2014-2015 Annual Report
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DIRECTOR’S MESSAGE

Dear Colleagues and Administrators,

This has been another excellent year for the IMBS; it started with the encouraging news that the IMBS has been renewed for another five years! This means that we can continue to explore how to use mathematical reasoning to advance our understanding of the social and behavioral sciences.

The strength of any organization derives from the contributions of its members. In this direction, let me strongly encourage the reader to jump ahead to the first main part, IID. This section, which outlines some of the results and advances that have been made this year by IMBS members, is my personal favorite. While I know much of what is being done, each year I am amazed at the variety of topics being addressed and the exciting new results being discovered. Topics range from the use of mathematics to address new concerns in the cognitive sciences, decisions made by adolescents, new results about color perception and sparse data problems, to even special reports requested by the President-elect of Poland. Impressive!

As true every year, to help advance the use of mathematics and the social and behavioral sciences, the IMBS puts together several conferences. (Agendas are in Section IVA.) An interesting one we had in early February (with participants representing mathematics, engineering, evolutionary sciences, and the social and behavioral sciences) explored the topic of “Validation. What is it?” The problem addressed reflects the reality that throughout the social, behavioral, and even engineering and physical sciences, models are developed to analyze the frontiers of science. But, how accurate and reliable are they? This is, of course, a central issue in engineering, where a typical approach is to use data to assess accuracy of predictions. But, as true in several federal agencies, this standard approach is an unavailable luxury. In Homeland Security, or with various issues facing NIH, for instance, if data is available, it can imply an inefficient, disastrous model. Moreover, if the validity, or weaknesses, of a model can be identified in advance, savings would be obtained. But, as it turns out, there are no general, available principles to validate models, and so a purpose of this conference was to identify what they may be. Because of the importance NIH attaches to these issues, we are holding discussions with appropriate NIH officials about the possibility of another meeting or study, and with a NRC committee that has expressed interest.

A second conference, held in March, combined central IMBS themes of the understanding how groups should make decisions and how decisions actually are made. The Behavioral Social Choice meeting, which attracted speakers from across the country representing the disciplines of psychology, mathematics, political science, economics, and sociology. A particular feature of this conference is how some of the presentations identified new approaches that will be further explored.
A topic of growing interest involves using mathematical models of economics to address puzzles of religion and culture. In our May conference examining these issues, topics ranged from the role of financial markets, and social norms in addressing a variety of cultural norms. This conference was an extension of a workshop held through the year and organized by Jean-Paul Carvalho.

Of growing popularity is our annual graduate student conference that now is named in honor of Duncan Luce, the founding director of the IMBS. The wide variety of interests of students affiliated with the IMBS is reflected by the titles of their presentations.

Other activities (agendas in IIC, IVD) include our weekly colloquium on Thursday that covers a wide variety of topics, and our Friday noon session where the emphasis is more on ideas still being developed. Most of the presentations in this Friday series are by graduate students; most are from the social and behavioral sciences, but others come from engineering, ecology and evolutionary biology. New this year is a Tuesday night discussion group (section III C) where the emphasis has been on notions that are still bubbling up; ideas that have not matured to a state of paper. As the description suggests, this proves to be a lively discussion group. In this same direction of encouraging new directions of research, this year the IMBS initiated a “seed grant” program.

Among the many other IMBS features you will find described in this report are the winners of the Falmagne Dissertation Research Award, the large number of papers published, talks presented, awards, grants, and distinctions received, and conferences organized by IMBS members.

It has been another active, successful year. We hope you enjoy reading this report.

Sincerely,

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, Joanna Kerner. 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 2014-15

Carter Butts, Professor of Sociology
Michelle Garfinkel, Professor of Economics
Geoff Iverson, Professor of Cognitive Sciences
Michael D. Lee, Professor of Cognitive Sciences
Mark Machina, Professor of Economics, UC San Diego
Brian Skyrms, Professor of Logic and Philosophy of Science
Hongkai Zhao, Professor of Mathematics

II. RESEARCH

A. Current Research Programs

There are 66 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.

Measurement Theory, Foundational Issues, and Scaling Models:
   Barrett, Batchelder, Burton, Falmagne, Lefebvre, Maddy, Narens, Romney,
   Skyrms, and Weatherall
Statistical Modeling:

**Cognitive**: Baldi, Batchelder, Dosher, Eppstein, Falmagne, Iverson, Lee, Pearl, Romney, Smyth, Steyvers, and Yellott

**Economic**: Brownstone, Poirier, and Saari

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

Individual Decision Making: Birnbaum, Keller, Machina, Narens, Saari, and Trueblood

Perceptions and Psychophysics:

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

**Psychophysics and Response Times**: Brownstone, Falmagne, Iverson, Jameson, Narens, and Yellott

Social and Economic Phenomena:

**Economics and Game Theory**: Branch, Brownstone, Brueckner, Burton, Carvalho, Frank, Garfinkel, Komarova, Kopylov, Levin, McBride, O’Connor, Poirier, Saari, Skaperdas, and Skyrms

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

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

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

B. Publications

The members who have replied report a total of 223 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 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/research/technical.php.

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 181 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*

**William Batchelder**

This past year I and my Co-Editors Hans Colonius, Ehtibar Dzhafarov, and Jay Myung have finalized Volume I of the New Handbook of Mathematical Psychology to be published by Cambridge University Press, and we are well on the way to Volume II. The original three volume Handbook of Mathematical Psychology, Edited by Duncan Luce, Robert Bush, and Eugene Galanter in the 1960s, was a key element in the rise of mathematical psychology in the 1960s. We have tried to remain faithful to the original handbook by emphasizing foundational issues and mathematical methods rather than specific models and empirical studies.

**Vladimir A. Lefevre**

a) Translation and publication of my book “Conflicting Structures” devoted to modeling the systems that have an image of the self, published by Leaf & Oaks Publishers, 2015.

b) Theoretical explanation of the figure 0.75 appearing in experiments devoted to the quantification of human emotion. The result of this work done in collaboration with Dr. Robert Schwartz from the University of Pittsburgh Medical Center was published in the American Psychologist, Sept. 2014, under the title “The Quantification of Emotion: An Empirical Ratio in Search of a Theory”

c) Construction of theoretical model of antiterrorism using the reflexive game theory. The results were published as a paper and PP Presentation at 19th International Command and Control Research and Technology Symposium, 2014. This work was done in collaboration with Dr. Kofi Nyamekye from Integrated Activity-Based Simulation Research, Inc.

**Louis Narens**

During the last year, my research primarily focused on four overlapping areas: (1) foundations of probability, (2) modeling context effects in Social Science experimental research, (3) the psychological and social evolution of concepts, and (4) behavioral economics and decision theory. Surprisingly, there is much overlap in these four areas. For example, cross-cultural categorization data can be modeled by a newly developed probability theory that incorporates in context as part of its probabilistic structure, where, in this instance, context corresponds to the culture in which a physical color sample is categorized.
My foundations of probability research and my behavioral economic and decision theory research are based mainly on the idea that there are alternatives to standard probability that can account for puzzling and hard to model empirical Social Science phenomena. New foundations for probability based on non-boolean event spaces are investigated and applied to a variety of situations in which forms of ambiguity, vagueness, and contextuality are present. A part of the behavioral economic research involving utilitarian distribution of goods uses different ideas that I have previously developed for the foundations of measurement.

Starting September this year, I became a Co-PI on a new $980,000 NSF grant on the psychological and social evolution of concepts (Kimberly Jameson, IMBS, PI, Natalia Komarova, IMBS and Mathematics, and Dominik Vordaz, Ecology and Evolution, as other Co-PIs). My focus for this proposal is developing and implementing computer simulations using methods and concepts from evolutionary game theory to get artificial populations of agents to acquire shared meanings for systems of concepts, e.g., categorize the human perceptual spaces of colors in meaningful ways. During this year, progress was made on this goal through collaboration with Kimberly Jameson and Sean Tauber (Assistant Research Scientist, IMBS) and a group of computer science students who participated in a special research program funded and sponsored by CALIT2.

The above research of mine has resulted in the following publications: A book, Probabilistic Lattices With Applications to Science (World Scientific), a book chapter, “On Replacing ‘Quantum Thinking’ with Counterfactual Reasoning” (to appear in Contextuality from Quantum Physics to Psychology, edited by Ehtibar Dzhafarov, Ru Zhang, Scott Jordan, and Victor Cervantes), and an article, “Probabilistic frames for non-boolean algebras,” to appear in Philosophical Transactions A of the Royal Society. Also, two articles has been submitted: “Multimode Utility Theory” to the Journal of Mathematical Psychology, and “Measuring Utilitarianism” (with Brian Skyrms, IMBS, Department of Logic and Philosophy of Science) to Philosophy of Science.

During the last year I have given presentations at several workshops and conferences, including two symposia presentations at the Mathematical Psychology Meeting (Quebec City, Canada), International Society for Psychophysics Meeting (Lund, Sweden), Winer Memorial Lecture (Purdue), Philosophy of Science Meeting (Chicago), Fields Institute (Toronto, Canada), a colloquium at Carnegie Mellon University, a lecture on perception at Kiel University (Germany), and a presentation at a conference I co-organized for IMBS.

During this year, my research has been support by grants from AFOSR and NSF.

Penelope Maddy

I’ve been working largely in meta-philosophy, especially on the relations between philosophy and science. I argue that philosophy needs no distinctive, extra-scientific methods.
**Statistical Modeling**

David Eppstein

In my paper "The Galois complexity of graph drawing: why numerical solutions are ubiquitous for force-directed, spectral, and circle packing drawings" (with Bannister, Devanny, and Goodrich, published at Graph Drawing 2014) we studied several standard methods of placing the nodes in visualizations of social networks. We showed that, although the intended placements used by these methods can be described by systems of polynomial equations, they have no exact closed form formulas. This explains in part why most implementations of these visualization systems use numerical hill-climbing methods to move the nodes into near-optimal position rather than directly placing them in their optimal positions.

