSF

Award Amount: Total: 375,000 UCI Amount: \$145,000

Award Period: 2014-2016 (Pending)

Title: Collaborative Research: An Integrated Theory of Syntactic Acquisition

Jennifer Trueblood

Source: NATIONAL SCIENCE FOUNDATION

Award Amount: (Pending)

Award Period: 2013 –2016

Title: Applications of Quantum Probability Theory to Human Causal Reasoning

James Weatherall

Source: National Science Foundation

Award Amount: \$221,590

Award Period: 9/1/13-8/31/16 Pending

Title: A Theoretical Study of the Conceptual, Mathematical, and Explanatory Interconnections at the Foundations of Classical Field Theories

Source: National Science Foundation

Award Amount: \$249,998

Award Period: 9/1/13-8/31/15 Pending

Title: Comprehending and Regulating Financial Crises

w/ Nina Bandelj (Sociology), Julia Elyachar (Anthropology), and Gary Richardson (Economics)

VI. APPENDICES

APPENDIX A CURRENT FACULTY MEMBERS

MEMBERS

Pierre F. Baldi, (Ph.D. Mathematics, California Institute of Technology). Distinguished Professor of Computer Science; Director, Institute for Genomics & Bioinformatics, University of California, Irvine. Research areas: Bioinformatics, computational biology, probabilistic modeling, machine learning.

Jeffrey Barrett, (Ph.D. Philosophy, Columbia University). Chancellor's Fellow, Professor of Logic and Philosophy of Science, University of California, Irvine. Research areas: Philosophy of science; 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 sciences.

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

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

William A. Branch, (Ph.D. Economics, University of Oregon). Professor of Economics, University of California, Irvine. Research areas: Macroeconomic dynamics.

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

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

Michael Burton, (Ph.D. Anthropology, Stanford University). Professor Emeritus of Anthropology, University of California, Irvine. Research areas: Economic and social anthropology.

Carter Butts, (Ph.D. Sociology, Carnegie Mellon University). Professor of Sociology, University of California, Irvine. Research areas: Social networks, Bayesian methods, informant accuracy and strategic behavior.

Jean-Paul Carvalho, (Ph.D. Economics, University of Oxford). Assistant Professor of Economics, University of California, Irvine. Research areas: Applied game theory; culture, identity and institutions.

Charles Chubb, (Ph.D. Experimental Psychology, New York University). Professor of Cognitive Sciences. University of California, Irvine. Research areas: Vision, perception, and information processing.

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

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

Art De Vany, (Ph.D. Economics, University of California, Los Angeles). Professor Emeritus of Economics, University of California, Irvine. Research areas: Models of industry organization, health, analysis and policy of extreme events, information processing and market institutions.

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

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

David A. Eppstein, (Ph.D. Computer Sciences, Columbia University). Professor of Computer Science, University of California, Irvine. Research areas: Computational geometry and graph algorithms, including finite element meshing, minimum spanning trees, shortest paths, dynamic graph data structures, graph coloring, graph drawing, geometric optimization, computational robust statistics, and geometric optimization.

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

Katherine Faust, (Ph.D. Social Science, University of California, Irvine). Professor of Sociology, University of California, Irvine. Research areas: Mathematical, computational, and conceptual models to study complex phenotypes.

Steven A. Frank, (Ph.D. Biology, University of Michigan). Professor of Ecology and Evolutionary Biology, University of California, Irvine. Research areas: Evolution of social behavior; design of reliability.

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; Director, Center for the Study of Democracy, University of California, Irvine. Research areas: Models of group decision making, models of individual choice, electoral competition.

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

Simon Huttegger, (Ph.D. Universität Salzburg). Chancellor's Fellow, Associate Professor of Logic and Philosophy of Science, University of California, Irvine. Research areas: Probability theory; philosophy of probability, induction, decision theory, social philosophy, dynamical Systems.

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

Kent Johnson, (Ph.D. Philosophy, Rutgers University). Professor of Philosophy, University of California, Irvine. Research areas: Lexical semantics, metaphysical/epistemological

relation between current linguistic theories and broader psychological processes, Methodological issues bearing on linguistic theorizing.

Marek Kaminski, (Ph.D. Government and Politics, University of Maryland). Associate Professor of Political Science, University of California, Irvine. Research areas: Political systems and economics in transition, formal models of voting, political consequences of electoral laws, models of allocation and social choice.

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.

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

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

Michael David Lee, (Ph.D. Philosophy, University of Adelaide). Chair, Department of Cognitive Sciences, Professor of Cognitive Sciences, University of California, Irvine. Research Areas: Mathematical and computational models of stimulus representation, categorization, memory, decision-making and problem-solving.

Simon Asher Levin, (Ph.D. Mathematics, University of Maryland). Director, Center for BioComplexity, Professor of Biology, Princeton University. Research Areas: Dynamics of populations and communities; spatial heterogeneity and problems of scale; evolutionary ecology; theoretical and mathematical ecology; biodiversity and ecosystem processes.

Mark 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). Distinguished Professor, Professor of Logic and Philosophy of Science and Mathematics, University of California, Irvine. Research areas: Philosophy of mathematics, especially the philosophy of set theory.

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

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

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

Andrew Noymer, (Ph.D. Sociology, University of California, Berkeley). Associate Professor of Sociology and Public Health, University of California, Irvine. Research Areas: Medical demography, mathematical sociology, quantitative methodology.

Richard S. Palais, (Ph.D. Mathematics, Harvard University). Adjunct Professor of Mathematics, University of California, Irvine. Research Areas: Mathematical Visualization and more specifically to continue the development of Macintosh program 3D-Filmstrip (now called 3D-XplorMath).

Lisa Pearl, (Ph.D. Linguistics, University of Maryland at College Park). Assistant Professor of Cognitive Sciences, University of California, Irvine. Research areas: Language acquisition, language change, natural language processing.

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). NAS Member, Research Professor of Anthropology, University of California, Irvine. Research areas: Cognitive anthropology, cultural consensus, informant accuracy, quantitative methods.

Donald G. Saari, (Ph.D. Mathematics, Purdue University). Distinguished Professor of Mathematics and Economics; Director, Institute for Mathematical Behavioral Sciences, 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: Economic theory and political economy.

Brian Skyrms, (Ph.D. Philosophy, University of Pittsburgh). NAS Member, Distinguished Professor of Social Sciences, Professor of Logic and Philosophy of Science, and Professor of Economics, University of California, Irvine. Research areas: Probability, induction, causation, rational choice.

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

Padhraic Smyth, (Ph.D. Computer Engineering, California Institute of Technology). Professor of 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). NAS Member, 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, Irvine. Research areas: Perception, development and cortical dynamics.

Hal Stern, (Ph.D. Statistics, University of California, Irvine). Dean, Donald Bren School of Information and Computer Science, Professor of Statistics, University of California, Irvine. Research areas: Bayesian methods, model diagnostics, statistical computing.

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

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

Jennifer Trueblood, (Ph.D. Cognitive Science, Indiana University, Bloomington). Assistant Professor of Cognitive Sciences, University of California, Irvine. Research areas: Judgment and decision making and cognitive modeling.

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.

James Weatherall, (Ph.D. Philosophy, University of California, Irvine). Assistant Professor of Logic and Philosophy of Science, University of California, Irvine. Research areas: Philosophy of physics. Philosophy of space and time, philosophy of science, atomic, molecular, and optical physics (theory), mathematical physics.

Douglas White, (Ph.D. Anthropology, Social Theory, University of Minnesota). Professor Emeritus of Anthropology, University of California, Irvine. Research areas: social networks, longitudinal social demography, cross cultural, quantitative methods.

Charles E. (Ted) Wright, (Ph.D. Psychology, University of Michigan). Associate Professor of Cognitive Sciences, University of California, Irvine. Research areas: Motor processing and control, visual search, handwriting.

Jack Xin, (Ph.D. Courant Institute, New York University). Professor of Mathematics, University of California, Irvine. 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, (Ph.D. Psychology, Stanford University). Professor Emeritus of Cognitive Sciences, University of California, Irvine. Research areas: Vision, probabilistic choice models.

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

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

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

APPENDIX B

SCIENTIFIC PUBLICATIONS OF MEMBERS, ACADEMIC 2012-13¹

William Batchelder

Agrawal, K., and Batchelder, W.H. (2012). Cultural consensus theory: Aggregating signed graphs under a balance constraint, In S.J. Yang, A. M. Greenberg, and M. Endsley (Eds.), *Social Computing, Behavioral-Cultural Modeling and Prediction*, LNCS 7227, pp.53-60. New York: Springer Verlag.

Batchelder, W. H., and Alexander, G. E. (2012). Insight problem solving: A critical examination of the possibility of formal theory, *Journal of Problem Solving*, 5, 56-100.

Batchelder, W.H., and Anders, R. (2012). Cultural consensus theory: Comparing different concepts of cultural truth, *Journal of Mathematical Psychology*, 2012, 56, 316-332.

Anders, R., and Batchelder, W. H. (2012). Cultural consensus theory for multiple consensus truths, *Journal of Mathematical Psychology*, 56, 452-469.

Batchelder, W.H., Hu, X., and Riefer, D.M. Multinomial Modeling. (2013). In H. Pashler (Ed.), *The Encyclopedia of the Mind*. Sage Publications, pp.538-541.

Batchelder, W. H. Discrete state models of information processing, In J. D. Wright (Ed.) *Encyclopedia of the Social and Behavioral Sciences*, Second Edition. (In Press).

Oravecz, Z., Vandekerckhove, J., and Batchelder, W. H. Bayesian Cultural Consensus Theory, *Field Methods*, (In Press).

Oravecz, Z., Vandekerckhove, J., and Batchelder, W. H. *User's Guide to Bayesian Cultural Consensus Theory Toolbox*, *Field Methods*, (In Press).

Matzke, D., Dolan, C., Batchelder, W. H., and Wagenmakers, E. J. Bayesian estimation of multinomial processing tree models with heterogeneity in participants and items, *Psychometrika*. (In Press).

Oravecz, Z., Anders, R., and Batchelder, W. H. Hierarchical Bayesian modeling for test theory without and answer key, *Psychometrika*. (Accepted).

Batchelder, W.H. Mathematical Psychology: History. In J.D. Wright (Ed.), Second Edition, *Encyclopedia of Social and Behavioral Sciences*, Second Edition. (In Press).

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

Michael Birnbaum

Birnbaum, M. H. (2012). Perspective on judgment and decision making as a skill. In M. K. Dhimi, A. Schlottmann, and M. R. Waldmann (Eds.), *Judgment and decision making as a skill*, (pp. 302-303), New York: Cambridge University Press.

Birnbaum, M. H. (2012). A statistical test of the assumption that repeated choices are independently and identically distributed, *Judgment and Decision Making*, 7, 97-109.

Birnbaum, M. H., and Bahra, J. P. (2012). Separating response variability from structural inconsistency to test models of risky decision making, *Judgment and Decision Making*, 7, 402-426.

Birnbaum, M. H., and Bahra, J. P. (2012). Testing transitivity of preferences in individuals using linked designs, *Judgment and Decision Making*, 7, 524-567.

John P. Boyd

Boyd, J.P., Mahutga, M.C., and Smith, D.A. (2013). Measuring Centrality and Power Recursively in the World CityNetwork: A Reply to Neal, Jordon, *Urban Stud* 50: 1641

William Branch

Branch, W.A. (Forthcoming). Nowcasting and the Taylor Rule, *Journal of Money, Credit and Banking*.

Branch, W.A., and Evans, G.W. (Forthcoming). Bubbles, Crashes and Risk, *Economics Letters*.

David Brownstone

Brownstone, D. (2012). Methodological Developments in Activity-Travel Behavior Analysis. In Pendayala, R.M., and Bhats, C. R. (Eds.), 11 Vol. Travel Behavior Research in an Evolving World, 249-26, *International Association for Travel Behavior Research*, 978-1-105-47378.

Jan Brueckner

Brueckner, J.K., and Sridhar K. (2012). Welfare Gains from Relaxing Land-Use Restrictions: The Case of India's Building Height Limits, *Regional Science and Urban Economics*, 42, 1061-1067.

Brueckner, J.K., Lee, D., and Singer, E. (2013). Airline Competition and Domestic U.S. Airfares: A Comprehensive Reappraisal, *Economics of Transportation*, 2, 1-1.

Brueker, J.K. (2013). Urban Squatting with Rent-Seeking Organizers, *Regional Science and Urban Economics*, 43, 561-569.

Mike Burton

Graber, R.G., DeCock, D.R., and Burton, M.L. (2012). A Guttman-Based Approach to Identifying Cumulativeness Applied to Chimpanzee Culture, *Cross-Cultural Research* 46: 295-314.

Jean-Paul Carvalho

Carvalho, J.P., (2013). Veiling, *Quarterly Journal of Economics*, 128(1), p. 337-370.

Charles Chubb

Eds. Chubb, C., Doshier, B.A., Lu, Z-L., and Shiffrin, R. (2013). Human Information Processing: Vision, Memory, Attention. *American Psychological Association*, Washington D.C.

Chubb, C., Solomon, J.A., and Sperling, G. (Forthcoming) The contrast contrast illusion, In *The Oxford Compendium of Visual Illusions*, Eds. Shapiro A, Todorovic D, Oxford University Press.

Chubb, C., Darcy, J., Landy, M.S., Econopouly, J., Nam, J-H., Bindman, D.R., Sperling, G. (Forthcoming). The Scramble Illusion: Texture Metamers. In *The Oxford Compendium of Visual Illusions*, Eds. Shapiro. A., Todorovic, D., Oxford University Press.

Iverson, G., and Chubb, C. (2013). The analytic form of the daylight locus. Chapter in *Vision, Memory, Attention*, Eds. Chubb, C., Doshier, B.A., Lu, Z-L, Shiffrin, R.M., American Psychological Association, Washington DC, In press.

Wright, C.E., Chubb, C., Winkler, A., and Stern, H. (2013). Equisalience analysis: a new window into the functional architecture of human cognition. Chapter in *Vision, Memory, Attention*, Eds. Chubb, C., Doshier, B.A., Lu, Z-L, and Shiffrin, R.M., American Psychological Association, Washington DC.

Morgan, M.J., Mareschal, I., Chubb, C., and Solomon, J.A. (2012). Perceived pattern regularity computed as a summary statistic: Implications for camouflage, *Proceedings of the Royal Society B*. 279, 2754–2760, doi:10.1098/rspb.2011.2645.

Vaina, L.M., and Chubb, C. (2012). Dissociation of first- and second-order motion systems by perceptual learning, *Attention, Perception & Psychophysics*, 74:1009–1019, DOI 10.3758/s13414-012-0290-3.

Venezia, J.H., Saberi, K., Chubb, C., and Hickok, G., (2012). Response bias modulates the speech motor system during syllable discrimination, *Front. Psychology*, 3:157. doi:

10.3389/fpsyg.2012.00157.

Chubb, C., Scofield, I., Chiao, C-C, and Sperling, G. (2012). A method for analyzing the dimensions of preattentive visual sensitivity, *Journal of Mathematical Psychology*, 56, 427–443.

Chiao, C-C., Ulmer, K.M., Siemann, L.A., Buresch, K.C., Chubb, C., and Hanlon, R.T. (2013). How visual edge features influence cuttlefish camouflage patterning, *Vision Research*, 83 (2013) 40–47.

Mike D’Zmura

Bhandari, S., Edberg, D., Rose, M., Yaralian, H., Krichmar, J., D’Zmura, M., and Gates, W. (2012). Tracking of mobile targets using unmanned aerial vehicles, *Proceedings of the AIAA Guidance, Navigation, and Control Conference 2012*, 13-16 August 2012, Volume 1, 3958-3970.

Horton, C., D’Zmura, M., and Srinivasan, R. (2013). Neural responses to competing speech reveal a phase-based suppression mechanism, *J. Neurophysiology* 109, 3082-3093.

Horton, C., Srinivasan, R., and D’Zmura, M. (Submitted). Envelope responses in single-trial EEG indicate attended speaker in a “cocktail party”, *J. Neural Engineering*.

David Eppstein

Eppstein, D. (2012). Optimally fast incremental Manhattan plane embedding and planar tight span construction, *Journal of Computational Geometry* 2(1):144–182, arXiv:0909.1866.

Duncan, C.A., Eppstein, D., Goodrich, M.T., Kobourov, S.G., and Nöllenburg, M. (2012). Lombardi drawings of graphs, *J. Graph Algorithms & Applications* 16(1):85–108, doi:10.7155/jgaa.00251, arXiv:1009.0579, Special issue for GD 2010.

Chambers, E., Eppstein, D., Goodrich, M.T., and Löffler, M. (2012). Drawing graphs in the plane with a prescribed outer face and polynomial area, *J. Graph Algorithms & Applications* 16(2):243–259, doi:10.7155/jgaa.00257, arXiv:1009.0088.

Eppstein, D., Mumford, E., Speckmann, B., and Verbeek, K. A. B. (2012). Area-universal and constrained rectangular layouts, *SIAM J. Computing* 41(3):537–564, doi:10.1137/110834032.

Eppstein, D., and Spiro, E.S. (2012). The h-index of a graph and its application to dynamic subgraph statistics, *J. Graph Algorithms & Applications*, 16(2):543–567, 2012, doi:10.7155/jgaa.00273.

Bannister, M.J., Eppstein, D., and Simons, J. (2012). Inapproximability of orthogonal

compaction, *J. Graph Algorithms & Applications* 16(3):651–673, doi:10.7155/jgaa.00263.

Eppstein, D. (2013). The complexity of bendless three-dimensional orthogonal graph drawing, *J. Graph Algorithms & Applications* 17(1):35–55, doi:10.7155/jgaa.00283.

Duncan, C.A., Eppstein, D., Goodrich, M.T., Kobourov, S.G., and Nöllenburg, M. (2013) Drawing trees with perfect angular resolution and polynomial area, *Discrete & Computational Geometry* 49(2):157–182, doi:10.1007/s00454-012-9472-y.

Barequet, G., Dickerson, M.T., Eppstein, D., Hodorkovsky, D., and Vyatkina, K. (2013). On 2-site Voronoi diagrams under geometric distance functions, *J. Computer Science and Technology*, 28(2):267–277, doi:10.1007/s11390-013-1328-2.

Eppstein, D., Löffler, M., Mumford, E., and Nöllenburg, M. (2013). Optimal 3D angular resolution for low-degree graphs, *J. Graph Algorithms & Applications*, 17(3):173–200, 2013, doi:10.7155/jgaa.00290.

Chambers, E., and Eppstein, D. (2013). Flows in one-crossing-minor-free graphs, *J. Graph Algorithms & Applications*, 17(3):201–220, 2013, doi:10.7155/jgaa.00291.

Borradaile, G., and Eppstein, D. (2012). Near-linear-time deterministic plane Steiner spanners and TSP approximation for well-spaced point sets, *Proc. 24th Canad. Conf. Computational Geometry*, pp. 311–316, arXiv:1206.2254.

Eppstein, D. (2012). Planar Lombardi drawings for subcubic graphs. *Proc. 20th Int. Symp. Graph Drawing*, pp. 126–137. Springer-Verlag, *Lecture Notes in Computer Science* 7704, 2012, doi:10.1007/978-3-642-36763-2_12, arXiv:1206.6142.

Bannister, M.J., Eppstein, D., Goodrich, M.T., and Trott, L. (2012). Force-directed graph drawing using social gravity and scaling, *Proc. 20th Int. Symp. Graph Drawing*, pp. 414–425. Springer-Verlag, *Lecture Notes in Computer Science* 7704, doi:10.1007/978-3-642-36763-2_37, arXiv:1209.0748.

Brandenburg, F.-J., Eppstein, D., Gleißner, A., Goodrich, M.T., Hanauer, K., and Reislhuber, J. (2012). On the density of maximal 1-planar graphs. *Proc. 20th Int. Symp. Graph Drawing*, pp. 327–338. Springer-Verlag, *Lecture Notes in Computer Science* 7704, doi:10.1007/978-3-642-36763-2_29.

Yeh, C. H.-Y., Thomas, S., Eppstein, D., and Amato, N. (2012). UOBPRM: a uniform distributed obstacle-based PRM. *Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2012)*, pp. 2655–2662, doi:10.1109/IROS.2012.6385875.

Eppstein, D. (2012). Diamond-kite meshes: adaptive quadrilateral meshing and orthogonal circle packing. *Proc. 21st Int. Meshing Roundtable*, pp. 261–277. Springer-Verlag, doi:10.1007/978-3-642-33573-0_16, arXiv:1207.5082.

Bannister, M.J., DuBois, C., Eppstein, D., and Smyth, P. Windows into relational events: data structures for contiguous subsequences of edges, *Proc. 24th Symp. Discrete Algorithms*. SIAM, 2013, arXiv:1209.5791.

Eppstein, D. (2013). The graphs of planar soap bubbles. *Proc. 29th Symp. Computational Geometry*. ACM, 2013.

Jean-Claude Falmagne

Falmagne, J.-Cl., and Lee, M. (Forthcoming). Mathematical Psychology, *Encyclopedia of Social and Behavioral Sciences*.

Doignon, J.P., and Falmagne, J.-Cl. Knowledge Spaces and Learning Spaces. (Forthcoming). *Handbook of Mathematical Psychology*. Eds. Batchelder, W., Colonius, H., Dzhafarov, E., and Myung, J. Cambridge University Press,

Falmagne, J.-Cl., Albert, D., Doble, C.W., Eppstein, D., and Hu, X. (2013). *Knowledge Spaces: Applications in Education*. Springer Heidelberg, New York, Dordrecht, London. ISBN 978-3-642-35329-1.

Falmagne, J.-Cl., (2013). Projections of a learning space. In *Human Information Processing: Vision, Memory, and Attention*. Eds.: C. Chubb, B.A. Doshier, Z-L. Lu, and R.M. Shi_rin. *American Psychological Association*. ISBN: 978-1-4338-1273-6.

Falmagne, J.-Cl. (2013). On a class of meaningful permutable laws. *MBS Technical Report 13-07*.

Falmagne, J.-Cl. On a bounded version of Holders Theorem and its application to the permutability equation. To appear as a chapter in the *Festschrift* honoring Patrick Suppess 90th birthday. ArXiv 0803.0575.

Steve Frank

Frank, S. A. (2013). Evolution of robustness and cellular stochasticity of gene expression, *PLoS Biology*. (In press).

Frank, S. A. (2013). Natural selection. VII. History and interpretation of kin selection theory, *Journal of Evolutionary Biology*, 26. (In press).

Frank, S. A. (2013). Microbial evolution: regulatory design prevents cancer-like overgrowths, *Current Biology*, 23:R343-R346.

Frank, S. A. (2013). Natural selection. VI. Partitioning the information in fitness and characters by path analysis, *Journal of Evolutionary Biology*, 26:457-471.

Frank, S. A. (2012). Mitochondrial burden on male health (commentary), *Current Biology*, 22:R797-799.

Frank, S. A. (2012). Natural selection. V. How to read the fundamental equations of evolutionary change in terms of information theory, *Journal of Evolutionary Biology*, 25:2377-2396.

Michelle R. Garfinkel

Garfinkel, M.R., McBride, M., and Skaparedas, S., (2012). Governance and Norms as Determinants of Arming, *Revue d'Economie Politique*, vol. 122.

Bernard Grofman

Feld, S.L., Godfrey, J., and Grofman, B. (Forthcoming). The Shapley-Owen Value and the Strength of Small Winsets: Predicting Central Tendencies and Degree of Dispersion in the Outcomes of Majority Rule Decision-Making. In Maurice Salles et al. (Eds.) *Festschrift for Moshe Machover and Daniel Felsenthal* (title tentative), Springer.

Feld, S., Godfrey, J., and Grofman, B. (2013). In Quest of the Banks Set in Spatial Voting Game, *Social Choice and Welfare*, 41(1): 43-71.

Brunell, T., Grofman, B., and Merrill III, S. (Forthcoming). Magnitude and Durability of Electoral Change: Identifying Critical Elections in the U.S. Congress 1854-2010, *Electoral Studies*.

Feld, S.L., Merrill III, and Grofman, B. (Forthcoming). Modeling the Effects of Changing Issue Salience in Two-Party Competition, *Public Choice*.

Adams, J., Brunell, T., Grofman, B., and Merrill III, S. (2013). Do Competitive Districts Produce Centrists. (Eds.) Kselman D., and Schofield, N. *New Developments in Party Competition Models* (title tentative), New York: Springer.

Donald Hoffman

Hoffman, D., and Singh M. (2012). Computational evolutionary perception, *Perception*, 41, 1073-1091. (Special issue in honor of David Marr).

Hoffman, D. (2013). Public objects and private qualia: The scope and limits of psychophysics, In *The Wiley-Blackwell Handbook of Experimental Phenomenology*, Edited by Albertazzi, L., 71-89.

Hoffman, D., Singh, M., and Mark, J. (2013). Does natural selection favor true perceptions? *Proceedings of the SPIE*.

Singh, M., and Hoffman, D. (2013). Natural selection and shape perception: Shape as an effective code for fitness, In *Shape Perception in Human and Computer Vision: An Interdisciplinary Perspective*. Edited by S. Dickinson and Z. Pizlo, 171-185.

Hoffman, D. (2013). Motion and color cognition, *The Encyclopedia of Color Science and Technology*. Edited by Moroney, N.M., Verlag, S., Hoffman, D.

Simon Huttegger

Huttegger, S. (2013). In Defense of Reflection, *Philosophy of Science*, 80:413—433.

Zollman, K.J.S., Bergstrom, C.T., and Huttegger, S.M. (2013). Between Cheap and Costly Signals: The Evolution of Partially Honest Communication, *Proceedings of the Royal Society London B*, 280:20121878.

Huttegger, S.M., Skyrms, B., and Zollman, K.J.S. (2013). Probe and Adjust in Information Transfer Games, *Erkenntnis*, forthcoming.

Huttegger, S. M. (2013). Probe and Adjust, *Biological Theory*, forthcoming.

Huttegger, S.M. (2013). How Much Rationality do we need to Explain Conventions? *Philosophy Compass*, forthcoming.

Huttegger, S.M., and Zollman, K.J.S. (2013). Methodology in Biological Game Theory, *The British Journal for the Philosophy of Science*, forthcoming.

Huttegger, S.M., and Zollman, K.J.S. (forthcoming). Evolution, Dynamics, and Rationality: The Limits of ESS Methodology, *Evolution and Rationality: Decisions, Co-operation, and Strategic Behaviour*, edited by Ken Binmore and Samir Okasha. Cambridge, Cambridge University Press.

Huttegger, S.M., and Skyrms B. (forthcoming). Emergence of a Signaling Network with “Probe and Adjust”, *Signaling, Commitment, and Emotion*, edited by Calcott, B., Richard Joyce R., and Sterelny, K., Cambridge, MA, MIT Press.

Kimberly Jameson

Komarova, N. L., Jameson, K. A. (2013). A quantitative theory of human color choices, *PLoS ONE*, 8(2): e55986. doi:10.1371/journal.pone.0055986.

Narens, L., Jameson, K. A., Komarova, N. L., Tauber, S. (2012). Language, Categorization, and Convention. *Advances in Complex Systems*, 15, Invited contribution to special issue of the journal devoted to Language Dynamics.

Marek Kaminski

Kaminski, M., Piotr Swistak Grzegorz Lissowki, (forthcoming). Formal Theory and Value Judgments, *Polish Sociology Review*.

Kaminski, M. (2012). How strong are soccer teams?? The paradoxes of soccer rankings, *Decisions*.

Robin Keller

Wang, Y., Feng T., Keller, L.R. (2013). A Further Exploration of the Uncertainty Effect, forthcoming, *Journal of Risk and Uncertainty*, ISSN: 0895-5646 (Print) 1573-0476 (Online)

Feng, T., Keller, L.R., Wu, P., and Xu, Y. (2013). An Empirical Study of the Toxic Capsule Crisis in China: Risk Perceptions and Behavioral Responses, forthcoming, *Risk Analysis*.