Michael Lee

My work continues to focus on modeling higher-order cognition (decision-making, memory, learning), especially through the application of hierarchical Bayesian methods. Research highlights have included a paper studying adaptive decision heuristics, several research efforts applying cognitive models to "wisdom of the crowd" problems (especially dealing with ranking data), and applied collaborations with Ranker.com (wisdom of the crowd in social media) and the Medical Care Corporation (Alzheimer's disease and related disorders).

Lisa Pearl

One set of findings concerns how the cognitively immature minds of children solve the various tasks involved in native language learning (called language acquisition). Pearl (2014) discusses how computational and mathematical modeling is an invaluable tool for scientists who want to understand the language acquisition strategies that all children use. This is because modeling provides a way to concretely realize a theory about a learning strategy, apply that strategy to realistic language data, and see the results of the learning strategy. This approach can be used for a wide range of linguistic phenomena and offers insights that cannot be found by using theoretical or experimental methods alone.

Several studies by Phillips & Pearl (2014, 2015, in press) use computational modeling to investigate the task of speech segmentation, which is the process of identifying individual units like 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 unconsciously impose boundaries to identify the words being spoken. Infants typically are able to do this for their native language as early as six month old. In our studies, we examine two speech segmentation strategies proposed for infant use, implement these strategies concretely via a mathematical formalization, and apply them to realistic language data that infants would hear. Importantly, we draw from existing experimental literature to empirically ground our simulations with respect to (i) how infants perceive the speech
stream, (ii) what kind of cognitive processing infants are capable of, and (iii) what kind of segmentation performance infants need to achieve. Interestingly, one of the two strategies — a Bayesian segmentation strategy — appears to correlate very well with infant segmentation behavior: (i) it succeeds equally well on languages as linguistically diverse as English, Japanese, and Farsi, and (ii) consistently segments useful linguistic units that can scaffold acquisition processes that occur in later in development. This suggests the Bayesian segmentation strategy is a robust strategy for infants to use for segmentation, no matter which language(s) they may be learning natively.

Another set of findings in this vein concern the acquisition of structural knowledge about language (called syntax). In Pearl & Mis (in press), we examine how toddlers learn the correct interpretation for the pronoun one in English (e.g., Look - an important finding! Here's another one!, with one referring to another important finding rather than just any old finding). Experimental data suggests that English 18-month-olds share this interpretation with adults, and so must have learned it by this point in development. Our mathematical modeling of the acquisition process suggests that this rapid acquisition is possible if toddlers are leveraging broader sets of data to make the syntactic generalizations that lead to their observed behavior — in this case, learning about how to interpret one by leveraging data about how other pronouns like it, her, and him are typically interpreted. This contrasts with many previous theories that stated infants needed to learn from restricted input sets (e.g., only some of the input data using one as a pronoun).

In Pearl & Sprouse (2015), we find a similar learning story for the structure of linguistic dependencies, such as "What do you think ___ convinced them?", where "what" seems to be understood as the subject of the embedded clause "convinced them". In particular, previous theories about how children learn about acceptable dependencies in their language assumed children learned from restricted data sets. These theories relied on very specific innate, linguistic knowledge to explain how children could learn the appropriate knowledge about dependencies from those restricted data sets. In contrast, our mathematical model leveraged a broader data set to generate the appropriate knowledge, and so did not require that very specific innate, linguistic knowledge. This suggests that children’s syntactic knowledge about dependencies may rely on more general learning procedures, rather than the very specific ones that target dependencies alone.

A finding in the area of natural language processing concerns the automatic identification of mental states of text, using linguistic cues within the text (rather than non-verbal cues such as voice pitch or facial expression). For example, “Don’t you just love this idea?” is expressing a persuasive intention (and possibly sarcasm), as well as some distinctive linguistic cues include the use of “don’t” to begin the question and the use of a second person pronoun (“you”) preceding a verb with a positive connotation (“love”). Since humans routinely transmit and interpret this kind of subtle information via linguistic cues, we suggest in Pearl & Enverga (2015), building on work in Pearl & Steyvers (2013, 2010), that humans can utilize the linguistic signature of a mental state (its “mindprint”) to accomplish this. We focus on the mindprints of eight mental states resulting
from intentions, attitudes, and emotions, and present a mindprint-based machine learning technique to automatically identify these mental states in realistic language data. By using linguistic features that leverage deeper linguistic information, our approach achieves near-human performance on average and even exceeds human performance on occasion. Interestingly, we find that our technique makes similar errors to humans in some cases, suggesting that the mindprints used are similar to the mindprints human use. Given the promising results we have found, we suggest that linguistically-sophisticated mindprints are likely to be a viable and important component of any intelligent system interacting linguistically with humans.

**Sociological/Anthropological**

**John Boyd**

This year and last: my co-author, William H. Batchelder, and I finished a chapter entitled "Networks" for the New Handbook of Mathematical Psychology. Batchelder's part of the chapter featured a new proof of the much cited but seldom proved Hammersley-Clifford theorem, while my part was devoted to applications of linear algebra to network analysis. An interesting personal vignette is that my graduate advisor, Anatol Rapoport, wrote the Network chapter for the original 1963 Handbook of Mathematical Psychology.

**Carter Butts**

Substance use among adolescents is of concern both because of its immediate impact on adolescent health and because of its potential for shaping long-run patterns of behavior: particularly in the case of tobacco use, adoption as a teenager can lead to a life-long addiction with serious health consequences. Interventions intended to reduce adolescent substance use are complicated by the fact that such behaviors are affected by the social and cultural context in which youth reside, and that this context is itself actively shaped by the youths themselves (including by their substance use behavior). Unraveling these complexities requires the use of cutting-edge computational and statistical models that can capture the interdependent process of decision making and social interaction among adolescents, while also accounting for environmental and other factors that shape the context in which decisions are made. In joint work with colleagues Cynthia Lakon, John Hipp, and David Timberlake (as well as postdoc Cheng Wang and student Rupa Josa), we have used such models to probe the interplay between peer influence, selection (i.e., the process by which adolescents choose friends and support partners), and parental relationships in shaping smoking behavior. Our approach allows us to not only estimate the direction and strength of each mechanism among adolescents in our data set (a sample of high schools and junior high schools from across the United States), but also to employ "what if" scenarios to probe the impact of each social mechanism both net of and in conjunction with the others. Our research shows that, for smoking behavior, peer influence has the strongest impact on prevalence -- but, contrary to popular belief, its typical effect is to suppress smoking rather than to encourage it. The solution to the influence puzzle lies in the simple observation that peer influence tends to suppress deviant behavior: and, for most adolescent populations, only a
minority of youth are smokers. Our findings indicate that this low prevalence is maintained in part by a form of "herd resistance" brought about by peer influence, with non-smoking adolescents helping to discourage smoking among their peers. Were the influence of peers abolished (a hypothetical we can explore via simulation), youth would be more vulnerable to the impact of marketing and other sources of pro-smoking influence (leading, we estimate, to a large increase in youth smoking prevalence). By contrast, interventions strengthening peer influence are predicted to lead to lower prevalence, suggesting that public health is better served by encouraging adolescents to talk to each other openly and frankly about smoking than by attempting to discourage adolescents from turning to peers for guidance. This research highlights the power of mathematical and computational models to reveal important and often counterintuitive facts about the social world, and to identify ways of leveraging these discoveries to address issues that affect the health and well-being of the public at large.

**Individual Decision-Making**

L. Robin Keller

A research team of UCI physicians and UCI Merage School of Business Professor L. Robin Keller and doctoral student Jiaru Bai, along with other physicians, used a Markov decision tree to evaluate the cost per added month of life of combining the biological therapy drug bevacizumab (Avastin™) to chemotherapy alone for advanced cervical cancer patients. Minion et al. (2015) found the estimated total cost of therapy with bevacizumab is approximately 13.2 times that for chemotherapy alone, adding $73,791 per 3.5 months (0.29 year) of life gained, resulting in an incremental cost-effectiveness ratio (ICER) of $21,083 per month of added life.

**Perception and Psychophysics**

Kimberly A. Jameson

In 2014-2015 Jameson’s research continued on topics in the empirical testing and mathematical modeling of color perception and cognition. However, the 2014-2015 academic year was marked by both new research ventures and novel extensions of longstanding research directions. For example, new opportunities arose to carry out exciting applied color perception research with a participant who is a professional artist who happens to also have the genetic potential for human tetrachromacy. Intense ongoing empirical study on this topic and has yielded some very important advances that have been presented in recent conference talks, and are reported in manuscripts in-progress. A second novel project envisioned by Jameson was initiated with medical school colleagues at the Gavin Herbert Eye Institute, UCI, and a grant was submitted to fund new studies on color perception assessment methods for Early Adult-onset Macular Degeneration. A third novel project -- which is an extension of Jameson’s ongoing UC PacRim Research Program project -- was envisioned and proposed by Jameson (PI) and her IMBS colleagues Komarova, Narens and Wodarz to the National Science Foundation (entitled “New methods for investigating
the formation of individual and shared concepts and their dynamic dispersion across related societies”) and was one of three grants successively classified as “Highly Competitive” and was granted a fully funded award. This latter project will greatly extend and expand on Jameson’s ongoing work on the Mesoamerican Color Survey database, which in addition to basic research results in the area, will make available to the public for the first time one of the most extensive public archives on color categorization data across ethnolinguistic groups.

Jack Xin

The first project is on sparse representation of high dimensional data in redundant basis arising in imaging and compressed sensing using difference of L1 and L2 norms techniques to enhance robustness and sparsity beyond convex methods using L1 norm. An application in physical science is recovering high frequency information of sparse signals from low frequency measurements to gain resolution in imaging (so called super-resolution in geo-science and astronomy). The second project is on blind and partially blind source separation of mixture signals and images (‘blind’ refers to no knowledge of the mixing conditions) based on geometric and optimization methods. Applications include removing out of focus blur in images, and detecting chemical threats in food and drinks. The third project is on analysis/computation of turbulent flame speeds in level-set Hamilton-Jacobi equations and advection-reaction-diffusion equations related to the understanding of how fast fires spread or quench in volume preserving flows (liquid combustion in the engine). When the flows become chaotic (disordered), enhanced propagation speeds sustain even as molecular diffusion goes down to zero. Such residual transport phenomenon may not exist when the flow patterns are ordered with closed streamlines.