Keller, L.R. and Kophazi, K.M. (2012). Copulas, Group Preferences, Multilevel Defenders, Sharing Rewards, and Communicating Analytics: From the Editors, *Decision Analysis*, 9(3) 213-218. <http://da.journal.informs.org/cgi/reprint/9/3/213>

Keller, L.R., Abbas, A., Bickel, J.E., Bier, V., Budescu, D., Butler, J.C., Diecidue, E., Raimo, D.M., Lictendahl Jr., H.K.C., Merrick, J.R.W., Simon, J.R., Jay R., and Wu, G. (2012). Brainstorming, Multiplicative Utilities, Partial Information on Probabilities or Outcomes, and Regulatory Focus - From the Editors, *Decision Analysis*, 9(4) 297-302. <http://da.journal.informs.org/cgi/reprint/9/4/297>

Sarin, R.K. and Keller, L.R. (2013). Probability Approximations, Anti-Terrorism Strategy, and Bull's-Eye Display for Performance Feedback: From the Editors, *Decision Analysis*, 10(2)1-5. <http://dx.doi.org/10.1287/deca.1120.0262> 2013.0269

Sarin, R.K. and Keller, L.R. (2013). Group Decisions, Preference Elicitation, Experienced Utility, Survival Probabilities, and Portfolio Value of Information- From the Editors, *Decision Analysis*, 10(2) 99-102. <http://dx.doi.org/10.1287/deca.2013.0269>

Eriksen, S., Huynh, C.H., and Keller, L.R. (2013). Decision Trees in Saul I. Gass and Michael C. Fu (eds.) *Encyclopedia of Operations Research & Management Science*, 3rd edition. Springer London, Limited, ISBN 1441911545, 9781441911544, <http://www.springer.com/business+%26+management/operations+research/book/978-1-4419-1137-7>. Updated version of chapter by Eriksen and Keller, in Saul I. Gass and Carl M. Harris (eds.), *Encyclopedia of Operations Research and Management Science*, Kluwer Academic Publishers, Hingham, MA, 1996, pp. 159-161; second centennial edition.

Huynh, C.H., Simon, J., and Keller, L.R. (2013). Decision Technologies, Invited chapter in section V. Old and new issues in Judgment and decision making, in *Wiley-Blackwell Handbook of Judgment and Decision Making: An Interdisciplinary Perspective*, eds. Gideon Keren and George Wu. Slated for 2014 publication. Malden (MA): Blackwell.

Simon, J., Kirkwood, C.W., and Keller, L.R. (2013). Decision Analysis with Geographically Varying Outcomes: Preference Models and Illustrative Applications, working paper under review.

Leonhardt, J. and Keller, L.R. Under review. Probability Format and Perceived Vaccine Risk, working paper, partially funded by a fellowship (Leonhardt) from the Newkirk Center for Science and Society and conducted under UCI Institutional Review Board's approved research protocol HS# 2009-7037.

Natalia Komarova

Wodarz, D. F. X., Komarova, N. (2013). Dynamics of cancer: mathematical foundations of oncology. *WorldScientific*, 250 pp. (Accepted.)

Komarova, N., Wodarz, D. F. X. (2013). Cancer treatment in silico: small molecule inhibitors and oncolytic viruses. *Birkhauser*. 350 pages pp. (Accepted).

Komarova, N. (2012). Axiomatic modeling in life sciences. In R.V. N. Melnik, A. V. Antoniouk (Eds.), *Mathematics and Life Sciences*. 6.1. (pp. 113-144).

Komarova, N. (2013). Evolutionary rate. In S. Maloy, K. Hughes (Eds.), *Brenner's Online Encyclopedia of Genetics*, 2nd, (pp. 547-548).

Komarova, N. (2015). Cancer initiation and progression, modeling. In Engquist et al. (Eds.), *Encyclopedia of Applied and Computational Mathematics*. Springer.

Wodarz, D. F. X., Komarova, N. (2013). Dependence of the firearm-related homicide rate on gun availability: a mathematical analysis. *PLoS One*. (Accepted).

Rodrigues-Brenes, I. A., Komarova, N., Wodarz, D. F. X. (2013). Tumor growth dynamics: insights into somatic evolutionary processes. *Trends in Ecology and Evolution*. (Accepted).

Komarova, N., Levy, D., Wodarz, D. F. X. (2013). Synaptic transmission and the susceptibility of HIV infection to anti-viral drugs. *Scientific Reports*. (Accepted).

Rodrigues-Brenes, I. A., Wodarz, D. F. X., Komarova, N. (2013). Minimizing the risk of cancer: tissue architecture and cellular replication limits. *Jour Roy Soc Interface*. (Accepted).

Wodarz, D. F. X., Sun, Z., Lau, J. W., Komarova, N. (2013). Nearest neighbor interactions, habitat fragmentation, and the persistence of host-pathogen systems. *American Naturalist*.

Rodrigues-Brenes, I. A., Wodarz, D. F. X., Komarova, N. (2013). Stem cell control, oscillations and tissue regeneration in spatial and non-spatial models. *Front. Oncol*, 3, 82.

Komarova, N., Wodarz, D. F. X. (2013). Virus dynamics in the presence of synaptic transmission. *Math Biosci*, 242(2), 161171.

Wodarz, D. F. X., Boland, C. R., Goel, A., Komarova, N. (accepted) (2013). Methylation kinetics and CpG-island methylator phenotype status in colorectal cancer cell lines. *Biology Direct*.

Komarova, N. (2013). Spatial stochastic models of cancer: fitness, migration, invasion. *Mathematical Biosciences and Engineering*, 10(3), 761–775.

Komarova, N., Jameson, K. A. (2013). Quantitative theory of human color choices. *PLoS One*, 8(2), e55986.

Komarova, N., Anghelina, D., Voznesensky, I., Trinite, B., Levy, D., Wodarz, D. F. X. (2013). Relative contribution of free virus and synaptic transmission to the spread of HIV through target cell populations. *Biology Letters*, 9(1).

Sun, Z., Komarova, N. (2013). Stochastic control of proliferation and differentiation in stem cell dynamics. *Jour. Math. Bio.* (Accepted).

Komarova, N., Urwin, E., Wodarz, D. F. X. (2012). Accelerated crossing of fitness valleys through division of labor and cheating. *Scientific Reports* 2, 2(917), srep00917.

Komarova, N., Levy, D. N., Wodarz, D. F. X. (2012). Effect of synaptic transmission on viral fitness in HIV infection. *PLoS ONE*, 7(11), e48361.

Komarova, N., Sorace, R. (2012). Accumulation of neutral mutations in growing cell colonies with competition. *Jour. of Theor. Biol.*, 314, 8494.

Michael Lee

Lee, M.D., & Wagenmakers, E.-J. (Forthcoming). Bayesian cognitive modeling: A practical course, *Cambridge University Press*.

Pachur, T., Raaijmakers, J. G. W., Davelaar, E. J., Daw, N. D., Dougherty, M. R., Hommel, B., Lee, M. D., Polyn, S. M., Ridderinkhof, K. R., Todd, P. M., & Wolfe, J. M. (2012). Unpacking cognitive search: Mechanisms and processes. In: P. M. Todd, T. T. Hills, & T. W. Robbins (eds.), *Cognitive search: Evolution, algorithms, and the brain. Strüngmann Forum Reports*, Vol. 9, Cambridge, MA: MIT Press.

Falmagne, J.-C., & Lee, M.D. (in press). Mathematical psychology, *International Encyclopedia of the Social and Behavioral Sciences*.

Lee, M.D., & Zhang, S. (2012). Evaluating the process coherence of take-the-best in structured environments, *Judgment and Decision Making*, 7, 360-372.

Vanpaemel, W., & Lee, M.D. (2012). Using priors to formalize theory: Optimal attention and the Generalized Context Model, *Psychonomic Bulletin & Review*, 19, 1047-1056.

Lee, M.D., & Pooley, J.P. (2013). Correcting the SIMPLE model of free recall, *Psychological Review*, 120, 293-296.

Lee, M.D., & Vanpaemel, W. (in press). Quantum models of cognition as Orwellian newspeak, *Behavioral and Brain Sciences*.

van Ravenzwaaij, D., Newell, B.R., Moore, C.P., & Lee, M.D. (in press). Using recognition in multi-attribute decision environments. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Conference of the Cognitive Science Society*, Austin, TX: Cognitive Science Society.

Vladimir Lefebvre

Cho takoe odushevlenost? (translation) What Are Consciousness, Animacy, Mental Activity and the Like in Russian, Moscow. (2013). *Cogito-Centre*.

Korolia igraet svita: Modelirovanie vyborom soverwaemogo diktatorom. (translation) King plays a retinue: Modeling Dictator's Decision in Russian, (2013). *Reflexive processes and Control*. Accepted.

Simon Levin

Badiou, P. et al. (including Levin, S.A.). (2013). International Boreal Conservation Science Panel: Conserving the World's Last Great Forest Is Possible: Here's How. *Science/Policy Briefing, International Boreal Conservation Science Panel and Associates*. November 2011. *Forthcoming*.

Bonachela, J.A., Allison, S.D., Martiny, A.C., and Levin, S.A. (2013). A model for variable phytoplankton stoichiometry based on cell protein regulation. *BioGeoSciences* 10: 3241-3279.

Case, M.F., Halpern, C.B., and Levin, S.A. (2013). Contributions of gopher mound and casting disturbances to plant community structure in a Cascade Range meadow complex. *Botany*. *Forthcoming*.

Farrior, C.E., et al (including Levin, S.A.). (2013). Amount and frequency of rainfall determine intensity of root competition in forests: A tractable model of individual-level competition for water and light. *American Naturalist* 181(3): 314-330.

Farrior, C.E. et al. (including Levin, S.A.). (2013). Resource limitation in a competitive context determines complex plant responses to experimental resource additions. *Ecology*. *Forthcoming*. Preprint available at: <http://www.esajournals.org/toc/ecol/0/0>.

Fischer, I. et al. (including Levin, S.A.). (2013). Fusing enacted and expected mimicry generates a winning strategy that promotes the evolution of cooperation. *PNAS*. *Forthcoming*.

Kinzig, A.P. et al. (including Levin, S.A.). (2013). Social norms and global environmental challenges: The complex interaction of behaviors, values, and policy. *BioScience* 63(3): 164-175.

Lade, S.J., Tavoni, A., Levin, S.A., and M. Schlüter. (2013). Regime shifts in a social-ecological system. (*Special Issue on Regime Shifts and Tipping Points*). *Theoretical Ecology*. *Forthcoming*.

Levin, S.A. (2013). Comment on "Voluntary Pledges and Green Growth in the Post-Copenhagen Economy" by Thomas Sterner and "World Economic Crises: Commodity

Prices and Environmental Scarcity as Missing Links” by Ramón López. In *Report of the World Commission on Environment and Development*. 2010 ABDCE Stockholm. *Forthcoming*.

Levin, S.A. (2013)(2013).. *Connected Dots* (Collaborative Project with the Santa Fe Institute). Brooklyn, NY: Seed Media Group. *Forthcoming*.

Levin, S.A. (2013). Cooperation and sustainability. In *Practicing Sustainability*, ed. G. Madhavan et al., 39-43. New York: Springer. *Book was awarded the Nautilus Award*.

Levin, S.A. 2013. Ecological resilience and robustness. *Encyclopedia Britannica*. Available from:
<http://www.britannica.com/EBchecked/topic/1919092/ecological-resilience>.

Levin, S.A., ed. (2013). *Encyclopedia of Biodiversity* (2nd Edition). Elsevier.

Levin, S.A. (2013). Foreword: A personal perspective on landscape ecology in the United States. *History of Landscape Ecology in America*. *Forthcoming*.

Levin, S.A. (2013). Foreword. *Dispersal, Individual Movement and Spatial Ecology: A Mathematical Perspective*, ed. M.A. Lewis et al., v-vii. *Lecture Notes in Mathematics* 2071. Berlin; Heidelberg: Springer-Verlag.

Levin, S.A. (2013). Foreword. *Special Issue Mathematical Biosciences*. BIOCAMP 2012. *Forthcoming*.

Levin, S.A. (2013). Mathematics of sustainability. *AMS Notices* 60(4): 392-393.

Levin, S.A. (2013). Preface to the *Encyclopedia of Biodiversity* (2nd edition). Elsevier.

Levin, S.A. et al. (2013). Social-ecological systems as complex adaptive systems: Modeling and policy implications. *Environment and Development Economics* 18(2): 111-132.

Martiny, A.C. et al., (including Levin, S.A.). (2013). Strong latitudinal patterns in the elemental ratios of marine plankton and organic matter. *Nature Geoscience* 6: 279-283. DOI: 10.1038/NGEO1757.

Nadell, C.D. et al. (including S.A. Levin). (2013). Cutting through the complexity of cell collectives. *Proceedings of the Royal Society B* 280(1755). DOI: 10.1098/rspb.2012.2770.

Thompson, S., Levin, S., and I. Rodríguez-Iturbe. (2013). Linking plant disease risk and precipitation drivers: A dynamical systems framework. *The American Naturalist* 181(1): 1-38. Available from: <http://www.jstor.org/stable/10.1086/668572>.

Torney, C.J., Levin, S.A., and I.D. Couzin. (2013). Decision accuracy and the role of spatial interaction in opinion dynamics. *Journal of Statistical Physics*. DOI: 10.1007/s10955-013-0700-5.

Arrow, K., Ehrlich, P., and Levin, S.A.. (2013). Some perspectives on linked ecosystems and socio-economic systems. In *Environment and Development Economics: Essays in Honour of Sir Partha Dasgupta*, ed. S. Barrett et al. Springer-Verlag. *In press*.

(2012). Akçay, E. et al (including Levin, S.A.). (2012). Evolution of cooperation and skew under imperfect information. *PNAS* 109(37): 14936-14941.

Bonachela, J.A. Muñoz, M.A., and Levin, S.A.. 2012. Patchiness and demographic noise in three ecological examples. *Journal of Statistical Physics* 148: 723-739.

Chisholm, R.A. and Levin, S.A.. (2012). Linking dispersal and immigration in multidimensional environments. *Bulletin of Mathematical Biology* 74(8): 1754-1763.

Dixit, A.K., Levin, S.A. and D.I. Rubenstein. Reciprocal insurance among Kenyan pastoralists. *Theoretical Ecology*: DOI: 10.1007/s12080-012-0169-x.

Frank, A. et al (including Levin, S.A.). (2012). Security in the age of systemic risk: Strategies, tactics, and options for dealing with femtorisks and beyond. IIASA Interim Report (IR-12-010). IIASA.

Jiang, X. et al (including Levin, S.A.). (2012). Functional biogeography of ocean microbes revealed through nonnegative matrix factorization. *PLoS One* 7(9): e43866.

Klein, E., et al Levin, S.A.. (2012). Relationship between treatment-seeking behavior and artemisinin drug quality in Ghana. *Malaria* 11: 110.

Klein, E. et al (including Levin, S.A.). (2012). Superinfection and the evolution of resistance to antimalarial drugs. *Proceedings of the Royal Society B: Biological Sciences*: DOI: 10.1098/rspb.(2012).1064.

Leonard, NE et al. (including Levin, S.A.). (2012). Decision versus compromise for animal groups in motion. *PNAS* 109(1): 227-232.

Levin, S.A. (2012). Epilogue: The challenge of sustainability: Lessons from an evolutionary perspective. In *Sustainability Science: The Emerging Paradigm and the Urban Environment*, ed. M. Weinstein and R.E. Taylor, 168-174. New York: Springer.

Levin, S.A. (2012). Preface: Towards a marriage of theory and data. *Interface Focus* 2(1): DOI: rsfs.(2012).0006.

Levin, S.A. (2012). The trouble of discounting tomorrow. *Solutions* 3(4) (August 2012). Available at: <http://www.thesolutionsjournal.com/node/1144>.

- Levin, S.A., Arrow, K.J., and R.O. Keohane. (2012). An uncommon woman for the Commons (Elinor Ostrom retrospective). *PNAS* 109(33): 13135-13136.
- Levin, S.A., Bonachela, J.A., and C.D. Nadell. (2012). Mathematical and computational challenges in the study of complex adaptive microbial systems. In *The Social Biology of Microbial Communities: Workshop Summary, Institute of Medicine (IOM)*, 361-385. Washington, DC: The National Academies Press.
- Levine, H., Schaefer, P., and S. Levin. (2012). Tribute to Lawrence E. Payne. *Notices of the AMS* 59(5): 653-54.
- Reeves, M., Haanaes, K., Love, C., and Levin, S.A.. (2012). Sustainability as adaptability. *Journal of Corporate Finance* 24(2): 14-22.
- Scheffer, M. et al. (including Levin, S.A.). (2012). Anticipating critical transitions. *Science* 338: 334-348.
- Shaw, A.K. and Levin, S.A.. (2012). The evolution of intermittent breeding. *Journal of Mathematical Biology* 66(4-5): 685-703.
- Staver, A.C. and Levin, S.A.. (2012). Integrating theoretical rainfall and fire effects on savanna and forest stability dynamics. *American Naturalist* 180(2): 211-224.
- Tavoni, A., Schlüter, M., and Levin, S.A.. (2012). The survival of the conformist: social pressure and renewable resource management. *Journal of Theoretical Biology* 299: 152-161.
- Ziv, G. et al. (including Levin, S.A.). (2012). Trading-off fish diversity, food security, and hydropower in the Mekong River Basin. *PNAS* 109(15): 5609-5614.

Penelope Maddy

- Maddy, P. (2012). The philosophy of logic, *Bulletin of Symbolic Logic* 18, pp. 481-504.
- Maddy, P. (2012). A second philosophy of logic, to appear in P. Rush, ed., *The Metaphysics of Logic*, Oxford University Press.
- Maddy, P. (2012). Five questions, to appear in T. Luper and T. Adajian, eds., *Philosophy of Logic: Five Questions*, Automatic Press/VIP.

Michael McBride

- Carter, S., McBride, M. (2013). Experienced Utility versus Decision Utility: Putting the 'S' in Satisfaction, *Journal of Socio-Economics*. 42: 13-23.

D'Orsogna, M., Kendall, R., McBride, M., Short, M., (2013). Criminal Defectors Lead to the Emergence of Cooperation in an Experimental. *Adversarial Game PLOS ONE*, 8: e61458

McBride, M., Caldara, M. (Forthcoming). The Efficacy of Tables versus Graphs in Disrupting Dark Networks: An Experimental Study. *Social Networks*.

Louis Narens

Narens, L. *Probabilistic Lattices with Applications to Decision Theory*, (2013), (Forthcoming).

Andrew Noymer

Kasahara, A.K, Singh, J. Noymer, A. (2013). Vitamin D (25OHD) serum seasonality in the United States, *PLoS One* 8(6): e65785 <http://dx.plos.org/10.1371/journal.pone.0065785>.

Nguyen, A.M., Noymer, A. (2013). Influenza mortality in the United States, 2009 pandemic: Burden, timing and age distribution, *PLoS One* 8(5): e64198 (2013) <http://dx.plos.org/10.1371/journal.pone.0064198>.

Noymer, A., Lee, R. (2013). Immigrant health around the world: Evidence from the World Values Survey, *Journal of Immigrant and Minority Health* 15(3):614–623.

Bruckner, T.M., Noymer, A., Catalano, R.A. (2013). Life expectancy during the Great Depression in eleven European countries, *Population and Development Review* 39(1):57–74.

Wichai, C., Soonthornhdada, A., Jittimane, S., Noymer, A., Holomyong, C. (2012). Hardship of tuberculosis treatment access and adherence among Myanmar migrants at Maesai Hospital, Thailand, *Journal of Health Research* 26(4):167–171.

Noymer, A., Nguyen, A.M. (forthcoming). Influenza as a proportion of pneumonia and influenza mortality: United States, 1959–2007, *Biodemography and Social Biology*.

Lisa Pearl

Pearl, L., Sprouse, J. (In press). Computational Models of Acquisition for Islands. In J. Sprouse & N. Hornstein (eds), *Experimental Syntax and Islands Effects*. Cambridge University Press.

Pearl, L., Steyvers, M. (In press). C'mon – You Should Read This : Automatic Identification of Tone from Language Text. *International Journal of Computational Linguistics*.

Pearl, L., Goldwater, S. (In press). Statistical Learning, Inductive Bias, and Bayesian Inference in Language Acquisition. In J. Lidz, W. Snyder, & J. Pater (eds), *The Oxford Handbook of Developmental Linguistics*. Oxford University Press.

Pearl, L., Lidz, J. (2013). Parameters in Language Acquisition. In K. Grohmann & C. Boeckx (eds), *The Cambridge Handbook of Bilingualism*. Cambridge University Press, 129-159.

Pearl, L., Sprouse, J. (2013). Syntactic islands and learning biases: Combining experimental syntax and computational modeling to investigate the language acquisition problem. *Language Acquisition*, 20, 23-68.

Phillips, L., Pearl, L. (2012). Less is More' in Bayesian word segmentation: When cognitively plausible learners outperform the ideal. In N. Miyake, D. Peebles, & R. Cooper (eds.), *Proceedings of the 34th Annual Conference of the Cognitive Science Society*, Austin, TX: Cognitive Science Society, 863-868.

Dale Poirier

Poirier, D. (2012). What Is Sensible for Your Agents Should Be Sensible for Yourself, *Journal of Econometrics, Fellow's Opinion*, Vol. 170, 249-250.

Poirier, D., (2012). Perfect Classifiers in Partial Observability Bivariate Probit, *Economics Letters*, Vol. 116, 361-362.

Poirier, D. (forthcoming). Reacting to Surprising Seemingly Inappropriate Results, in I. Jeliaskov and X.-S. Yang, eds., *Bayesian Inference in the Social Sciences*, Wiley.

Donald Saari

Saari, D. G., Kinzig, A., Arrow, K., Barrett, S., Ehrlich, P., Levin, S., Levin, B., Oppenheimer, M., E. Ostrom, E. (2013). Social Norms and Global Environmental Challenges: The Complex Interaction of Behaviors, Values, and Policy, *BioScience*, 63 (3),164-175.

Saari, D. G. (2013). Explaining all possible paired comparison problems, in *Power, Voting, and Voting Power*. ed. M. Holler and H. Nurmi, Springer, pp 615 - 644.

Saari, D.G. (2012). Voting changed my teaching approach, *Teaching Children Mathematics*, 19, pp. 248 - 253.

Saari, D.G. Voting systems to appear in, *The Princeton Companion to Applied Mathematics*, ed. N. Higham, M. Dennis, P. Glendinning, P. Martin, F. Santosa, Princeton University Press.

Saari, D.G. From the N-body problem to astronomy and dark matter to appear in *The Princeton Companion to Applied Mathematics*, ed. N. Higham, M. Dennis, P. Glendinning, P. Martin, F. Santosa, Princeton University Press.

Saari, D.G. (2012). Continuing Kepler's Quest, Assessing Air Force Space Command's Astrodynamics Standards, (Jointly authored report, *NCR National Academy Press*).

Saari, D.G., McIntee, T. Connecting pairwise and positional election outcomes, to appear in *Mathematical Social Science*.

Consulting Ed. for the journal *Odyssey*: Special issue (Oct. 2012) on elections and voting

Stergios Skaperdas

Konrad, Kai A., Skaperdas, S. (2012). The Market for Protection and the Origin of the State, *Economic Theory*, 50(2), 417-443.

Garfinkel, M.R., McBride, M., Skaperdas, S. (2012). Governance and Norms as Determinants of Arming, *Revue d'économie politique*, 122(2), 197-212.

Skaperdas, S., Vaidya, S. (2012). Persuasion as a Contest, *Economic Theory*, 51(2), 465-486.

Jia, H., Skaperdas, S., Vaidya, S. (2013). Contest Functions: Theoretical Foundations and Issues in Estimation, *International Journal of Industrial Organization*, 31, 211–222.

Evia, J.L., Laserna, R., Skaperdas, S. Sociopolitical Conflict and Economic Performance in Bolivia, forthcoming in Warneryd, K (ed.), *The Economics of Conflict: Theory and Empirical Evidence*, Cambridge, MA: MIT Press.

Skaperdas, S. Proprietary Public Finance: On its Emergence and Evolution out of Anarchy, in Jorge Martinez-Vazquez and Stanley L. Winer (eds), *Coercion and Social Welfare in Public Finance: Economic and Political Dimensions*, forthcoming, Cambridge University Press.

Brian Skyrms

FROM ZENO TO ARBITRAGE, (2013). Oxford University Press.

Skyrms, B., McKenzie Alexander, J., Zabell, S.L. (2012). Inventing New Signals, *Dynamic Games and Applications* 2:129-145 doi: 10.1007/s13235-011-0027-2.

Skyrms, B. (2012). Aspects of Naturalizing the Social Contract, Complexity and Institutions: Market, Norms and Corporations. Ed. M. Aoki, K. Binmore, S. Deakin and H. Gintis. *New York: Palgrave Macmillan* 124-145.

Skyrms, B. (2012). Learning to Signal with Probe and Adjust, *Episteme* 9: 139-150.

Skyrms, B. (April 2013). Natural Social Contracts, *Biological Theory* (online version).

Skyrms, B., Huttegger, S., Zollman, K. (March 2013). Probe and Adjust in Information Transfer Games, *Erkenntnis*.

George Sperling

Krishnan, L., Kang, A., Sperling, G., & Srinivasan, R. (2012). Neural strategies for selective attention distinguish fast-action video game players. *Brain Topography*, DOI 10.1007/s10548-012-0232-3. 15pp.

Sun, P., Chubb, C., & Sperling, G. (2012). A paradoxical peripheral plaid motion phenomenon [Abstract]. *Journal of Vision*, 12(9), 1233.

Chubb, C., Sun, P., & Sperling, G. (2012). The perceived motion of moving barber poles [Abstract]. *Journal of Vision*, 12(9), 772.

Sperling, G., Sun, P., & Chubb, C. (2012). Perceived motion of moving barber pole arrays is determined by a streaming process [Abstract]. *Perception*, 41(Suppl.), 23.

Lu, Z.-L., & Sperling, G. (2012) Black-white asymmetry in visual perception. *Journal of Vision*, 12(10):8, 1-21.

Sperling, G., Sun, P., & Chubb, C. (2012). A peripherally viewed barber pole illusion reveals a new motion-perception mechanism [Abstract]. *Abstracts of the Psychonomic Society*, 17, 13.

Chubb, C. F., Scofield, I., Chiao, C.-C., & Sperling, G. (2012). A method for analyzing the dimensions of preattentive visual sensitivity. *Journal of Mathematical Psychology*, 56, 427-443.

Hal Stern

Baram, T. Z., Davis, E. P., Obenaus, A., Sandman, C. A., Small, S. L., Solodkin, A., Stern, H. (2012). Fragmentation and Unpredictability of Early-Life Experience in Mental Disorders, *American Journal of Psychiatry*, Vol. 169(9), pp. 907-915.

Little, R.J., D'Agostino, R, Cohen, M.L., Dickersin, K., Emerson, S.S., Farrar, J.T., Frangakis, C., Hogan, J.W., Molenberghs, G., Murphy, S.A., Neaton, J.D., Rotnitzky, A., Scharfstein, D., Shih, W.J., Siegel, J.P., Stern H. (2012), "The Prevention and Treatment of Missing Data in Clinical Trials," *New England Journal of Medicine*, Vol. 367(14), pp. 1355-1360.

Wang, Y-H., Magnúsdóttir, G., Stern, H., Tian, X., Yu, Y. (2012). "Decadal Variability of the NAO: Introducing an Augmented NAO Index," *Geophysical Research Letters*, Vol. 39(21).

Little, R.J., Cohen, M.L., Dickersin, K., Emerson S.S., Farrar, J.T., Neaton, J.D., Shih, W., Siegel, J.P., Stern, H. (2012). The Design and Conduct of Clinical Trials to Limit Missing Data, *Statistics in Medicine*, Vol. 31(28), pp. 3433-3443.

Zhou, B., Konstorum, A., Duong, T., Tieu, K.H., Wells, W.M., Brown, G.G., Stern, H. Shahbaba, B. (to appear). A Hierarchical Modeling Approach to Data Analysis and Study Design in a Multi-Site Experimental fMRI Study, *Psychometrika* (published online 28 November 2012 DOI: 10.1007/s11336-012-9298-9).

Wright, C.E., Chubb, C., Winkler, A., and Stern, H. (2013). Equisalience Analysis: A New Window into the Functional Architecture of Human Cognition, in *Human Information Processing* eds. C. Chubb, B. A. Doshier, Z-L Lu, and R. M. Shiffrin, pp. 75-91. American Psychological Association: Washington, DC.

Rein Taagepera

Taagepera, R. (2013). A World population growth model: Interaction with Earth's carrying capacity and technology in limited space, *Technological Forecasting and Social Change* 13, tentative acceptance.

Taagepera, R. (2013). Baltic quest for a Hungarian path, 1965. *Journal of Baltic Studies* 44, 19-47.

Taagerpera, R. and Gaines J. (2013). How to operationalize two-partyness, *Journal of Elections, Public Opinion and Parties*, DOI:10.1080/17457289.2013.770398.

Taagepera, R. and Qvortrup, M. (2012). Who gets what, when, how – through which electoral system? *European Political Science*, 11, 244-258

Jennifer Trueblood

Pothos, E. M., Busemeyer, J. R., Trueblood, J. S. (in press). A quantum geometric model of similarity. *Psychological Review*.

Trueblood, J. S., Brown, S. D., Heathcote, A., Busemeyer, J. R. (2013). Not just for consumers: Context effects are fundamental to decision-making. *Psychological Science*, 24 (6), 901-908 doi: 10.1177/0956797612464241

Trueblood, J. S. (2012). Multi-alternative context effects obtained using an inference task. *Psychonomic Bulletin & Review*, 19 (5), 962-968 doi: 10.3758/s13423-012-0288-9

Trueblood, J.S. (in press). A dynamic dual-process model of decision-making under uncertainty. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.