Jack Yellott

During the past year I continued working on the same problem that has preoccupied me for the past few years: altering printed characters to overcome presbyopic visual defocus. I have a perfect theory for the case of white characters on a black background, but I had been hung up for some time on the problem of how to represent the contrast of black characters on white backgrounds--ordinary printed text, in other words. Finally this past year I solved that problem when I realized that for such characters there is normally a maximum possible value of white (i.e., the page with no ink--nothing the printer can do can make the page brighter. When that assumption is formalized, it turns out that the limits on improving the retinal image contrast of defocused black-on-white characters by typographical means are exactly the same as for white-on-black. So now I have a complete theory, and I only need to summon up the energy to write the paper I've been working on for some eight years.

Hongkai Zhao

My research focus is on developing efficient computational models and methods for problems arising from science and engineering. For examples, (1) geometric modeling of 3D shapes and surfaces, (2) data analysis, such as understanding geometric structure and statistical inferences
from big data; (3) medical imaging, such as cone beam CT reconstruction using low-rank matrix factorization; (4) numerical simulation of physical and biological systems.

**Social and Economic Phenomena**

**Bill Branch**

In a recent paper, “Financial Frictions, the Housing Market and Unemployment,” joint with Nicolas Petrosky-Nadeau and Guillaume Rocheteau, we construct a model that can explain both U.S. house prices and unemployment rates over the period 1996-2010. Over this period, there was a large run up in house prices followed by a large crash during the Great Recession. Concurrently with the housing bubble and crash, there was a steady decline in unemployment rates followed by a steep increase. Our explanation for the joint movement of housing prices and unemployment comes from the use of home equity loans to finance consumption. Higher house prices have two effects: they relax borrowing constraints on home equity loans and, thereby, increase the demand for goods which leads firms to expand business activity and create new jobs. A crash has the opposite effect. We find that our model can quantitatively explain both the housing crash and the unemployment during the Great Recession.

**Jan K. Brueckner**

In a recent paper, two coauthors and I studied the forces that spurred use of alternative mortgage products (AMPs) during the housing boom. AMPs include interest-only mortgages and option adjustable-rate mortgages (the latter type allows payment of less than the interest due, leading to negative amortization). These contracts are characterized by “backloading” of payments, which delays repayment of principal, and this feature heightens default risk by raising the balance due on the mortgage at any time relative to a traditional contract. A theoretical model shows that, when future house-price expectations become more favorable, reducing the likelihood of negative equity and thus concerns about default, mortgage choices shift toward AMPs. The paper’s empirical work confirms this prediction by showing that an increase in past house-price appreciation, which captures more favorable expectations for the future, raises the market share of alternative mortgages. In addition, the paper tests the fundamental presumption that backloaded mortgages are more likely to default, finding support for this view.

**Jean-Paul Carvalho**

I received three requests to submit revisions from journals (two of which have been completed):

**Education, Social Mobility and Religious Movements: The Islamic Revival in Egypt (with Christine Binzel). R&R, The Economic Journal.**

Muslim societies have been reshaped in recent decades by an Islamic revival. This paper focuses on Egypt—the epicenter of the movement in the Arab world. We document a contemporaneous
decline in social mobility among educated youth. We then develop a model to show how an unexpected drop in social mobility combined with inequality can produce a religious revival, led by the educated middle class. The principal idea is that religion helps individuals to cope with unfulfilled aspirations by adjusting their expectations-based reference point. By raising aspirations, economic development may make societies more not less prone to religious revivals.

**Coordination and Culture. R&R, Economic Theory**

Culture constrains individual choice, rendering certain actions impermissible or taboo. While cultural constraints may regulate behavior within a group, they can have a pernicious effect in multicultural societies, inhibiting the emergence of unified social conventions. We analyze interactions between members of two cultural groups who are matched to play a coordination game with an arbitrary number of actions. Due to cultural constraints, miscoordination prevails despite strong incentives to coordinate behavior. In an application to identity-based conflict, exclusive ethnic and religious identities persist in poorer and more unequal societies. Occasional violation of cultural constraints and own-group interactions can make miscoordination even more stable.


Oppositional attitudes to 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 a rising skill premium, but reduce education—a phenomenon we call resisting education. This amplifies income inequality. Thus technological progress, globalization and anti-discrimination policies are linked to oppositional attitudes to education.

In addition, I presented results from a new paper titled “Identity-Based Organizations”, which is in preparation.

**Identity-Based Organizations**

Identity formation is an inescapably social process entailing negative externalities and free rider problems. Identity-based organizations emerge to solve these problems. We show that organizations at high tension with mainstream society can sustain higher levels of strictness and are more successful at identity formation. Competition moderates organizations under certain conditions. In other cases, competition can lead to forms of escalating extremism. Success in identity formation tends to be self-undermining leading to various types of cyclic dynamics. We apply these insights to the case of religious extremism in the Middle East.
Steve Frank

Many of the great principles of science can be described as changes in populations. In biology, the force of natural selection increases the frequency of favored types. In mechanics, physical forces alter the locations and energies in populations of particles. This study shows that different problems of population dynamics often have the same underlying form: a balance between direct and inertial forces. The direct forces are defined by holding constant the frame of reference in which change is observed. The inertial forces arise by change in the frame of reference caused by the direct forces and the varying perspective of measurement. This article unifies and extends biological and physical theory through the separation of direct and inertial forces in populations. A bit more detail from the abstract: I develop a framework for interpreting the forces that act on any population described by frequencies. The conservation of total frequency, or total probability, shapes the characteristics of force. I begin with Fisher's fundamental theorem of natural selection. That theorem partitions the total evolutionary change of a population into two components. The first component is the partial change caused by the direct force of natural selection, holding constant all aspects of the environment. The second component is the partial change caused by the changing environment. I demonstrate that Fisher's partition of total change into the direct force of selection and the forces from the changing environmental frame of reference is identical to d'Alembert's principle of mechanics, which separates the work done by the direct forces from the work done by the inertial forces associated with the changing frame of reference. In d'Alembert's principle, there exist inertial forces from a change in the frame of reference that exactly balance the direct forces. I show that the conservation of total probability strongly shapes the form of the balance between the direct and inertial forces. I then use the strong results for conserved probability to obtain general results for the change in any system quantity, such as biological fitness or energy. Those general results derive from simple coordinate changes between frequencies and system quantities. Ultimately, d'Alembert's separation of direct and inertial forces provides deep conceptual insight into the interpretation of forces and the unification of disparate fields of study.

Marek Kaminski

The special report “Voting methods for single-member districts and their properties” (see below) was prepared for the President-elect of Poland Andrzej Duda, the main Prime Minister candidate of the biggest party Beata Szydło, the leader of the third-largest party Pawel Kukiz, and several electoral-law political advisors. It was already presented to and discussed with some of the politicians; further meetings are scheduled for mid-July. The report evaluates different options for electoral reform in the context of the forthcoming referendum on introducing single-member districts and their political consequences. According to polls, the electoral reform is favored by voters by an approximate margin of 70:20.
Igor Kopylov

First, I characterized a family of models for various framing effects, such as partition dependence in probabilistic beliefs and comparative ignorance in ambiguity attitudes. My models allow one to derive subjective beliefs, sets of beliefs, or variational costs separately for each suitably defined context. I defined the choice context in several different ways. The main two cases violate monotonicity and transitivity respectively, but not both together.

Second, I studied a new model of updating where the unique subjective belief and the set of all possible priors are updated separately via Bayesian or non-Bayesian rules. For example, the updated set of possible priors may discard all beliefs that assign the new information probability below a given threshold.

Third, in a revision of my joint paper with J. Noor, we have modeled agents who exhibit lack of resolve as in the “good intentions lead to hell” pattern. More formally, agents may succumb to temptations, but only when they are accompanied by normatively appealing alternatives. In this case, agents fail to avoid these temptations through previous commitment.

Simon Levin

My research program has long been directed to 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 highlights of the past year are discussed below, organized according to the work on biodiversity, on infectious diseases, and on the dynamics of coupled ecological and economic systems. References listed refer to papers in the following list of publications.

The Dynamics of Biodiversity and Biocomplexity

My efforts on this topic have involved understanding the spatial dynamics of ecological pattern, including collective movement, the consequences for biodiversity, and the mechanisms underlying the robustness of ecosystems. Primary recent foci have been on semi-arid systems and marine communities, and more generally on collective motion and the robustness of ecosystems.

I have been working for several years with former graduate student Carla Staver (Yale University) on bistability in savanna-forest systems. Our earlier models, with Sally Archibald (University of the Witwatersrand, Johannesburg, South Africa), reproduced observed patterns from MODIS remote-sensing data sets, and were based on phenomenological representations of influence of grass cover on fire frequency. To provide a more mechanistic basis, with former postdoctoral fellow Emmanuel Schertzer (University of Paris, VI), Staver and I have now published a spatially explicit model of fire spread that justifies the earlier representation (Schertzer et al., 2015). We continue to work on this topic, with a variety of collaborators, and I expect this to remain a core of my research for the next several years.
In related work, with colleague Corina Tarnita (Princeton University), former postdoctoral fellow Juan Bonachela (University of Strathclyde, Scotland), and others, I published a paper in Science on the role of termites in maintaining the robustness of dryland vegetation systems, expanding on earlier models by others of vegetation and water dynamics that only explain a portion of observed pattern (Bonachela et al., 2015). Former graduate students Ryan Chisholm (National University of Singapore), Duncan Menge (Columbia University), and I, with others, also demonstrated the potential for alternative stable states in nutrient-rich grasslands (Chisholm et al., 2015). And finally, in this area, Ignacio Rodriguez-Iturbe (Princeton University), former postdoctoral fellow Sally Thompson (University of California, Berkeley), and I continued our work on the potential spread of the important plant pathogen Phytophthora cinnamomi under climate change; such spread would have major impacts on plant communities (Thompson et al., 2014).