Trueblood, J.S., Brown, S. D., & Heathcote, A. (in press). The multi-attribute linear ballistic accumulator model of decision-making. Eds. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth, *Proceedings of the 35th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.

James Weatherall

Weatherall, J. (2013). *The Physics of Wall Street: A Brief History of Predicting the Unpredictable*. Houghton Mifflin Harcourt, Boston, MA.

Weatherall, J. (2014). Inertial motion, explanation, and the foundations of classical space-time theories, forthcoming, *Towards a Theory of Spacetime Theories*, eds. D. Lehmkuhl, G. Schieman, and E. Scholz, Birkhauser: Boston, MA., forthcoming.

Weatherall, J. (2013). When Wall Street does the math, it can get it wrong, *Orange County Register*.

Weatherall, J. (2013). You can know the future, *Australian Financial Review*, 23 March 2013, 58.

Weatherall J., (2013). It is not the maths that causes crises but the trust we put in it, *Financial Times*, 15 February 2013, 11.

Weatherall, J., (2013). Evil Wall Street tricks can be used for good, *USA Today*. 13 February 2013.

Weatherall, J., (2013). Black swans are difficult to predict but we still need maths in finance, *City A.M.*, 11 February 2013.

Weatherall, J., (2013). The 'Pioneer Anomaly' that Threatened to Upend Physics, *The Boston Globe*, 2 September 2013.

Weatherall, J., (2012). The Higgs Boson 'Nightmare Scenario': What if the biggest new discovery in physics isn't a beginning, but an end? *The Boston Globe*, 22 July 2013, K3.

Douglas White

White, Douglas R., Dow, Malcolm M., Eff, E. Anthon, and Gray, J. Patrick, Editors (2013). Companion to Cross-Cultural Research, *Blackwell Publishers*. In progress.

White, Douglas R. (2012a). Networks and Globalization Policies, Chapter 11, pp189-219. *Networks in Social Policy Problems*. Editors, Balázs Vedres, and Marco Scotti. Cambridge University Press.

White, Douglas R., (2012b). Social Science Initiative project. Grant Proposal: NSF. UK: Cambridge University Press.

Jack Xin

Xin, J., with Esser, E. and Lou, Y. (to appear). A Method for Finding Structured Sparse Solutions to Non-negative Least Squares Problems with Applications, *SIAM Journal on Imaging Sciences*.

Xin, J., with He, Q. (2013). A RANDOMLY PERTURBED INFOMAX ALGORITHM FOR BLIND SOURCE SEPARATION, *Proceedings of the 38th International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Vancouver, pp. 3218 – 3222, May 2013.

Xin, J., with Esser, E., Moller, M., Osher, S., and Sapiro, G. (2012). A Convex Model for Non-negative Matrix Factorization and Dimensionality Reduction on Physical Science, *IEEE Transactions on Image Processing*, 21(7), pp. 3239-3252.

Xin, J., with Sun, Y. (2012). Nonnegative Sparse Blind Source Separation for NMR Spectroscopy by Data Clustering, Model Reduction, and L1 Minimization, *SIAM J. Imaging Sciences*, 5(3), pp. 886-911.

Xin, J., with Sun, Y. (2012). A Recursive Sparse Blind Source Separation Method and its Application to Correlated Data in NMR Spectroscopy of Biofluids, *Journal of Scientific Computing, Scientific Computing*, 51(3), pp. 733--753.

Xin, J., with Yu, Y. (to appear) Sharp asymptotic growth laws of turbulent flame speeds in cellular flows by inviscid Hamilton-Jacobi models, *Annales de l'Institut Henri Poincare, Analyse Nonlineaire*.

Xin, J., with Liu, Y., and Yu, Y. (to appear) Turbulent Flame Speeds of G-equation Models in Unsteady Cellular Flows, *Math Model. Natural Phenom.*

Xin, J., with Shen, L., and Zhou, A. (2013). Finite Element Computation of KPP Front Speeds in 3D Cellular and ABC Flows, *Math Model. Natural Phenom.*, 8(3), pp. 184-199.

Xin, J., with Shen L. and Zhou, A. (2013). Finite Element Computation of KPP Front Speeds in Cellular and Cat's Eye Flows, *Journal of Scientific Computing*, 55(2), pp. 455-470.

Xin, J., with Liu, Y. and Yu, Y. (2013). A Numerical Study of Turbulent Flame Speeds of Curvature and Strain G-equations in Cellular Flows, *Physica D*, 243(1), pp. 20-31.

Jack Yellott

Watson, A.B. and Yellott, J.I. (2012). A unified formula for light-adapted pupil size, *Journal of Vision*, September, pp. 1-16.

Hongkai Zhao

Luo, S., Quian, J. and Zhao, H. (2012). Higher-order schemes for 3-D traveltimes and amplitudes, *Geophysics*, Vol 77 (2), pp 47-56.

Castillo, E., Liang, J., and Zhao, H. (2012) Point cloud segmentation and denoising via constrained least squares normal estimates, Book Chapter, *Innovations for Shape Analysis: Models and Algorithms*, Springer.

Liang, J., Park, F., and Zhao, H. (2013). Robust and efficient implicit surface reconstruction of point clouds based on convexified image segmentation, *Journal of Scientific Computing*, Vol. 54 (2-3), pp 577-602.

Hou, S, Song, P., Wang, L., and Zhao, H.. (2013). A weak formulation for solving elliptic interface problems without body fitted grid, *J. Comp. Phys.*, Vol. 249, pp 80-95.

Huang, K., Li, P., and Zhao, H. (2013). An efficient algorithm for the generalized Foldy-Lax formulation, *J. Comp. Phys.*, Vol. 234, pp 376-398.

Lai, R., Liang, J., Wong, T.W., and Zhao, H. (2012). Geometric Understanding of Point Clouds Using Laplace-Beltrami Operator, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*.

Ren, K., Gao, H., and Zhao, H. (2013). A hybrid reconstruction method for quantitative photo-acoustic tomography, *SIAM Journal on Imaging Sciences*, Vol. 6 (1), pp 32-55.

Liu, X., Wang, J., Li, Z., Zhao, H., and Luo, R. Exploring a Charge-Central Strategy in the Solution of Poisson Equation for Biomolecular Applications, *Phys. Chem. Chem. Phys.*, 74, in press.

Botello-Smith, W.M., Liu, X., Cai, Q., Li, X., Zhao, H., and Luo, R. Numerical Poisson-Boltzmann Model for Continuum Membrane Systems, *Chem. Phys. Lett.*, in press.

Liang, J. and Zhao, H. (2013). Solving partial differential equations on point clouds, *SIAM Journal on Scientific Computing*, Vol. 35(3), pp 1461-1486.

Bao, G., Huang, K., Li, P., and Zhao, H. A direct imaging method for inverse scattering using the generalized Foldy-Lax formulation, *Contemp. Math.*, AMS, to appear.

Lai, R., Liang, J., and Zhao, H. A local mesh method for solving PDEs on point clouds, *Inverse Problem and Imaging*, to appear.

APPENDIX C
IMBS TECHNICAL REPORTS, 2012-13

MBS 11-05

Predictions About Bisymmetry and Cross-Modal Matches From Global Theories Of Subjective Intensities

Duncan Luce

MBS 11-06

Contending Parties: A Logistic Choice Analysis of Inter- and Intra-group Blog Citation Dynamics in the 2004 US Presidential Election

Zack W. Almquist and Carter T. Butts

MBS 11-07

Estimating the Political Center From Aggregate Data: The Stimson Dyad Ratio Algorithm and an Item Response Theory Approach

Anthony J. McGann

MBS 12-01

Deriving scientific or geometric laws from thought experiments, via meaningfulness, with an application to the Pythagorean Theorem

Jean-Claude Falmagne

MBS 12-02

Unifying voting theory results from Nakamura's to Greenberg's theorems

Donald G. Saari

MBS 12-03

Quantitative theory of human color choices

Natalia L Komarova and Kimberly A. Jameson

MBS 12-04

A Correction to the SIMPLE Model of Free Recall

James P. Pooley and Michael D. Lee

MBS 12-05

Contest Functions: Theoretical Foundations and Issues in Estimation

Hao Gia, Stergios Skaperdas and Samarth Vaidya

MBS 13-01

Unifying Voting Theory from Nakamura's to Greenberg's Theorems

Donald G. Saari

MBS 13-02

Connecting Pairwise and Positional Election Outcomes

Donald G. Saari and Tomas McIntee

MBS 13-03

Strategic and Behavioral Decomposition of $2 \times 2 \times \dots \times 2$

Daniel T. Jessie and Donald Saari

MBS 13-04

COOPERATION IN n -PLAYER GAMES

Daniel T. Jessie and Donald Saari

MBS 13-05

Why Go to Court? Bargaining Failure under the Shadow of Trial With Complete Information

Michael McBride, Stergios Skaperdas, and Pi-Han Tsai

MBS 13-06

Difference-Form Persuasion Contests

Stergios Skaperdas, Amjad Toukan, and Samarth Vaidya

MBS 13-07

On a class of meaningful permutable laws

Jean-Claude Falmagne

MBS 13-08

ON THE COEVOLUTION OF THEORY AND LANGUAGE AND THE NATURE OF SUCCESSFUL INQUIRY

Jeffrey A. Barrett

MBS 13-09

ON THE COEVOLUTION OF BASIC ARITHMETIC LANGUAGE AND KNOWLEDGE

Jeffrey A. Barrett

APPENDIX D
COLLOQUIA AND CONFERENCES OF IMBS MEMBERS, 2012-13²

William Batchelder

Alexander, G. (Presenter), and Batchelder, W. H. "A Statistical Development and Comparison of Two Useful Recognition memory Models." Paper presented at the Annual Meeting of the Society for Mathematical Psychology (Conference). Ohio. July 2012.

Matzke, D. (Presenter), Dolan, C., Batchelder, W. H., and Wagenmakers, E-J. "Hierarchical Multinomial Processing Tree Models for the Pair-clustering Paradigm with Heterogeneity in Participants and Items." Paper presented at the Annual Meeting of the Society for Mathematical Psychology (Conference). Ohio. July 2012.

Anders, R. (Presenter), and Batchelder, W. H. "Cultural Consensus Theory for Multiple Consensus Truths." Paper presented at the Annual Meeting of the Society for Mathematical Psychology (Conference). Ohio. July 2012.

Oravecz, Z. (Presenter), and Batchelder, W. H. "Bayesian Hierarchical Cultural Consensus Theory." Paper presented at the Annual Meeting of the Society for Mathematical Psychology, (Conference). Ohio. July 2012.

Batchelder, W. H. (Presenter). "Facets of Duncan Luce's Research Career." Invited Keynote address at 51st Annual Edwards Bayesian Research Conference. Fullerton. Feb. 2013.

Batchelder, W. H. (Presenter), Anders, R., and Oravecz, Z. "The Inverse Problem of Signal detection." Invited paper read at 51st Annual Edwards Bayesian Research Conference. Fullerton. Feb. 2013.

Batchelder, W. H. (Presenter). "Cultural Consensus Theory." Invited paper in Wisdom of the Crowd Conference. Institute for Mathematical Behavioral Sciences. Irvine. April 2013.

Batchelder, W. H. (Presenter). "Cultural Consensus Theory." Invited paper in Festschrift for Professor James T. Townsend. Indiana. April 2013.

Michael Birnbaum

Birnbaum, M. H., & Schmidt, U. "Constant consequence paradoxes of Allais: Coalescing, restricted branch independence, or error?" Foundations of Utility and Risk XV (FUR XV). (Conference). Atlanta. July, 2012. [Conference Website](#)

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

Birnbaum, M. H., & Schmidt, U. “Modeling choice to test if Allais paradoxes are due to coalescing, restricted branch independence, or error.” Workshop on Testing Theories of Choice Behavior (Conference). Berlin. July 2012. [Workshop Website](#)

Birnbaum, M. H. Welcome. 51st Edwards Bayesian Research Conference, Fullerton. February 2013.

Birnbaum, M. H. “R. Duncan Luce (1925-2012): Decision, Choice, & Utility.” (Symposium honoring the memory of R. Duncan Luce) Eastern Psychological Association Meetings (Conference). New York. March 2013.

John Boyd

“Direct generation of random graphs with a given degree sequence: Applications to clustering and assortative mixing.” Sunbelt Social Network Conference. Germany, May 2013.

William Branch

Department of Economics. San Diego. May 2013.

INEXC Workshop on Finance and Expectational Coordination, New York. February 2013.

AEA Annual Meeting. San Diego. January 2013.

Department of Economics. Purdue University. November 2012.

Research Department, Federal Reserve Bank. Kansas City. November 2012.

Conference on Expectations in Dynamic Macroeconomic Models, Federal Reserve Bank. St. Louis. August 2012.

David Brownstone

“The neglected impact of measurement error on disaggregate transportation demand models.” UC Irvine, Department of Economics. Irvine. May 2013.

“The neglected impact of measurement error on disaggregate transportation Demand models.” Department of Civil and Environmental Engineering, University of Texas. Austin. April 2013.

“A Model for Broad Choice Data, 2012 California Econometrics Conference.” Presenter & Author, with Li, P., Author. (Refereed.) U.C. Davis, Davis. September 2012.

“Demand for High Fuel Economy Vehicles.” 13th International Conference International Association for Travel Behavior Research. Presenter & Author, with Bunch, D. S., Author. (Refereed). Toronto. July 2012.

Jan Brueckner

Regional Science Association International Meetings. Ottawa. November 2012.

Conference on the End of Federalism. WZB. Berlin. October 2012.

Einaudi Institute of Economics and Finance. Rome. September 2012.

Kuhmo-Nectar Conference on Transportation Economics. Berlin. June 2012.

KU Leuven. Belgium. April 2012

International Industrial Organization Conference. Boston. May 2013.

Conference on Urbanization and Poverty Reduction. World Bank. May 2013.

George Washington University. April 2013.

Florida International University. March 2013.

American Real Estate and Urban Economics Association Meetings. San Diego. January 2013.

Mike Burton

“History of Conflicts Among Urban Populations, Farming People, and Pastoralists Over Water Rights.” Conference on Groundwater in the Middle East. UC Irvine. Fall 2012.

“Comparisons Across Small Nations (less than 1 million people), Using Western Pacific Region as an Example of the Kinds of Variables.” Presentation at Cross-National Comparisons Workshop. UC Irvine. Fall 2012.

Jean-Paul Carvalho

“Resisting Education.” IMBS lunch, UC Irvine. March 2013.

“Faith-Based Organizations.” ASREC annual conference, Washington DC. April 2013.

“Education, Social Mobility and Religious Movements: A Theory of the Islamic Revival in Egypt.” NBER Conference on Culture and Institutions. Cambridge. April 2013.

Charles Chubb

Chubb C., Silva, A. “The four human visual mechanisms sensitive to gray scale scrambles.” Talk presented by C Chubb at the Annual Meeting of the Vision Sciences Society. Naples, FL. May 2013.

Herrera, C., Sun, P., Groulx, K., Wright, C.E., Chubb, C., Sperling, G. “How the S, M and L Cones contribute to motion-luminance assessed using minimum motion.” Poster presented by C Herrera at the Annual Meeting of the Vision Sciences Society. Naples, FL. May 2013.

Sperling, G., Sun, P., Chubb, C. “The perceived motion of three varieties of moving barberpole stimuli.” Talk presented by G Sperling at the Annual Meeting of the Vision Sciences Society. Naples, FL. May 2013.

Victor, J., Thengone, J., Chubb C., Conte, M. “Local image statistics: A highly conserved perceptual space encompassing statistics of low and high order.” Poster presented by J Victor at the Annual Meeting of the Vision Sciences Society, Naples, FL, May 2013.

Yang, H., Sun, P., Chubb, C., Sperling, G. “Attention filters based on contrast magnitude weighting.” Poster presented by H Yang at the Annual Meeting of the Vision Sciences Society. Naples, FL. May 2013.

David Eppstein

“Möbius transformations, power diagrams, Lombardi drawings, and soap bubbles.” EuroGIGA Midterm Conference, Prague, Czech Republic, July 2012. (Invited keynote presentation).

“Planar Lombardi drawings for subcubic graphs.” 20th Int. Symp. Graph Drawin. Redmond, Washington. September 2012. (Contributed presentation).

“Diamond-kite meshes: adaptive quadrilateral meshing and orthogonal circle packing.” 21st Int. Meshing Roundtable. San Jose. October 2012. (Contributed presentation).

“Circle packings, hyperbolic Voronoi diagrams, Lombardi drawings, and soap bubbles.” International Workshop on Combinatorial Image Analysis, Austin. November 2012. (Invited keynote presentation).

“The graphs of planar soap bubbles. 29th Symp. Computational Geometry.” Rio de Janeiro, Brazil. June 2013. (Contributed presentation).

“A brief history of curves in graph drawing.” Workshop on Drawing Graphs and Maps with Curves. Dagstuhl, Germany. April 2013. (Invited keynote presentation).

“From information visualization to soap bubbles.” Distinguished Lecture Series, David Cheriton School of Computer Science. University of Waterloo. May 2013.

Jean-Claude Falmagne

Falmagne, J.-Cl. “R. Duncan Luce, 1925-2012. One of the giants of mathematical psychology. One of our founding fathers.” Symposium honoring the scientific life of Duncan Luce. Invited talk at the Annual Meeting of the Society for Mathematical Psychology and the European Mathematical Psychology Group. Potsdam, August 2013.

Falmagne, J.-Cl. “On the Mathematical Forms of Permutable Scientific Laws.” Annual Meeting of the European Mathematical Psychology Group. University of Navarra. Pamplona, Spain. 2012.

Katherine Faust

Faust, K. “What is Social about Social Networks?” Keynote address, Symposium on Animal Social Networks, University of Manchester, May 2013.

Faust, K., and Mahutga, M. “Modeling Multirelational, Asymmetric Networks with an Application to International Commodity Flows through Time” Centre for Business Network Analysis University of Greenwich, April 2013.

Faust, K., and Mahutga, M. “Modeling Asymmetric International Commodity Flows through Time” International Sunbelt Social Network Conference, Hamburg, Germany, May 2013.

Michelle R. Garfinkle

“Trade in the Shadow of Conflict.” Keynote address at the International Conference on Cooperation or Conflict? Wageningen University, The Netherlands. May 29-31, 2013.

Bernard Grofman

“Is Turnout the Paradox that Ate Rational Choice Theory.” Presented at at Leuphana University, Lüneburg. July 3, 2012. (an earlier version of this paper was presented at previous conferences).

“Using Spanish Surname to Estimate Hispanic Voting Population in Voting Rights Litigation: A Bayesian Model of Context Effects.” Presenters: Bernard Grofman and Jennifer Garcia. Seminar on Law, Economics and Politics, New York University Law School, October 2012.

“Problems for Redistricting Reformers.” Presented at the Brennan Center for Justice Under Law. New York University Law School. April 2013.

Donald Hoffman

Does Evolution Favor True Perceptions? Keynote Talk, SPIE HVEI Conference, San Francisco.

Quantum Game Theory. "Quantum Thinking" Conference, IMBS, UC Irvine.

Perception, Evolution, and Quantum Measurement. "Quantum Thinking" Conference. IMBS, UC Irvine.

Simon Huttegger

"Meinungsverschiedenheiten und die Konvergenz von Wahrscheinlichkeiten." Department of Philosophy. University of Salzburg. March 2013.

"Some Measurement-Theoretic Problems of Phenotype Spaces." Symposium on the Foundations of Quantification and Measurement in the Biological Sciences sponsored by the John Templeton Foundation. New York. February 2013.

"Pattern Learning in Games." IMBS, UC Irvine. February 2013.

"How to Learn in Strategic Interactions." Philosophy & Economics, University of Bayreuth. January 2013.

"Probe and Adjust." PSA Meeting in San Diego. November 2012.

"The Evolution of Social Norms in Structured Populations." Formal Ethics 2012. Munich, October 2012.

"Pattern Learning in Games." Department of Philosophy, CMU. October 2012.

"Learning in Games: Are Socially Desirable States Reachable? Frontiers of Rationality and Decision." Groningen. August 2012.

Kimberly Jameson

Jameson, K. A. & Komarova, N. L. "A quantitative theory of human color choices." IMBS Colloquium. UC Irvine. November 2012.

Marek Kaminski

"How strong are soccer teams?" UC Irvine. January 2013.

Robin Keller

James M. Leonhardt (poster presenter), L. Robin Keller, & Riana S. Beals. “Parents and Pictographs: Probability Format Affects Parents’ Perceived Vaccine Risk.” UCI Merage Ph.D. Research Fest. April 2013.

James M. Leonhardt, L. Robin Keller. (poster presenter). “Parents and Pictographs: Probability Format Affects Parents’ Perceived Vaccine Risk.” Society for Judgment/Decision making conference, Minneapolis. November 2012.

L. Robin Keller. (panelist). INFORMS, Women in OR/MS cluster, Panel Discussion on Women in OR/MS: Publishing, Recruitment, and Retention. Chaired by Laura McLay. October 2012.

L. Robin Keller, (presenter), Yitong Wang. INFORMS, FDA invited talk in session chaired by L. Robin Keller, “Ranking FDA Risks: The Medical Devices Case. October 2012.

<http://dels.nas.edu/Report/Risk-Characterization-Framework-Decision/13156>.

Natalia Komarova

Colloquium. UC Irvine, Physics Department. March 2013.

Mathematical Biology Seminar. Arizona State University. March 2013.

CSC/PIMS Distinguished Speakers Series talk. Simon Fraser University, Canada. October 2012.

International conference on stochastic processes in systems biology, genetics and evolution. Houston, Texas. August 2012.

Igor Kopylov

“Non-Binding Commitments and Self-Deception.” UC San-Diego, 2013.

“Non-Binding Commitments and Self Deception.” University of South California,

“Non-Binding Commitments and Self Deception,” Southwest Economic Theory Conference, University of Hawaii,

“Hard and Soft Commitments: Self-Control in the Presence of Self-Deception.” IMBS, UC Irvine, November 2012.

Michael Lee

“Model adaptive search in human decision making.” Presented at the 9th Triennial Choice Symposium. Noordwijk aan Zee, Netherlands, June 2013.

Invited commentary on paper presented by Robert Nosofsky. Context and Episodic Memory Symposium. Philadelphia. May 2013.

“Cognitive models and the wisdom of the crowd.” Department of Psychology, New York University. May 2013.

“Cognitive models and the wisdom of the crowd.” Institute for Mathematical and Behavioral Sciences Workshop on Wisdom the Crowd. UC Irvine. April 2013.

“A model-based approach to measuring expertise in ranking tasks.” Australasian Experimental Psychology Conference. Adelaide, Australia. March 2013.

“Cognitive models and the wisdom of the crowd.” Australasian Mathematical Psychology Conference. Sydney, Australia, February 2013.

“Connecting models and data.” Annual Interdisciplinary Conference. Jackson Hole, Wyoming. January 2013.

“Cognitive models and the wisdom of the crowd.” Caltech, Los Angeles. December 2012.

“Word association and sentiment analysis.” Workshop on formal modeling of natural language concepts. University of Leuven, Leuven, Belgium. October 2012.

“Cognitive models and the wisdom of the crowd.” Department of Psychology, University of Leuven, Leuven, Belgium. October 2012.

“Some Bayesian re-analyses acknowledging uncertainty.” Annual Meeting of the Society for Mathematical Psychology. Columbus, Ohio. July 2012.

Vladimir Lefebvre

“Reflexive Systems.” Invited paper at the American Society for Cybernetics Joint Conference with Bateson Idea Group. Asilomar. July 2012.

Simon Levin

“Collective Phenomena, Collective Motion, and Collective Action in Ecological Systems.” Department of Physics & Astronomy Colloquium, UC Irvine. January 2013.

Critical Transitions in Ecological and Complex Adaptive Systems. Institute for Mathematical Behavioral Sciences Colloquium. UC Irvine. January 2013.

“Collective Phenomena, Collective Motion, and Collective Action in Ecological Systems.” Mathematics of Planet Earth Lecture Series 2013, Australian Mathematical Sciences Institute, University of Melbourne. January 2013.

“Critical Transitions in Ecological and Complex Adaptive Systems.” Mathematics of Planet Earth Lecture Series 2013, Australian Mathematical Sciences Institute, University of Melbourne. January 2013.

“The Challenge of Sustainability and the Promise of Mathematics.” Simons Public Lecture, Mathematics of Planet Earth 2013, Australian Mathematical Sciences Institute, University of Melbourne. January 2013.

“Mission Impossible: Proof-First Management of Complex Adaptive Systems.” AAAS Symposium: Getting to Global Ecological Sustainability: Climate and Small-Planet Ethics, AAAS Annual Meeting, Boston, MA. February 2013.

“Collective Phenomena, Collective Motion, and Collective Action in Ecological Systems.” A Crude Look at the Whole Conference, Nanyang Executive Centre (NEC), Singapore. March 2013.

“The Challenge of Sustainability and the Promise of Mathematics.” Tulane University, Mathematics Department Colloquium. April 2013.

“Bounded Rationality and Decision-Making.” Natural Algorithms and the Sciences Workshop. Center for Computational Intractability, Princeton, NJ. May 2013.

“The Challenge of Sustainability and the Promise of Mathematics.” Geophysical Center, Russian Academy of Sciences. June 2013.

“Complex Adaptive Systems and the Challenge of Sustainability.” SIAM Annual Meeting, Minneapolis, MN. July 2012.

“Global Change, Complex Adaptive Systems and Emergence.” 2012 Metabolic Basis of Ecology Gordon Research Conference (Metabolic Basis of Ecology & Evolution in a Changing World). University of New England, Biddeford, Maine. July 2012.

“Complex Adaptive Systems and the Challenge of Sustainability.” (Keynote Speaker). International Conference on Sustainable Development 2012, PSEG-Institute for Sustainability Studies. Montclair State University, Montclair, NJ. August 2012.

“Challenges in Mathematical Ecology: Scaling and Collective Phenomena.” Math Biology: Looking at the Future, MBI 10th Anniversary Meeting. The Ohio State University, Columbus, OH. September 2012.

“Plenary Lecture, Ecosystem Services and The Challenge of Sustainability in a Global Commons.” EcoSummit. The Ohio State University, Columbus, OH. October 2012.

“Complex Adaptive Systems and the Challenge of Sustainability.” NoMER Annual Meeting, Helsinki, Finland. October 2012.

“The Role of Systems Analysis in Supporting Global Transformations.” IIASA 40th Anniversary Conference. October 2012.

“Evolutionary Perspectives on Discounting, Public Goods and Collective Behavior.” NIMBIOS Interdisciplinary Seminar (NIMBioS Postdoctoral Fellows Invited Distinguished Visitor), University of Tennessee. November 2012.

“Complex Adaptive Systems and the Challenge of Sustainability.” ATP Group, Centro de Matemática e Aplicações Fundamentais, Instituto para a Investigação Interdisciplinar da Universidade de Lisboa, Portugal (November 2012)for Mathematical Psychology. Columbus, OH. July 2012.

Mark Machina

During the year, I have presented this work at several conferences and universities, such as the Society for Advanced Economic Theory (Paris), the Summer Workshop in Economic Theory (Paris), the Hebrew University of Jerusalem, the University of Manchester (UK), Virginia Tech University and Arizona State University.

Penelope Maddy

Philosophy of perception. Fall-Winter, UC Irvine. 2012-2013

Wittgenstein’s Philosophical Investigation. Reading course, Spring 2013

Michael McBride

“Why go to Court? Bargaining Failure under the Shadow of Trial with Complete Information.” Claremont Graduate University, September 2012.

“Why go to Court? Bargaining Failure under the Shadow of Trial with Complete Information.” UC Irvine, Department of Economics. April 2013.

“Why go to Court? Bargaining Failure under the Shadow of Trial with Complete Information.” Economics Sciences Association Conference, November 2012.

“Beyond the Mormon Moment: Directions for Mormon Studies in the New Century.” A Conference in Honor of the Career of Armand Mauss. Mormonism: Some Lessons from an Authority in Economic Approach. Department of Religion, Claremont Graduate University. March 2013.

“Toward an Economic Theory of Religious Authority.” ASREC. April 2013.

Andrew Noymer

“Gesundheit und Gesellschaft: The payoff to the social sciences of demographic-epidemiologic studies of disease.” University of Wisconsin, Madison. November 2012

“Beyond 'best practices': Waiting times to life expectancy improvements.” Sheila Xiao and Andrew Noymer. Session 176. Population Association of America 2013 annual meeting. New Orleans. 2013.

“Male and female life expectancy co-move — even when they diverge.” Population Association of America 2013 annual meeting. Andrew Noymer and Viola Van. Session 184. New Orleans. 2013.