In the vegetation systems, as well as marine and other systems, an extremely fruitful recent trend has been in the development of trait-based models that allow the interfacing of ecological and evolutionary perspectives. I have been involved in such work in marine systems for many years, largely with former postdoctoral fellow Christopher Klausmeier and Elena Litchman (both at Michigan State University), and we have a survey paper, with Juan Bonachela and Kyle Edwards (University of Hawai‘i, Mānoa), in review in the Journal of Plankton Research.

In recent years, I have been involved in extending these efforts to terrestrial systems, especially on the topic of nitrogen fixation, together with Lars Hedin (Princeton University) and Duncan Menge. The latest effort in this direction is with Hedin, former postdoc Efrat Shefer (Hebrew University of Jerusalem), and Sarah Batterman (Princeton University); a paper on this topic also is in review. Finally on this topic, former graduate student Caroline Farrior (NIMBioS), colleagues Steve Pacala (Princeton University) and Ignacio Rodriguez-Iturbe and I, with others, have been investigating the evolutionary ecology of plant traits. Most recently, we showed that decreased water limitation under elevated carbon dioxide increases the potential for carbon sinks, a result of major importance for addressing the impact of climate change (Farrior et al., 2015).

Another major effort in ecosystem modeling has been a continuing collaboration with Adam Martiny (University of California, Irvine) and others on the dynamics of marine ecosystems, and in particular patterns of element ratios, complementing the work with Klausmeier and others. Most recently, we published a paper in PNAS on the impact of ocean phytoplankton diversity on the uptake of phosphate (Lomas et al., 2014). We also began investigation of the role of viruses in structuring these communities (Bonachela and Levin, 2014), and continued our work on incorporating flexible nutrient uptake into models of plankton communities.

Search and collective navigation have also been continuing themes in my work. Along these lines, with former student Andrew Berdahl (Santa Fe Institute) and others, I published two papers, one on collective navigation in salmonids, and the other on the interplay between dispersal and local adaptation (Berdahl et al., 2014; 2015). Related work in this area has explored search (Salvador et al., 2014), decision-making (De Froment, Rubenstein and Levin, 2014) and
especially collective decision-making (Torney et al., 2014) in other animals, in the belief that this can inform the study of decision making in human societies. Carter et al. (2015) applies models of movement to an applied issue, that of the conservation and management of tiger populations.

One of the more exciting recent developments in ecological theory has been its application to microbial systems, from the gut microbiota to bacterial biofilms to the understanding of cooperation, public goods, and multicellularity (Levin, 2004). I have been involved in such work for several years, and find exciting mutualism between it and my work on larger-scale ecosystems. In other work, Corina Tarnita and I have been investigating various aspects of pattern and multicellularity through diverse collaborations. Most notable, (Tarnita et al., 2015), was our demonstration of the maintenance of genotypic and phenotypic diversity (through bet-hedging) in the cellular slime mold *Dictyostelium discoideum*, showing that individuals that do not participate in slug formation play an important role in the robustness of the slime mold. Work continues in this and related area with a variety of collaborators.

A very hot topic in ecological theory, as well as for other systems, has been the potential for these systems to flip from one basin of attraction to another, analogous to phase transitions in physics. I have, over the past decade, worked on such issues in financial systems (with Robert May (University of Oxford) and George Sugihara (Scripps Institution of Oceanography, University of California, San Diego), and more recently with Andrew Lo (MIT)), international relations (Frank et al., 2004), and ecological systems (for example, the work described above with Staver, Menge, Chisholm and others). Most models investigating these themes have been deterministic, so with Juan Bonachela and others, I published a paper in *PNAS* investigating the role of stochastic effects in smoothing potentially catastrophic transitions in a variety of systems (Villa Martin et al., 2015).

**The Dynamics of Infectious Diseases**

Over the years, my research on this topic has ranged from molecular interactions between pathogens and hosts, including the interaction of the immune system with pathogens, to the epidemiology of infectious diseases and the public-health consequences. I have worked on influenza, HIV, malaria, Ebola and other diseases (see for example, most recently, Klein et al., 2014; Castillo-Chavez et al., 2015). In the past few years I have focused on the interface between the dynamics of disease and management aspects, especially with respect to the rise of antibiotic resistance. To this end, working with collaborators at Arizona State, Yale and elsewhere, I have completed and/or published a series of papers contributing to the development of the new discipline of economic epidemiology (Perrings et al., 2014; Morin et al., 2014; Morin et al., 2015). The classical theory of epidemics has represented one of the most successful applications of mathematics to biology, and has had a deep influence on management. But that theory has almost entirely ignored the utility-based actions of humans, for example to avoid contacts during an epidemic. Incorporation of such complications has been the goal of our work, and changes the predictions of epidemiological models, as well as recommended practice, in fundamental ways.
As regards antibiotic resistance, which is one of the greatest contemporary threats to public health and surgical protocols, I have been working with economist Ramanan Laxminarayan (The Center for Disease Dynamics, Economics & Policy, Washington D.C.) and others over the past decade to identify sources of problems, and suggest ways to ameliorate the threat. In the past year plus, working with postdoctoral fellow Thomas van Boeckel (now at Zurich University), with Bryan Grenfell (Princeton University), and with others, we have published two high profile papers (Van Boeckel et al., 2014; 2015, in *Lancet Infectious Diseases* and *PNAS*) documenting global trends in antibiotic use, country by country. Together, these provide crucial information regarding one of the greatest public health threats of our time, and a central common-pool resource problem.

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

In this area, I have been primarily interested in how to develop cooperative agreements to deal with public goods and common-pool resources, and what can be learned from natural systems. More generally, I have focused on the challenges of managing complex adaptive systems. Last year, I reported a completed review paper on the latter topic, and that paper (Arrow, Ehrlich and Levin, 2014) has now appeared in a book published by Springer-Verlag, and honoring Partha Dasgupta (University of Cambridge, UK).

I have been particularly interested in how global society can deal with public goods and common-pool resources (Levin, PNAS, 2014; Tavoni and Levin, 2014), from water and fisheries to biodiversity, public health, and the global environment. Three active research projects, NSF grants with former postdoctoral fellows Malin Pinsky (Rutgers University) and James Watson (Stockholm Resilience Centre), and a Nordic grant with Nils Stenseth and former postdoctoral fellow Anne Maria Eikeset (both at the University of Oslo, Norway), have supported some of the work above, and will result in several publications in the coming year.

Most recently, I have been working with Jorge Pacheco (University of Minho, Portugal), students Philip Hannam (Princeton University) and Vitor Vasconceles (University of Minho, Portugal), and others on a variety of schemes, including insurance arrangements (Pacheco et al., in review, 2015), polycentric approaches to climate change agreements (Hannam et al., in review, 2015), and other efforts (Vasconceles et al., 2014). (See also Tavoni and Levin, 2014). I have further been working with former mentees Maja Schlüeter (Stockholm Resilience Centre) and Alessandro Tavoni (London School of Economics), current student Andrew Tilman (Princeton University) and others to extend our earlier work on endogenous mechanisms (social norms) for maintaining cooperation in dealing with common-pool resources. Finally, with Tasos Xepapadeas (Athens University of Economics and Business), I have been exploring the neglected area of spatial heterogeneity in environmental economics (Levin and Xepapeas, in review, 2015). My work in this area has been growing, and I expect it to remain a major part of my work in the coming years.
Exploratory Work

The three categories already discussed form the core of my research program, but I have always found it profitable to explore new directions in order to keep my research program fresh and growing. In 2014-15 this included a paper in *PNAS* (Lei et al., 2014), modifying a framework Kenneth Arrow (Stanford University) and I applied to the intergenerational transfer of resources in human societies and extending it to understand the epigenetic transfer of information by stem cells. Another example from the past year involves a comparison of the consequences of different assumptions about the infection cycle of marine viruses, key players in understanding the dynamics of marine ecosystems (Bonachela and Levin, 2014). Finally, I have been enthusiastic about using lessons from evolutionary biology to guide the management of risks in societies, from financial systems to international relations. To this end, Joshua Ramo (Kissinger Associates) and I have organized a series of meetings over the last several years bringing together leaders from the complex-systems and international-relations communities. In the most recent example, I organized a workshop at IIASA in Austria, which led to a Perspective in *PNAS* during the past year (Frank et al., 2014). Robert Keohane (Princeton University), a leader in political science, and I have organized a follow-up meeting to be held at Princeton University in October 2015, focusing on what evolution can teach us about international relations.

Natalia Komarova

The fascinating ability of humans to modify the linguistic input and “create” a language has been widely discussed. In the work of Elissa Newport and colleagues, it has been demonstrated that both children and adults have some ability to process inconsistent linguistic input and “improve” it by making it more consistent. One example is the fascinating study of the performance of a 7-year deaf boy Simon, who mastered the American Sign Language (ASL) by learning it from his parents, both of whom were imperfect speakers of ASL. In a number of papers, Newport and colleagues studied artificial miniature language acquisition from an inconsistent source. It was shown that (i) children are better at language regularization than adults, and that (ii) adults can also regularize, depending on the structure of the input. Together with students Yelena Mandelshtam and Jacquelyn Rische we created a number of learning algorithms of the reinforcement-learning type, which exhibits patterns and suggest a way to explain them. It turns out that in order to capture the differences between children's and adults' learning patterns, we need to introduce a certain asymmetry in the learning algorithm. Namely, we have to assume that the reaction of the learners differs depending on whether or not the source's input coincides with the learner's internal hypothesis. We interpret this result in the context of a different reaction of children and adults to positive and negative evidence. We propose that a possible mechanism that contributes to the children's ability to regularize an inconsistent input is related to their heightened sensitivity to positive evidence rather than the (implicit) negative evidence. In our model, regularization comes naturally as a consequence of a stronger reaction of the children to evidence supporting their preferred hypothesis. In adults, their ability to adequately process implicit negative evidence prevents them from regularizing the inconsistent input, resulting in a weaker degree of regularization.
Over the last year I have also worked on several topics of mathematical biology. This includes stochastic dynamics of stem cells; applying methods of evolutionary biology to optimizing treatment of the blood cancer CLL (chronic lymphocytic leukemia); and investigating the role of spatial constraints in crossing fitness valleys in evolutionary dynamics.

**Michael McBride**

Graduate student Garret Ridinger and I conducted an experimental study of the effect of monetary incentives on the ability to read others’ emotions. Monetary incentives hindered females' ability while bolstering males' ability. This finding contributes to our understanding of gender differences in participation in competition and life outcomes, including wages.

**Cailin O’Conner**

I recently finished a cluster of papers which applied the same game theoretic model - the sim-max game - to several interrelated problems. This game is similar to the signaling game introduced by David Lewis in that two actors transfer information about the world. The difference is that the world states in the sim-max game bear relationships to one another. One can think of this as modeling properties like color, temperature, sweetness, length, or really anything that varies by degree. I employed these games to explain the evolution of linguistic vagueness, linguistic ambiguity, perceptual categories, and learning generalization.

More recently I’ve worked on several projects. The first involves using game theory and evolutionary game theory to understand why certain academic fields have difficulty recruiting and retaining gender and racial minorities. The second explores the evolution of moral emotions and guilt in particular. The third considers where and when the methodology of game theory is problematic in biology. The fourth looks at how various academic groups can be disadvantaged when bargaining over collaborative projects.

I am also part of a group at UCI using methods from experimental economics to explore philosophical questions. To date we have run several experiments on the emergence of meaning… The group consists of Simon Hutter, myself, Justin Bruner, Hannah Rubin, and Lindley Slpetz. Our first paper `David Lewis in the Lab: An experimental study of signaling conventions' is forthcoming in the journal Synthese and currently available online. We have a working paper of our second experiment titled, 'Communication Without the Cooperative Principle: A signaling experiment' which is available upon request.

**Dale Poirier**

I am an econometrician mostly working in the area of Bayesian statistics. Over the past year I have been writing a monograph entitled *Mostly Harmless Bayesian Econometrics*. One chapter, “Implicit Distributional Assumptions,” will be presented at the Econometric Society World Congress to be held in Montreal, August 2015.
Don Saari

It is surprising how notions developed to address problems from the social and behavioral sciences can provide a guideline for addressing compelling puzzles from the physical sciences. But, this was one of the topics explored during the past year. In particular, Arrow’s theorem has been treated as a roadblock for progress in that it is often described as asserting that there are no fair voting rules for three or more candidates. But, by examining the result from the perspective of the reductionist philosophy, it becomes clear that Arrow’s result reflects weaknesses of a methodology – the reductionist method applied to paired comparisons—rather than being a statement about all voting rules.

Once this perspective is recognized, it provides a way to understand a wide selection of other puzzles. One, which I have explored with Bernie Grofman and I reported the basic results at a March IMBS conference, involves the well known complexities associated with allocation methods such as the one used to assign Congressional seats to states based on population figures. Another puzzle concerns the compelling mystery from astronomy of dark matter. By using lessons learned from analyzing Arrow’s Theorem, it became clear that many of the conclusions associated with dark matter are highly questionable. Some of this is explained in an invited feature article for the British Journal of Political Science and described in several lectures, including my January 2015 Porter Lecture at the annual meetings of the mathematical societies.

Other work emphasized the structure of binary comparisons. This work led to a new way to analyze some of the claims made by the group in the cognitive sciences promoting “quantum thinking.”

Carole Uhlaner

Much of my IMBS relevant work this past year has been devoted to developing my "relational goods" approach to understanding the paradox of the collective action problem -- namely, that in the presence of the logic of free-riding, people nonetheless do participate in politics. One specific instance to which I have been devoting more attention is that of participation in recent revolts. There is a widespread academic and popular understanding that social media played an important role. However, that mechanism of their role is typically glossed over. The relational goods approach provides an explanation of the process whereby the social media contributed to encouraging collective action.

Doug White

Working with primatologist C. C. Grueter relying on the standard cross-cultural sample (Murdock and White) with variables contributed by White and others, and primate field observation, we reconceived for early humans core disincentives for hostile intergroup relations, including economic interdependence (trade), and absence of patrilocaity with external war, which mollifies internal war between communities, controlling overall for significant language co-phylogeny.
Interrmarriage and other variables did not have explanatory power in curtailing war. The analysis is complemented with an exploration of the evolutionary factors underlying elementary forms of meta-group organization in non-human primates.

**Research Seminars and Activities**

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

Bill Batchelder, Mathematical Models of Cognitive Processes  
Bill Batchelder, Special Topics: Stochastic Models  
Carter Butts, Network Theory  
David Eppstein, Seminar in Algorithms and Theoretical Computer Science  
Marek Kaminski, Introduction to Game Theory  
Marek Kaminski, Introduction to Voting Theory  
Robin Keller, Decision Theory  
Robin Keller, Decision Analysis  
Simon Huttegger, de Finetti's Philosophy of Probability  
Cailin O’Coonor, Philosophy of Biology: OJ  
Lisa Pearl, Computational Models of Cognition  
Louis Narens, Don Saari, and Brian Skyrms, Social Dynamics  
James Weatherall, Foundations of Quantum Field Theory (I & II)  
Penelope Maddy, two-quarter seminar on Primary and Secondary properties, a crucial distinction in the early modern period, when philosophers were first reacting to the Scientific Revolution.

**Color and Cognition Reading Group:** For Spring quarter 2014, Kimberly Jameson resumed (with Christian Herrera, Cognitive Sciences Graduate Student, co-organizing) the popular Color and Cognition Reading Group. This is an active multidisciplinary group of faculty, students and postdocs that meets weekly, or bi-monthly, on topics related to the mathematical modeling and empirical investigations of color cognition and perception.

**Computational Models of Language (CoLa) Reading Group**  

**The Social Network Research Group:** *(SNRG)* is a weekly meeting of researchers in the social network area. The SNRG welcomes discussions and/or presentations of current theoretical, methodological, and/or empirical work on or of relevance to the study of social structure. Discussion of “early phase” research and preliminary findings are especially welcomed, as are presentations by students and newcomers to the field.

**UCI Social Network Research Group**  
[http://lakshmi.calit2.uci.edu/cnra/?page_id=205](http://lakshmi.calit2.uci.edu/cnra/?page_id=205)

**Social Dynamics and Complexity Research Group**  
[http://escholarship.org/uc/imbs_socdyn](http://escholarship.org/uc/imbs_socdyn)
III. GRADUATE TRAINING

A. Ph.D. 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 9 Ph.D. students, of whom 1 graduated this academic year. We are admitting 3 new MBS students fall quarter.

The following is our current roster of students enrolled in the Ph.D. program in Mathematical Behavioral Sciences during the current academic year. They are listed in Appendix F.

Kalin Agrawal
Calvin Cochran
Steven Doubleday
Santiago Guisasola
Lisa Guo
William Leibzon
*Tom McIntee
Bahattin (Tolga) Oztan
Dan Wolf

*Graduated in 2014-2015

B. Graduate Activities

While the formal part of our graduate program is small, the actual impact on the UCI graduate program is more extensive. This is because several graduate students from other programs participate on a regular basis with our weekly Friday lecture section, our Tuesday night open discussions, and our annual graduate conference. This past year the IMBS graduate students organized student meetings with weekly colloquia speakers. This gives students an opportunity to interact and network with professors. One of the goals is to gain insight into how students perceive IMBS and how to facilitate more involvement of the social science student body.

C. Weekly Research Presentations

Tuesday Evening Discussion

IMBS graduate student Steve Doubleday organized an hour long, Tuesday evenings, 6:00 – 7:00 p.m., discussion group for faculty and students. The schedule below illustrates the topics discussed:

<table>
<thead>
<tr>
<th>Date</th>
<th>Presenter</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 14</td>
<td>Dan Wolf, MBS and</td>
<td>Contests and Conflict and their Consequences</td>
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<tr>
<td></td>
<td>Steve Doubleday, MBS</td>
<td>Rules and Human Judgement</td>
</tr>
<tr>
<td>Date</td>
<td>Presenter</td>
<td>Title</td>
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<tr>
<td>October 21</td>
<td>Tomas McIntee, MBS</td>
<td>Emergence of complexity and how such topic as chaos theory, power law and even mandelbrot fractals may ultimately be related to it</td>
</tr>
<tr>
<td>October 28</td>
<td>Mac Strelioff, Cog Sci and Michael Sacks, MBS</td>
<td>Neural mechanism of decoy effect Information and knowledge: the impact on modeling</td>
</tr>
<tr>
<td>November 4</td>
<td>William Leibzon, MBS</td>
<td>What is complexity, and what is intelligence</td>
</tr>
<tr>
<td>November 18</td>
<td>Steve Doubleday, MBS</td>
<td>Long-standing ideas with what I've learned more recently: cognitive science findings, and some history of the physical sciences. Are we as effective we should be in the Social Sciences?</td>
</tr>
<tr>
<td>December 3</td>
<td>Ani Wodeyar, Cog Neur</td>
<td>Theoretic Measures of Neural Connectivity</td>
</tr>
<tr>
<td>December 9</td>
<td>Steve Doubleday, MBS</td>
<td>Feedback from previous week’s discussion on effective social science</td>
</tr>
<tr>
<td>January 6</td>
<td>Mac Strelioff, Cog Sci</td>
<td>An experiment addressing two cognitive explanations of consumer context effects</td>
</tr>
<tr>
<td>January 13</td>
<td>Steve Doubleday, MBS</td>
<td>What multiple studies across disciplines might look like (game theory, cog sci, linguistics, sociology, organizational theory).</td>
</tr>
<tr>
<td>January 20</td>
<td>Togla Oztan, MBS</td>
<td>A cross-cultural study of structured kin avoidance behavior.</td>
</tr>
<tr>
<td>February 3</td>
<td>Alexander,</td>
<td>User Experience (UX) research in HCI</td>
</tr>
<tr>
<td>February 10</td>
<td>William Leibzon, MBS</td>
<td>Origins of scale free and small world properties of human social networks</td>
</tr>
<tr>
<td>March 10</td>
<td>Bennett Holman, LPS</td>
<td>Exploration by industrial selection</td>
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</table>