“Influenza mortality in the United States, 2009: Burden and timing.” Ann M. Nguyen and Andrew Noymer. Poster 22.013. International Meeting on Emerging Diseases and Surveillance (IMED). Vienna, Austria. 2013.

“Assessing the mortality link between respiratory infections and heart disease: A time-series approach.” Ann M. Nguyen, Chunyang Li and Andrew Noymer. Poster 22.024. International Meeting on Emerging Diseases and Surveillance (IMED). Vienna, Austria. 2013.

“Cancer mortality patterns in Pacific islander populations: A comparative analysis of American Samoa, Guam, Hawai’i, and Saipan.” Daisy Carreon and Andrew Noymer. Session 22. 2nd Asian Population Association Conference. Bangkok, Thailand. 2012.

“Breastfeeding, age at menarche, and adolescent health: Exploring multicausal linkages in the Philippines.” Marigee Bacolod and Andrew Noymer. Session 80. 2nd Asian Population Association Conference. Bangkok, Thailand. 2012.

Lisa Pearl

“Language.” Developmental Psychology Lecture, University of California, Irvine, April 2013.

“Understanding language learning using computational methods.” Department of Cognitive Science. Johns Hopkins University, Baltimore, MD. February 2013.

“Investigating the development of knowledge using computational methods.” School of Education. Johns Hopkins University, Baltimore, MD. February 2013.

“Empirically investigating the Universal Grammar hypothesis.” Linguistics Colloquium. New York University. November 2013.

“‘Less is More’ in Bayesian word segmentation: When cognitively plausible learners outperform the ideal.” 34th Annual Conference of the Cognitive Science Society. Sapporo, Japan. (with Lawrence Phillips). July 2012.

Dale Poirier

“Reacting to Surprising Seemingly Inappropriate Results.” UC Irvine, Department of Economics. September 2012.

California Econometrics Conference, University of California, Davis, September 2012.
University of Technology Sydney, February 20, 2013.

“Discrete Covariates: An Answer to Whimsicality?” UC Irvine, Department of Economics. January 2013.

Australian National University, Department of Economics. (Keynote Speaker) First Melbourne Bayesian Econometrics Workshop. University of Melbourne, February 25, 2013.

Donald Saari

“The three million body problem.” New Trends in Dynamics (Conference). Barcelona, Spain. Oct. 2012.

“Mathematics and the ‘dark matter mystery’.” Steklov Mathematical Institute (Invited talk). Moscow. June 2013.

The ten \$1.5 - 2\$ hour lectures described my research results on the mathematics of the social and behavioral sciences to mathematicians who came from the US and Europe. Conference Board of Mathematical Sciences (CBMS): Sole lecturer for one week conference sponsored by CBMS for mathematicians. West Chester, PA. August 2012.

Topics:

1. Mathematics of apportionment methods.
2. Reductionist philosophy critically explored via Arrow's Theorem.
3. Modeling of qualitative dynamics in the social sciences.
4. Power indices.
5. Spatial voting.
6. Introduction to mathematics of voting theory.
7. Symmetry structures of voting theory.
8. Uniting and extending central tools of political science.
9. Mysteries of dynamics in economics.
10. Using decision theory to answer mysteries from psychology.

“Cyclic outcomes and empty cores; uniting and extending several theoretical results.”
Theoretical Economics. (Conference). University of Kansas, Lawrence, Kansas. Dec. 2012

“Mathematics and the mystery of `dark matter.” Joint Math Meetings, Special Session,
Celestial Mechanics, San Diego. Jan 2013.

“The reductions argument: Unexpected complexities.” Joint Math Meetings, Special
Session, Math and Social Interactions. San Diego. Jan 2013.

“Symmetry groups to connect/extend voting theory results Joint Math Meetings.” Special
Session, Math of Decisions, Elections and Games. San Diego. Jan 2013.

“Making Math Real.” (Keynote Speaker). PA State System Math Assoc. Annual
conference. April 2013.

“Mathematics and the Dark Matter Mystery.” (Hour presentation). PA State System Math
Assoc. Annual conference. April 2013.

“Unifying and extending voting theory results ranging from Nakamura's to Greenberg's
theorems.” Political Science, Washington University, St. Louis. April 2013

“After Rockland and 1913: Finally Labor success!” Finnish – American National Festival,
Finlandia University Michigan Technological University. Houghton MI. June 2013.

“We vote; but can we elect someone who we really don't want?” Science Sundays. (Public
lecture). Ohio State University. September 2012.

“Can we elect someone we don't want?” Sigma Xi Society. Orange County. Sept. 2012.

“Why numbers get in the way of what the voters want.” Sante Fe Institute presentation.
Palo Alto. Sept. 2012.

Distinguished Visiting Scholar; Brigham Young University, Provo, Utah. Oct. 2012.

1. “Mathematics and the `Dark Matter' mystery.”
2. “Making mathematics real in the classroom.”
3. “Mathematics of voting procedures.”

“Mathematics and the chaotic mysteries of voting.” Whittier College, Whittier, CA.
October 2012.

“What you need to know about social choice and voting theory” Economics, University of
Kansas. Dec. 2012.

“The complexity of decisions: From voting theory to game theory.” Center for Applied
Math. Cornell University. March 2013.

Stergios Skaperdas

“Guns, Lawyers and Money: Economic Consequences of Costly Conflict.” Concentration on Conflict, Autonomous University of Barcelona and Barcelona Graduate School of Economics, June 2013.

“Guns, Lawyers and Money: Economic Consequences of Costly Conflict.” Conference on Conflict: Theory and Evidence, Stockholm School of Economics. June 2013.

“Why Go to Court? Bargaining Failure under Complete Information.” Conference on Contests, Tournaments and Relative Performance Evaluation. Fresno Center of UC Merced, March 2013.

“Guns, Lawyers and Money: Economic Consequences of Costly Conflict.” Department of Economics Seminar, York University. Toronto, Canada. December 2012.

“Guns, Lawyers and Money: Economic Consequences of Costly Conflict.” Conference on the economic costs and consequences of conflict. Sponsored the University of the Andes, Cartagena, Colombia. August 2012.

Brian Skyrms

“Dynamics of Signaling Games” Keynote Lecture. Conference on Games, Interactive Rationality and Learning. Lund University, Lund Sweden. April 26, 2013.

George Sperling

“A peripherally viewed barber pole illusion reveals a new motion-perception mechanism.” Psychonomic Society. Minneapolis, Minnesota. November 16, 2012

“Attention filters.” Thirty-Eighth Annual Interdisciplinary Conference. Jackson, Wyoming, January 30, 2013.

“The perceived motion of three varieties of moving barberpole stimuli.” Vision Sciences Society. Naples, Florida. May 13, 2013.

Hal Stern

“Statistics in Sports.” Department of Mathematics, Undergraduate Colloquium. University of California, Irvine, CA. October 2012.

“Statistics in Sports.” Committee on National Statistics. Beckman Center, Irvine, CA. February 2013.

“Using Spatial Information in Genome Wide Association Studies.” Committee on National Statistics. Beckman Center, Irvine, CA. February 2013.

“Bayesian Statistical Methods: When, When Not and How to Use Them.” FBI Laboratory, Quantico, VA. June 2013.

Jennifer Trueblood

Trueblood, J. S., Brown, S. D., Heathcote, A., & Busemeyer, J. R. “The Multi-attribute Linear Ballistic Accumulator Model of Context Effects in Multialternative Choice.” The 33rd Annual Conference of the Society for Judgment and Decision Making. Minneapolis, Minnesota. November 2012.

Trueblood, J. S., Brown, S. D., Heathcote, A., & Busemeyer, J. R. “The Multiattribute Linear Ballistic Accumulator Model of Context Effects in Multi-alternative Choice.” Annual meeting of the Society for Mathematical Psychology. Columbus, Ohio. July 2012.

“Quantum Probability Models of Cognition and Decision-making.” Interdisciplinary College (IK2013). (Invited talk). Günne, Germany. March 2013.

“Modeling Order Effects in Inference and Causal Reasoning with Quantum Probability Theory.” Mind, Technology, and Society Talk Series (Invited talk), UC Merced. March 2013.

Trueblood, J. S. “Modeling Human Judgments with Quantum Probability Theory.” Department of Psychology (Invited talk). UC San Diego. October 2012.

“A Quantum Model of Order Effects in Inference and Casual Reasoning.” Quantum Thinking (Invited talk), IMBS, UC Irvine. February 2013.

James Weatherall

“Against Dogma: On Superluminal Propagation in Classical Electromagnetism.” Annual Philosophy of Physics Conference. University of Western Ontario. London, ON. May 2013.

“The Physics of Wall Street.” Department of Physics & Astronomy. California State University. Long Beach, CA. April 2013.

“The Physics of Wall Street.” University Club Spring Forum/Osher Lifelong Learning Institute. University of California. Irvine, CA. April 2013.

“The Geometry of Conventionality.” Philosophy of Physics Seminar. Department of History and Philosophy of Science. University of Pittsburgh. Pittsburgh, PA. April 2013.

“The Physics of Wall Street.” Dornsife College of Letters, Arts, and Sciences (Panel discussion). University of Southern California. Los Angeles, CA. March 2013.

“The Physics of Wall Street.” Center for Science Writings. Stevens Institute of Technology. Hoboken, NJ. March 2013.

“Against Dogma: On Superluminal Propagation in Classical Electromagnetism.” Joint Particle Seminar. Department of Physics & Astronomy. University of California. Irvine, CA. March 2013.

“The Physics of Wall Street.” Department of Physics & Astronomy. University of California. Irvine, CA. March 2013.

“Physics, Phynance, and Filosofia.” Worth Leading Wealth Advisors Summit. Los Angeles, CA. March 2013.

“The Physics of Wall Street.” Anderson School of Management. University of California. Los Angeles, CA. February 2013.

“The Physics of Wall Street.” Seattle Town Hall Science Series. Seattle, WA. January 2013.

“What is a singularity in geometrized Newtonian gravitation?” Philosophy of Science Association 2012 Biennial Meeting. Symposium: “New Horizons for Singularities in Classical Spacetime Theories.” November 2012, symposium contribution.

“Can Newtonian gravitation explain inertial motion?” School of Philosophy. University of Southern California. Los Angeles, CA. October 2012.

“The Geometry of Conventionality.” Institute for Philosophy. Hungarian Academy of Science. Budapest, Hungary. (September 2012, delivered by co-author J. Manchak).

Douglas White

“Effects of structural cohesion in forager networks on the evolution of cooperation.” Doug White and Tolga Oztan. San Diego Supercomputer (UCSC) Complex Networks Seminar, A Network Theory of Human Evolution, contra Richard Dawkins' theory of the selfish gene. UCSD, San Diego. June 6, 2012.

“Cohesive Subnetwork Causality in the Evolution of Cooperation: How did humans come to be prosocial.” Artificial Intelligence (Elkan) Seminar in Computer Science, UC San Diego. February 5, 2012.

Complex Social Science Gateway: Autocorrelation Modeling, Kinship Modeling, k- and pairwise cohesion in Large Networks, & Open Opportunities for Online Education”. Tolga Oztan, Doug White, Robert Sinkovits and Telmo Menezes. May 2013.

Session on Large Scale Networks Analysis-2. XXXIII Sunbelt Social Networks Conference of the International Network for Social Network Analysis (INSNA). Hamburg, Germany. May 2013.

“Theory of Foragers, Networks, and the Evolution of Cooperation.” Session on Boundaries of Discipline, Boundaries of Kinship. Organized by Dwight Read and Fadwa El Guindi. American Anthropological Association Annual Meeting, San Francisco, CA. November 2012.

Jack Xin

The 9th AIMS conference on dynamical systems, differential equations and applications, Orlando, Florida. July 2012.

Applied Math Seminar. Sichuan University, Chengdu, China. August 2012.

Computational Mathematics Seminar. Institute of Computation, Chinese Academy of Sciences. Beijing, China. August 2012.

DTRA/NSF/NGA Algorithm Workshop. San Diego. November 2012.

Workshop on "Adaptive Data Analysis and Sparsity". IPAM, UCLA. January 2013.

Math Colloquium. Georgia Tech. Atlanta, March 2013.

Institute of Computation Seminar. Academia Sinica. Beijing. March 2013.

PDE seminar. Tulane University. New Orleans. April 2013.

Mathematics Colloquium. Tulane University. New Orleans. April 2013.

38th International Conference on Acoustics, Speech, and Signal Processing. Vancouver, Canada. May 2013.

Hongkai Zhao

Workshop on Inverse Problems in Scattering and Imaging. Purdue University. April 2013.

Clifford Lectures. Tulane University. March 2013.

CMM Workshop on Coupled-Physics Inverse Problems. Santiago, Chile. January 2013.

International Conference on Imaging Science, in honor of Stanley Osher's 70th birthday. Hong Kong. December 2012.

Oberwolfach Workshop on Computational Inverse Problems. Germany. October 2012.

International Conference on Inverse Problems and Applications, in Honor of Gunther Uhlmann's 60th Birthday. Hangzhou, China. September 2012.

Inverse Problems and PDE Control. Chengdu, China. July 2012.

APPENDIX E
FACULTY AWARDS/ACHIEVEMENTS, 2012-13

Jeff Barrett

I recently gave the Zukunftskolleg Lecture at the University of Konstanz 10 June 2013. The title was "Quantum Mechanics and Wigner's Mind-Body Dualism" See <https://www.zukunftskolleg.uni-konstanz.de/news-events/events/review-on-events/>

William Batchelder

2012 Fellowship Award from the Oak Ridge Institute for Science and Education (ORISE)

Michael Birnbaum

There was an Advanced Training Institute organized after the Edwards Bayesian Research Conference, in which Birnbaum and Gary McClelland (U Colorado, Boulder) trained researchers in JavaScript and the canvas feature for creating dynamic and interactive graphics for Web-based experiments and surveys.

Mike D'Zmura

"How do aliens think?" *Through the Wormhole, Season 4*. Host: Morgan Freeman, featured imagined speech research by Mike D'Zmura. Science Channel. June 19, 2013.

David Eppstein

Best paper award for "Planar Lombardi drawings for subcubic graphs", 20th Int. Symp. Graph Drawing, 2012.

Jean-Claude Falmagne

ALEKS, the web-based company that J.-Cl. Falmagne founded with his graduate students in 1996, has recently been acquired by McGraw-Hill Education. This is an important development for our university because UCI owns the educational software produced by ALEKS and, accordingly, received a yearly amount of royalties. The merge of ALEKS with McGraw-Hill Education, a much bigger company, means that considerably more students will use the software in the future, with an anticipated substantial growth in the UCI royalties, some of which go to the Department of Cognitive Sciences and the IMBS.