**Friday Lunch Seminar**

This IMBS activity was coordinated by Stergios Skaperdas and Jean-Paul Carvalho and directed by graduate student and IMBS participant Michael Sacks. Weekly research meetings give space for graduate students and faculty to gather on Fridays from Noon- 1:00 p.m. in the Luce Conference Room to introduce research they are working on. The presentations are followed by discussion periods afterwards. Below is the list of the presentations for the year:
<table>
<thead>
<tr>
<th>Date</th>
<th>Presenter</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1</td>
<td>Susan Finkbeiner, Ecology and Evolutionary Biology</td>
<td>“Deconstructing visual signals in social butterflies”</td>
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<tr>
<td>October 17</td>
<td>Ian Finn, Economics</td>
<td>“Ties that bind: the political economy of coerced labor”</td>
</tr>
<tr>
<td>October 31</td>
<td>Roger Battle, Civil and Environmental Engineering</td>
<td>“Online mechanism design to urban traffic operations”</td>
</tr>
<tr>
<td>November 7</td>
<td>Jen Briner, Ecology and Evolutionary Biology</td>
<td>“Parasitic manipulation of host behavior: STDs and sex drive in Drosophila melanogaster”</td>
</tr>
<tr>
<td>November 14</td>
<td>Ashley Thomas, Cognitive Sciences</td>
<td>“Reward allocation in preschoolers”</td>
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<tr>
<td>November 21</td>
<td>Jerrod Anderson, Economics</td>
<td>“Religious Schisms”</td>
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<tr>
<td>December 5</td>
<td>Santiago Guisasola, MBS</td>
<td>“Talkin’ About Creativity”</td>
</tr>
<tr>
<td>December 12</td>
<td>Ryan Kendall, Ph.D., Economics</td>
<td>“Experimental Economics”</td>
</tr>
<tr>
<td>January 16</td>
<td>Hau Liu, Ph.D., Civil and Environmental Engineering</td>
<td>“A New Data Mining Technique and its Application on Water Resource Problems in California”</td>
</tr>
<tr>
<td>January 23</td>
<td>Kimberly Jameson, Associate Project Scientist, IMBS</td>
<td>“Do you see what I see? Investigating interpersonal comparisons of color experience”</td>
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<tr>
<td>January 30</td>
<td>Andrew Colopy, Political Science</td>
<td>“The Political Economy of Monopolistic Competition Under Asset Inequality”</td>
</tr>
<tr>
<td>February 27</td>
<td>Emily Smith, Sociology</td>
<td>“Multiplexity, Bridging, and Granovetter’s Entailment: Testing the Structure of US Job Lead Ties”</td>
</tr>
<tr>
<td>April 10</td>
<td>William Leibzon, IMBS</td>
<td>“Social Network of Software Developers in analysis of Open Source Projects Collaboration based on GitHub social data”</td>
</tr>
<tr>
<td>April 17</td>
<td>Michael Birnbaum, Professor of Psychology, Cal State Fullerton</td>
<td>“Empirical evaluation of third-generation prospect theory for the endowment effect and preference reversals”</td>
</tr>
<tr>
<td>May 1</td>
<td>Igor Kopylov, Associate Professor, Economics</td>
<td>“Costly Ambiguity and Variation AL Utility”</td>
</tr>
</tbody>
</table>
**D. Duncan Luce Graduate Student Conference**

IMBS sponsors a yearly graduate student conference where students in the MBS program, as well as other students whose research interests are related to MBS, present their research. The graduate organizers of the 13th Annual conference were Santiago Guisasola, Tomas McIntee, and Michael Sacks.

**Luce Graduate Student Conference**

**Friday, May 29, 2019**

9:00 a.m. – 5:00 p.m., SSPA 2112

<table>
<thead>
<tr>
<th>Session I: Social Chairs</th>
<th>Chair: Tomas McIntee</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 Paul Lombardi, Economics</td>
<td>&quot;Forecasting School Attendance with Income-based Shocks&quot;</td>
</tr>
<tr>
<td>9:30 Tolga Otzan, IMBS</td>
<td>&quot;Networks of Kin Avoidance&quot;</td>
</tr>
<tr>
<td>10:00 Lisa Guo, IMBS</td>
<td>&quot;A Dual-Process Model of Framing Effects in Risky Choice&quot;</td>
</tr>
<tr>
<td>10:30 Mid-session break</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Session II: Generalized Networks</th>
<th>Chair: Michael Sacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:40 Francis Lee, Sociology</td>
<td>&quot;Inferring the state of an unknown network by integrating error-prone measurements from multiple sources.&quot;</td>
</tr>
<tr>
<td>11:10 Dan Wolf, IMBS</td>
<td>&quot;Urbanization and Liberalization&quot;</td>
</tr>
<tr>
<td>11:40 Michael Bellato, Cognitive Sciences</td>
<td>&quot;Differentiating Endogenous Auditory Event Related Potentials Related Top-Down Feature Selectivity&quot;</td>
</tr>
<tr>
<td>12:10 Lunch</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Session III: Simulation from music to individuals</th>
<th>Chair: Michael Sacks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:10 Calvin Cochran, IMBS</td>
<td>&quot;Preliminary thoughts on the dynamics of a trading card game&quot;</td>
</tr>
<tr>
<td>1:40 William Leibzon, IMBS</td>
<td>&quot;Non-Euclidean Game Theory&quot;</td>
</tr>
<tr>
<td>2:10 Santiago Guisasola, IMBS</td>
<td>&quot;Listening in Improvisation: Experimental Music &amp; Science&quot;</td>
</tr>
<tr>
<td>2:40 Inter-session break</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Session IV:</th>
<th>Chair: Santiago Guisasola</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:00 Cole Williams, Economics</td>
<td>&quot;Endogenous Group Identification&quot;</td>
</tr>
<tr>
<td>3:30 Tomas McIntee, IMBS</td>
<td>&quot;Generalized Duverger Dynamics&quot;</td>
</tr>
<tr>
<td>4:00 Jen Briner, Ecology &amp; Evolutionary Biology</td>
<td>&quot;Strategic reproductive effort in Drosophila melanogaster: A life history perspective&quot;</td>
</tr>
<tr>
<td>4:30 Closing remarks with cake and wine reception</td>
<td></td>
</tr>
</tbody>
</table>

27
E. Jean-Claude Falmagne Dissertation Award

Each year, the IMBS presents 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 committee presented Heidi Tucholski, a 2014 graduate of MBS, for her dissertation, “Incentivized Decisions in the U.S. Air Force: Stepping Back to look at the Big Picture”.

This year the committee selected two dissertations and co-awards were presented to Tomas McIntee, a 2015 graduate of MBS, for his dissertation, “Geometric Ways of Understanding Voting Problems,” and Blake Allison, a 2015 graduate of Economics, for his dissertation, “Essays on Competition and Conflict.” Both McIntee and Allison have accepted positions that have them heading east. Tomas McIntee, who received his doctorate in mathematical behavioral sciences, has taken a position at Virginia Tech. Blake Allison, a Ph.D. recipient in economics, heads to Georgia’s Emory University as an assistant professor of economics.

CONGRATULATIONS!

IV. COMMUNICATION

A. IMBS Conferences

The director’s statement expanded on the areas of interest for this year’s research conferences. We are providing the following conference agendas to give a more in-depth look at the scope of our presentations.
**INSTITUTE FOR MATHEMATICAL AND BEHAVIORAL SCIENCES**

"VALIDATION. WHAT IS IT?"

SSPA 2112, DUNCAN LUCE CONFERENCE ROOM
February 13, 1:00 – 5:00 p.m. & February 14, 9:15 a.m. – 5:00 p.m.

<table>
<thead>
<tr>
<th>Friday, February 13, 2015</th>
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<tbody>
<tr>
<td>1:00 pm – 1:15 pm</td>
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<th>Saturday, February 14, 2015</th>
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**UC IRVINE INSTITUTE FOR MATHEMATICAL AND BEHAVIORAL SCIENCES &**
**CHAPMAN UNIVERSITY INSTITUTE FOR THE STUDY OF RELIGION, ECONOMICS, AND SOCIETY**

**WORKSHOP ON THE ECONOMICS OF RELIGION AND CULTURE**

**FRIDAY, MAY 8, 10:00 AM – 5:00 PM**
**DUNCAN LUCE CONFERENCE ROOM, SSFA 2112**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker/Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 am to 10:15 am</td>
<td>Welcome, Mike McBride, UC Irvine, Department of Economics</td>
</tr>
<tr>
<td>10:15 am to 11:00 am</td>
<td>Jared Rubin, Chapman University, <em>Endogenous Political Legitimacy: The English Reformation and Institutional Foundations of Limited Government</em></td>
</tr>
<tr>
<td>11:00 am to 11:45 am</td>
<td>Saumitra Jha, Stanford University, <em>Voting for Peace in A Conflict Zone: The Effects of Exposure to Financial Markets</em></td>
</tr>
<tr>
<td>12:00 pm to 1:30 pm</td>
<td>Lunch Break</td>
</tr>
<tr>
<td>1:45 pm to 2:30 pm</td>
<td>Sascha Becker, University of Warwick, <em>Social Cohesion Religious Beliefs, and the Effect of Protestantism on Suicide</em></td>
</tr>
<tr>
<td>2:30 pm to 3:15 pm</td>
<td>Ran Abramitzky, Stanford University, <em>The Mystery of the Kibbutz: How Egalitarian Principles Survived in a Capitalist World</em></td>
</tr>
<tr>
<td>3:15 pm to 3:30 pm</td>
<td>Break</td>
</tr>
<tr>
<td>3:30 pm to 4:15 pm</td>
<td>Michael Sacks, UC Irvine, <em>Economic Development and Community: Lessons from Jewish Emancipation in 19th Century Europe</em></td>
</tr>
<tr>
<td>4:15 pm to 5:00 pm</td>
<td>Discussion</td>
</tr>
</tbody>
</table>
B. Conferences/Seminars Organized By IMBS Members

Carter Butts

Co-organizer and instructor, 2015 statnet workshops (in conjunction with Sunbelt 2015), June 2015, Brighton, UK.

I ran a four day lab rotation workshop for students in the Chemistry and Materials Physics (ChaMP) program. This entailed hands-on training in the use of Ising models, exponential family random graph models (ERGMs), and Markov chain Monte Carlo methods. Exercises included simulating the impact of alternative material structures on the properties of ferromagnets, fitting and simulating ERGMs for social and other networks, and using ERGMs to model hydrogen bond networks in liquid water, September 2014.

Jean-Paul Carvalho


Co-organizer, Friday Lunch Seminar, IMBS.

Faculty discussant, IRES Graduate Workshop, Chapman University.

David Eppstein

Program co-chair for SIAM Meeting on Algorithm Engineering & Experiments (ALENEX), January 2015, San Diego.

Steering committee member for the International Symposium on Graph Drawing and for the Symposium on Computational Geometry.

Simon Huttegger

Organizer, Workshop, "Topics in Inductive Logic" UC Irvine, March 2015.

L. Robin Keller

Decision Analysis Society of INFORMS: 50-Year Celebration Program Committee Meeting, November 2014.

Decision Analysis Affinity Group (DAAG) Conference Steering Committee, Huntington Beach, Spring 2015.
Louis Narens


Don Saari


James Weatherall


Doug White


C. Visitors

IMBS 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 continue work with Professor Kim Romney, Sean Tauber will continue work with Project Scientist Kimberly Jameson, and Robert Forbes will continue work with Professor Louis Narens.

D. IMBS Colloquia Series

During the academic year the Institute conducts a weekly colloquia series with speakers from both 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 and to co-sponsor joint talks with other research units. We distribute a relevant paper, when available, prior to each
The following talks were presented in the IMBS Luce Conference Room during the 2014-2015 academic year:

**OCTOBER 9**  
EHTIBAR DZHAFAROV  
Professor of Psychological Sciences  
Purdue University  
“Probabilistic Contextuality of Top Direct Cross-Influences: A General Theory”

**OCTOBER 16**  
MICHAEL BIRNBAUM  
Professor of Psychology  
CSUF  
“Testing a Class of Models that Includes Majority Rule and Regret Theories: Transitivity, Recycling, and Restricted Branch Independence”

**OCTOBER 23**  
JEAN-PIERRE FOUQUE  
Director, Center for Financial Mathematics and Actuarial Research  
UCSB  
“Mean Field Games and Systemic Risk”

**OCTOBER 30**  
JOHN DUFFY  
Professor of Economics  
UCI  
“Stochastic Asymmetric Blotto Games: Theory and Experimental Evidence”

**NOVEMBER 6**  
ZHILAN FENG  
Co-sponsored with CAM  
Professor of Mathematics  
Purdue University  
“Emerging disease dynamics in a model coupling with-in and between-host systems”

**NOVEMBER 13**  
SEAN FULOP  
Professor of Linguistics  
Fresno State University  
“Unification as a cognitive process for language acquisition”

**NOVEMBER 20**  
JEAN-PAUL CARVALHO  
Professor of Economics
UCI
“Identity Based Organizations”

DECEMBER 4
CHRIS FIELDS
Independent Scientist, Sonoma, CA
“Quantum theory from a simple symmetry”

JANUARY 8
EDO GALLO
University Lecturer
University of Cambridge
“Efficiency and equilibrium in network games: An Experiment ”

JANUARY 22
JAY SIMON
Assistant Professor
Naval Post Graduate School
“Altruistic preference theory”

JANUARY 29
CARL BERGSTROM
Professor of Biology
University of Washington
“Optimal learning produces maladaptive anxiety in a subset of learners”

FEBRUARY 5
NATALIA KOMAROVA
Professor of Mathematics
UC Irvine
“Mathematical modeling of learning from an inconsistent source”

FEBRUARY 19
SIMON LEVIN
Professor of Biology
Princeton University
“Dealing with public goods and common-pool resources”

FEBRUARY 26
BILL BRANCH
Professor of Economics
UC Irvine
“Bounded Rationality and Trading Inefficiencies”

MARCH 5
IGOR KOPYLOV
Associate Professor of Economics
UC Irvine
“Comparative Ignorance and Unawareness”

MARCH 12
ANDREW NOYMER
Associate Professor, Public Health
UC Irvine
“What levels of vaccination are necessary for measles control and eradication: A mathematical model of measles transmission in developing countries”
Joint with Katelyn Corey (UCI)

APRIL 2
SIMONE CERREIA VIOLGIO
Assistant Professor
Università Bocconi
“Stochastic Dominance Analysis without the Independence Axiom”

APRIL 13
SVEN MÜLLER
Lecturer (Privatdozent)
University of Hamburg
“OR Practice: Pilgrim Scheduling for Public Safety during the Hajj”

APRIL 23
IGOR KOPYLOV
Associate Professor
UC Irvine
“Comparative Ignorance and Unawareness”

APRIL 30
DRAZEN PRELEC
Professor
MIT
“Opinion aggregation when truth is unverifiable: The meta-prediction approach”

MAY 7
RAN ABRAMITZKY
Associate Professor
Stanford University
“Cultural Assimilation during the Age of Mass Migration”

MAY 14
MICHAEL ORRISON
Professor of Mathematics
Harvey Mudd College
“Generalized Condorcet Winners”
MAY 21
SIMON HUTTEGGER
Associate Professor, Logic and Philosophy of Science
UC Irvine
“Inductive learning in small and large worlds”

JUNE 4
RALPH KEENEY
Research Professor Emeritus
Duke University
“Understanding and Applying the Group Decision Analysis Model”

V.  BUDGET

A.  Appropriations and Expenditures

Appropriations:

<table>
<thead>
<tr>
<th>Appropriation</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMBS 2014-15 Budget allocation</td>
<td>$90,000.00</td>
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<tr>
<td>IMBS 2013 Carry Forward</td>
<td>$9,672.00</td>
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<tr>
<td>Visitor Allocation</td>
<td>$26,245.00</td>
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<tr>
<td><strong>Total budget for 2014-15:</strong></td>
<td><strong>$125,917.00</strong></td>
</tr>
</tbody>
</table>

Expenditures:

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Salaries (Director, Administrator, Visitor)</td>
<td>$70,363.10</td>
</tr>
<tr>
<td>School Administrative Support</td>
<td>$7,500.00</td>
</tr>
<tr>
<td>Conference/Colloquia</td>
<td>$23,853.65</td>
</tr>
<tr>
<td>IMBS Seed Grants</td>
<td>$6,700.00</td>
</tr>
<tr>
<td>Supplies &amp; Expenses</td>
<td>$5,414.00</td>
</tr>
<tr>
<td>Graduate Student Support</td>
<td>$12,086.89</td>
</tr>
<tr>
<td><strong>Total Expenditures:</strong></td>
<td><strong>$125,917.00</strong></td>
</tr>
</tbody>
</table>

Closed fiscally solvent
B. Extramural Funding Activity

GRANTS AWARDED AND ACTIVE:

IMBS faculty research was supported by research grants totaling $49,395,913 with pending grants totaling $4,184,278. The following is a detailed breakdown of the extramural funding:

William H. Batchelder

Source: John Templeton Foundation  
Amount: $54,019  
Award Period: 2014-2017  
Title: A Formal Modeling Framework for the Dynamics of Subjective Well-being, including Satisfaction, with Interpersonal Relationships  
Role: Senior Researcher

Source: Renewal from Oak Ridge Institute for Science and Education (ORISE)  
Amount: $75,000  
Award Period: 2013-2014  
Title: Work with Dr. Michael Young in the U.S. Research Lab at Wright Patterson Air Force Base  
Role: Research Fellowship

Pending

Source: NSF  
Amount: $299,787  
Award Period: 2015-2018  
Title: Statistical Extensions and new Application of Cultural Consensus Theory  
Role: PI (Pending)

Source: NSF  
Amount: $99,860  
Title: A Web Based Tool for Peer Evaluation  
Role: Co-PI

Carter Butts

Source: ARO  
Amount: $153,479  
Award Period: 2014 – 2015  
Title: Advancing Statistical Methods for Analysis of Multiple Networks  
Role: PI
Source: NSF DMS
Amount: $1,308,441
Award Period: 2014 – 2018
Title: Bayesian Methods for Protein Fibrillization: Model Integration and Network Dynamics
Role: PI and Martin, Rachel W. (Co-PI)

Source: NSF IIS
Amount: $746,783
Award Period: 2013 – 2016
Title: BIGDATA: Small:DA DCM: Measurement and Learning Large-Scale Social Networks
Role: Co-PI and Anandkumar, Anima (PI)

Source: NIH NIDA
Amount: $402,820
Award Period: 2012 – 2015
Title: Cas Cascades of Network Structure and Function: Pathways to Adolescent Substance Use
Role: Co-Investigator with Lakon, Cynthia M. (PI); Butts, Carter T. (Co-Investigator); Hipp, John R. (Co-Investigator); Timberlake, David (Co-Investigator)

Source: NIH NICHD
Amount: $3,092,315
Award Period: 2011 – 2016
Title: Statistical Methods for Network Epidemiology
Role: Co-Investigator with Morris, Martina (PI); Steven M. Goodreau (Co-Investigator); Hunter, David (Co-Investigator); Bender-deMoll, Skye (Co-Investigator); and Krivitsky, Pavel (Co-Investigator)