As a by-product of this merger, the Falmagne family has created three new endowed chairs at UCI. The chair holders will be recognized experts in the application of mathematics to the cognitive sciences, in the tradition of the late UC Irvine distinguished

professor R. Duncan Luce.

We also have set up an irrevocable gift instrument that will provide Jean-Claude Falmagne and his wife an income stream for life. Upon our deaths, the remainder of the gift that was contributed into the trust will be disbursed outright to the University of California Irvine Foundation where it will be used to support the Institute for Mathematical and Behavioral Sciences and the Department of Cognitive Sciences, in the School of Social Sciences.

Katherine Faust

I spent part of Spring quarter 2013 as a visiting scholar at the Mitchell Centre for Social Networks at the University of Manchester. This year I finished my term as Chair of the Mathematical Sociology Section of the American Sociological Association. I continue to serve as Vice President of the International Network for Social Network Analysis (INSNA).

Michelle Garfinkel

Served on the editorial boards of several journals. JOURNAL OF CONFLICT RESOLUTION, JOURNAL OF MACROECONOMICS, JOURNAL OF ECONOMICS AND BUSINESS, DEFENCE AND ECONOMICS, EUROPEAN JOURNAL OF POLITICAL ECONOMY

Simon Huttegger

Named UCI Chancellor's Fellow (2013-2016).

An article was published about my work on costly signaling with Carl Bergstrom and Kevin Zollman in the Scientific American (Hunger Game: Is Honesty Between Animals Always the Best Policy? <http://www.scientificamerican.com/article.cfm?id=hunger-game-is-honesty-between-animals-always-the-best-policy>)

Kimberly Jameson

The Encyclopedia of Color Science and Technology:

On-going duties as Section Editor for *The Encyclopedia of Color Science and Technology* (Springer Publishers), section on *Color Cognition and Language* (including more than 40 top-tier research scientists contributing section entries). Jameson continues her active role as Section Editor for the Language and Cognition portions of *The Encyclopedia of Color Science and Technology* (Springer Publishers)
<http://refworks.springer.com/mrw/index.php?id=2981>

STUDENT Support and Supervision:

Supervision of UCI IMBS graduate student: Lisa Guo.

Supervision of UC Berkeley Linguistic undergraduate student: Ayden Parish.

Ad Hoc REVIEWING:

Journal of Vision; Attention, Perception & Psychophysics; Color Research & Application
Journal of the Optical Society of America; Perception; Vision Research; Philosophical
Psychology; National Science Foundation

Marek Kaminski

Initial drawings prepared for cartoon based on my book Games Prisoners Play

Robin Keller

Nominated to run for President of INFORMS (Summer 2013 election)

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

National Academies Committee Membership:

U. S. National Committee for the International Institute for Applied Systems Analysis
(IIASA), Board on International Scientific Organizations; appointed as member by Ralph
Cicerone, Chair of the National Research Council and President of National Academy of
Sciences, January 2007-Dec. 2009 (term 1), January 2010- December 2012 (term 2).

INFORMS

Kimball Medal Committee Chair for 2013 award, Committee Member for 2012 award

Decision Analysis Society of INFORMS:

Publications award competition in 2012, based on 2010 paper, member of committee
(decision in July 2012)

UC Service Roles:

The Paul Merage School of Business at UCI:

Director, Doctoral Program, 7/2009-6/2011; 7/2011-6/2013

Area Coordinator for Operations and Decision Technologies, Fall 2012 and Winter 2013

Member, Search Committee for ODT Faculty Member, 2012-13

Member, Search Committee for Long Chair in Business/Law, 2011-13

Invited Attendee at Pi Beta Phi Scholarship Dinner, May 20, 2013

Igor Kopylov

Referee reports: American Economic Review, Econometrica, Journal of Economic Theory,
Review of Economic Studies, Operations Research, Games and Economic Behavior

Associate Editor: Theoretical Economics Partition Dependence and Ambiguity Aversion

Michael Lee

Paper highlighted by Psychology Press: <http://psychologyprogress.com/inferring-expertise-in-knowledge-and-prediction-ranking-tasks/>

Collaborative research with company Ranker.com appeared in media:
<http://www.sfgate.com/business/prweb/article/Recent-Celebrity-Deaths-are-Predicted-by-Ranker-4511945.php>

Simon Levin

Fellow, Ecological Society of America (2012)

IIASA Honorary Scholar (2012)

Journal of Biological Dynamics 6, Supplement 2, 2012, Special Issue in Honor of Simon Levin's 70th Birthday

Michael McBride

Certificate of Reviewing Excellence, *Journal of Public Economics* (2013)

Appointed Fellow of the Center for Economic Studies and Ifo Institute, April 2013

Andrew Noymer

I was quoted in the *New York Times Magazine* in spring 2013 on life expectancy.

My paper with Ann Nguyen (my former MPH student at UCI) on the 2009 influenza pandemic received national news coverage, including in the print edition of the *New York Times*

I continue to collaborate closely with IIASA, the International Institute for Applied Systems Analysis in Laxenburg (near Vienna), Austria.

Public service: Member, Metrics Group for California HAI (Hospital Acquired Infections) Reporting

Dale Poirer

International Society for Bayesian Analysis Fellow (Inaugural), December 2012.
Associate Editor, *Journal of Econometrics*.

Invitation to nominate candidates for 2013 The Sveriges Riksbank Prize in Economic Science in Memory of Alfred Nobel.

Member of the International Society for Bayesian Analysis Fellow Selection Committee, 2013.

Member of the 2013 Dennis J. Aigner Award Committee to select the winner for the best applied paper published in the *Journal of Econometrics* in 2011-2013.

Kimball Romney

An application for a patent related to U.S. Provisional Patent Application, serial no. 60/915,333, by A. Kimball Romney was approved for issue in July 2013. The patent was sponsored by the University of California, Irvine. The patent is entitled; “A Method and Apparatus for Use of An Universal Color Index (UCI): A Color Appearance System Calibrated To Reflectance Spectra.”

The invention relates to the field of the measurement and analysis of color or reflected light and in particular to an apparatus and process for physical characterization of spectra in a color space and correlation of the same to a perceptual space of color appearance defined in terms of human perception of colors.

Donald Saari

Fellow, American Mathematical Society

Vice Chair, Governing Council, International Institute for Applied Systems Analysis, Vienna, Austria

Chair-Elect, Conference Board for the Mathematical Sciences

Chair, NRC Board on Mathematical Sciences and their Applications

Chair, NAS, National Member Organization, International Institute for Applied Systems Analysis

Stergios Skaperdas

Keynote speaker at two conferences (Conference on the economic costs and consequences of conflict, sponsored the University of the Andes, Cartagena, Colombia, August 2012 and Conference on Conflict: Theory and Evidence, Stockholm School of Economics, June 2013.)

Hal Stern

Editor, Applications and Case Studies Section, *Journal of the American Statistical Association* (2010-2012) – completed term during this academic year

Member, Committee on National Statistics (CNSTAT) (2008-2014) – Committee of the National Research Council of the National Academies of Science that tries to improve statistical methods and information for public policy.
– just reappointed for second term

Member, Committee of Visitors for the NSF Division of Social and Economic Sciences, 2013

Member, Ad Hoc Advisory Committee on Forensic Statistics, American Statistical Association, 2012-present

Rein Taagepera

2013 Outstanding Emeritus Award, UC Irvine Emeriti Association

James Weatherall

The Physics of Wall Street was a New York Times Editors' Choice, and then made the New York Times Bestsellers List. (It also got some very nice recognition elsewhere.)

Douglas White

Continuation as External Research Professor, Santa Fe Institute, 2009-2016.

Jack Xin

Inaugural Fellow, American Mathematical Society, September 2012.

Hongkai Zhao

Distinguished guest professorship at Beijing International Center for Mathematical Research

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>
* Royce Anders	Batchelder
* Kalin Agrawal	Batchelder
* Gregory Alexander	Batchelder
Blake Allison	McBride/Skaperdas
Jiwon Baek	Brueckner/Jameson
Jiaru Bai	Keller
Michael J. Bannister	Eppstein
Mark Bloxsom	Skaperdas
Justin Bruner	Huttegger/Skyrms
Eleanor Brush	Levin
Rico Bumbaca	Keller
Michael Caldara	Carvalho/McBride
Jack Zhanpeng Cheng	Eppstein
Robert Coleman	D'Zmura
Andrew Colopy	Kaminski/Skaperdas
Scott Crawford	Smyth
Tyler Dean	Chubb
Archie Delshad	Kaminski
William E. Devanny	Eppstein
Steve Doubleday	McBride/Skaperdas
Chris DuBois	Smyth
Jie Feng	Zhao
Katelyn Finley	Kaminski
Ian Finn	Skaperdas
Samuel Fletcher	Weatherall
* Robert Forbes	Narens
Jimmy Foulds	Smyth
Andrew Frank	Smyth
** Giorgio Gosti	Batchelder/McBride/White
* Diego Grijalva	McBride/Skaperdas
Michael Guggisberg	Poirier
Santiago Guisasola	Narens
Lisa Guo	Narens/Trueblood
Yuhong He	Keller
Christian Herrera	Chubb
Michael Ho	Xin
Laura Huang	Keller
Malorie Hughes	Poirier
Candice Huynh	Keller
Matt Inverso	Chubb
Fan Jiang	Carvalho
** Dan Jessie	Saari
Yeong Seon Kang	Keller

	Deven Kapadia	Poirier
*	Ryan Kendall	McBride/Saari
	Si-Yuan Kong	McBride
	William Leibzon	Narens
	James Leonhardt	Keller
	Jian Liang	Zhao
	Robert Lichtman	Sperling
	Alicia Lloro	Brownstone/Small
	Xiaolong Long	Xin
*	Dan Luo	Brueckner/Jameson
	Joshua Malnight	Uhlaner
	Daniel Mann	Chubb
*	Brian Marion	Hoffman
	Justin Mark	Hoffman
	Thomas McIntee	Saari
	Greg McWhirter	Skyrms
**	Ray Mendoza	Komarova
	Peter Miller	Uhlaner
*	Arshad Mohammad	Brownstone
	Abraham Morrison	Huttegger
	Cailin O'Connor	Huttegger/Skyrms
*	Tolga Oztan	White
	Erick Peterson	Carvalho
	Lawrence Phillips	Pearl
	James Pooley	Lee
**	Mohammad Arshad Rahman	Poirier/Brownstone
	Luke Rhee	Xin
	Erin Rice	Kaminski
	Garret Ridiger	Skaperdas
	Jacquelyne Rische	Komarova
	Sarita Rosenstock	Weatherall
	Hannah Rubin	Huttegger/Skyrms
	Michael Sacks	Carvalho
	Ryan Shirah	Uhlaner
	Joseph Simons	Eppstein
**	Samuel Thorpe	Narens
	Pi-Han Tsai	Brueckner/Jameson
*	Heidi Tucholski	Saari/Keller
	Andrea Vandom	McBride
	Andrew Wisti	D'Zmura
*	Dan Wolf	Kaminski
	Tim Wong	Brownstone
	Howard Yang	Chubb/Sperling
	Renghang Yin	Xin
*	Shuai Zhang	Lee/Xin
	Penghe Zu	Xin

(ii) (MA Degrees in Mathematical Behavioral Science during academic 2012- 2013

Callin O'Conner

APPENDIX G VISITORS' LETTERS

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

Don,

Here are the activities I took part in while at UCI in January 2013.

This year, because I was asked to give the Simons Lecture in Melbourne in January, kicking off the Special Year Mathematics of Planet Earth (See links below)*, I was only able to spend 3 weeks at UCI, primarily based in IMBS, but as usual with an affiliation with Ecology and Evolutionary Biology. I gave two colloquia during that period,

- (1) Physics department colloquium: *Collective phenomena, collective motion, and collective action in ecological systems*
- (2) IMBS Colloquium: *Critical transitions in ecological and complex adaptive systems.*

Abstracts for both are attached below.

Furthermore, I met with Steve Allison, EEB, and our postdoctoral fellow, Juan Bonachela, in connection with our NSF grant (Adam Martiny, the PI, is on sabbatical in Copenhagen), and to finalize our joint manuscript, which has now been submitted to Biogeosciences. Another manuscript, with Martiny and others, was accepted for publication in Nature Geoscience during my visit. In addition to Bonachela, my postdoctoral fellow Erol Akcay visited.

I also met on a regular basis with Don Saari on a research project on collective action, and made considerable progress, with the expectation of producing a joint paper in the next few months.

In addition to these in-depth activities, I also had interactions, some formal and some informal, with a variety of faculty, including Steve Frank, Stergios Skaperdas, Arthur Lander, Kathleen Treseder, Brian Skyrms, Francisco Ayala, Fred Wan, Qing Nie, Susan Bryant, David Gardiner, Chuck Newman and Kim Romney, plus a number of Physics

faculty (Peter Taborek, Clare Yu, Michael Dennin, Thorsten Ritz and Zuzanna S. Siwy) in connection with my lecture there.

Throughout the period, I carried out research on public goods, on mechanism design, on ocean modeling, on collective decision making and on other topics.

MPE links

- <http://mathsofplanetearth.org.au/events/simons/>
- <http://mpe2013.org/2013/02/01/mpe-australia-launched/>

Abstracts of lectures given:

(1) Physics:

Collective phenomena, collective motion, and collective action in ecological systems

Fundamental questions in basic and applied ecology alike involve complex adaptive systems, in which localized interactions among individual agents give rise to emergent patterns that feed back to affect individual behavior. In such systems, a central challenge is to scale from the “microscopic” to the “macroscopic,” in order to understand the emergence of collective phenomena, the potential for critical transitions, and the ecological and evolutionary conflicts between levels of organization. This lecture will explore some specific examples, from universality in bacterial pattern formation to collective motion and collective decision-making in animal groups. It also will suggest that studies of emergence, scaling and critical transitions in physical systems can inform the analysis of similar phenomena in ecological systems, while raising new challenges for theory.

(2) IMBS:

Critical transitions in ecological and complex adaptive systems.

A fundamental characteristic of complex systems, and especially of complex adaptive systems, is the potential for sudden shifts from one basin of attraction to another. Many, but not all, such transitions are anticipated by more modest, reversible changes that warn of impending irreversible shifts. This lecture will discuss some examples from ecological systems, with possible extensions to social dynamics and a range of other applications.

Simon Levin
Professor, Ecology and Evolutionary Biology
Princeton