Source: NSF OIA
Amount: $2,152,181
Award Period: 2010 – 2016
Title: CDI-Type II: Topology and Function in Computer, Social and Biological Networks
Role: Co-PI with Markopoulou, Athina (PI); Przulj, Natasa (Co-PI)

Source: NSF CMMI
Amount: $404,948
Award Period: 2010 – 2014
Title: Collaborative Research: Informal Online Communication in Extreme Events: Content, Dynamics, and Structure
Role: PI

Source: ONR
Amount: $5,381,300
Award Period: 2008 – 2015
Title: Scalable Methods for the Analysis of Network-based Data
Role: Co-PI with Smyth, Padhraic (PI); Eppstein, David (Co-PI); Goodrich, Michael T. (Co-PI); Handcock, Mark S. (Co-PI); Hunter, David R. (Co-PI); Mount, David (Co-PI)

Pending:
Source: NSF CMMI
Amount: $450,000
Title: Collaborative Research: Online Hazard Communication in the Terse Regime: Measurement, Modeling, and Dynamics
Role: PI

Source: NSF IIS
Amount: $500,000
Title: III: NeTS: Small: Network Sampling and Construction Methods for Inference and Anonymization
Role: Co-PI with Markopoulou, Athina (PI)

Source: NSF IIS
Award Amount: $2,000,000
Title: BIGDATA: F: IA: N-body Algorithms for Mobile and Relational Data at Scale
Role Co-PI with Markopoulou, Athina (PI); Chandramowlishwaran, Aparna (Co-PI);

Jean-Paul Carvalho

Source: IMBS Seed Grant
Award Amount: $2500
Award Period: 2015-2016
Title: Coordination and Constraint
Role: PI

Source: UCI Research and Travel Funds Award
Award Amount: $1100
Award Period: June 2015
Role: PI

David Eppstein

Source: NSF
Amount: $388,861
Award Period: 2012-2016
Title: Geometric Graph Algorithms
Role: PI
Steve Frank

Source: NSF
Award Amount: $166,000
Award Period: 2016-2017
Title: OPUS: The common patterns of nature
Role: PI

Source: NSF
Award Amount: $270,000
Award Period: 2013–2017
Title: Models of Natural Selection, Development, and Life History
Role: PI

Kimberly Jameson

Source: Private Donations
Award Amount: $65,000
Award Period: 2015
Title: Clinical and Behavioral Investigations of Human hotpigment Opsin Gene Variations and Age-related Macular Degeneration
Role: PI with C.M. Kenney (Co-PI)

Source: NSF
Award Amount: $980,923
Award Period: 2014–2017
Title: IBSS: New methods for investigating the formation of individual and shared concepts and their dynamic dispersion across related societies
Role: PI with N. Komarova (Co-PI), D. Wodarz (Co-PI), L. Narens (Co-PI)

Source: Pacific Rim
Award Amount: $46,616
Award Period: 2011–2015
Title: Faculty initiative grant: Investigating concept formation and the linguistic processing of natural categories across Pacific Rim ethnolinguistic groups
Role: PI

Marek Kaminski

Source: Center for the Study of Democracy
Award Amount: $2,500
Award Period: 2015
Title: CSD Seed Grant
Role: PI

**Natalia Komarova**

Source: IMBS Seed Grant  
Award Amount: $2,500  
Award Period: 2015-2016  
Title: Quantifying the Evolution of Music  
Role: Investigator

Source: NIH  
Award Amount: $2,249,999  
Award Period: 2014 – 2019  
Title: Aspirin and Cancer Prevention in Lynch Syndrome: From Cell to Population Data  
Role: Co-PI (with PIs D. Wodarz and D. Levy)

Source: NSF  
Award Amount: $980,923 (calculated with Jameson’s award)  
Award Period: 2014-2017  
Title: IBSS: New methods for investigating the formation of individual and shared concepts and their dynamic dispersion across related societies  
Role: Co-PI, (with PI K. Jameson, Co-PIs D. Wodarz and L. Narens)

Source: NIH  
Award Amount: $1,211,630  
Award Period: 2011 – 2015  
Title: Virus Dynamics and Multiple Infection of Cells  
Role: Co –PI (with PIs D. Wodarz and D. Levy)

**Igor Kopylov**

Source: IMBS Seed Grant  
Award Amount: $1,700  
Award Period: 2015-2016  
Title: Subjective Model Uncertainty and Second Model Uncertainty and Second-Order Beliefs  
Role: Investigator

**Michael Lee**

Source: NSF  
Award Amount: $182,000  
Award Period: 2013–2015  
Title: Classifying categorization using state trace analysis and hierarchical Bayesian modeling
Role: Co-PI (subcontract)

**Louis Narens**

Source: NSF  
Award Amount: $980,923 (calculated with Jameson’s award)  
Award Period: 2014 – 2017  
Title: IBSS: New methods for investigating the formation of individual and shared concepts and their dynamic dispersion across related societies  
Role: Co-PI, (with PI K. Jameson, Co-PIs D. Wodarz and N. Komarova)

Source: AFOSR  
Award Amount: $388,187  
Award Period: 2012 – 2015  
Title: Modeling Behavioral and Decision Behavior through Systems of Observers  
Role: PI

**Michael McBride**

Source: UCI Center for the Study of Democracy Seed Grant  
Award Amount: $2,500  
Award Period: 2015  
Title: Research Assistance for the Study of Choice Blindness and Ethical Reversals  
Source: PI

Source: UC Connect Faculty Research Grant  
Award Amount: $138,586  
Award Period: 2014 – 2015  
Title: Experimental Studies for Traffic Incident Management  
Role: Co-PI

Source: NSF  
Award Amount: $4,600,000  
Award Period: 2013 – 2019  
Title: Low Energy Options for Making Water from Wastewater  
Role: Co-PI

Source: Army Research Office  
Award Amount: $3,750,000 (total); $340,275 (sub award)  
Award Period: 2011 – 2016  
Title: Scalable, Stochastic and Spatiotemporal Game Theory for Real-World Human Adversarial Behavior  
Role: Co-PI
Source: United States Air Force Office of Scientific Research
Award Amount: $7,500,000 (total); $291,718 (sub award)
Award Period: 2010 – 2015
Title: Inferring Structure and Forecasting Dynamics on Evolving Networks
Role: Co-PI

**Louis Narens**

Source: NSF
Award Amount: $980,923.00 (calculated with Jameson’s award)
Award Period: 2014-2017
Title: IBSS: New methods for investigating the formation of individual and shared concepts and their dynamic dispersion across related societies
Role: Co-PI with K. Jameson (PI), N. Komarova (Co-PI), D. Wodarz (Co-PI)

Source: AFOSR
Award Amount: $388,187
Award Period: 2012– 2016
Title: Modeling Behavioral and Decision Behavior through Systems of Observers
Role: PI

**Lisa Pearl**

Source: UCI School of Social Sciences Associate Professor Research Award
Award Amount: $5,000
Award Period: 2015
Title: Deeper linguistic features for automatic detection of opinion spam
Role: PI

Source: NSF
Award Amount: $375,000 (total); $142,000 (UCI)
Award Period: 2014 – 2017
Title: Collaborative Research: An Integrated Theory of Syntactic Acquisition
Role: PI

Source: NSF, SBIR Phase I
Award Amount: $150,000 (total); $18,542 (UCI)
Award Period: 2015
Title: Deep Linguistic Features for Automated Text Analysis
Role: PI (pending)
Hal Stern

Source: National Institute of Standards and Technology (NIST)
Award Amount: $20,000,000
Award Period: June 2015 – May 2020
Title: Center of Excellence in Forensic Statistics
Role: Co-PI and PI of UC Irvine subcontract ($3,700,000); A. Carriquiry, PI

Source: National Institutes of Mental Health – NIMH Conte Center
Award Amount: $10,000
Award Period: 2013 – 2018
Title: Fragmented Early Life Environment and Cognitive and Emotional Vulnerabilities,
Role: Co-PI and Head of Biostatistics Computation and Data Management Core, T. Baram, PI

James Weatherall

Source: NEH
Award Amount: $21,991
Award Period: 2014 – 2017
Title: What is Time? Perspectives from Physics, Philosophy, Fiction, and Film, NEH Big Questions Course Development Grant
Role: PI

Source: NSF
Amount: $221,590
Award Period: 2013 – 2016
Title: A Theoretical Study of the Conceptual, Mathematical, and Explanatory Interconnections at the Foundations of Classical Field Theories
Role: PI

Source: NSF Interdisciplinary Behavioral and Social Science Research Team Exploratory Grant
Award Amount: $249,928
Award Period: 2013-2015
Title: Comprehending and Regulating Financial Crises
Role: Co-PI with N. Bandelj, J. Elyachar, and G. Richardson

Jack Xin

Source: NSF
Award Amount: $419,691
Award Period: 2012 – 2016
Title: Reaction-Diffusion Front Speeds in Chaotic and Stochastic Flows
Role: PI
Source: NSF
Award Amount: $451,109
Award Period: 2012 – 2015
Title: Blind and Template Assisted Source Separation Algorithms with Applications to Spectroscopic Data
Role: PI

Source: NSF-PRISM
Award Amount: $1,950,568
Award Period: 2009 – 2015
Title: PRISM: UCI Interdisciplinary Com-putational and Applied Mathematics Program
Role: PI, with Co-PIs: H-K Zhao, S. Eichhorn, A. Ihler, M. Welling

Hongkai Zhao

Source: NSF
Award Amount: $238,860
Award Period: 2014 – 2017
Title: Shape and data analysis using computational differential geometry
Role: PI

Pending:

Source: NSF
Award Amount: $816,089
Award Period: 2016 – 2019
Title: BIGDATA:F: Theory and practice for exploiting deterministic structures of probability models in big data analysis
VI. APPENDICES

A. CURRENT FACULTY MEMBERS

APPENDIX A
IMBS FACULTY, 2014-2015

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 and Professor of Logic and Philosophy of Science, University of California, Irvine. Research areas: Philosophy of science; theory of knowledge; philosophy of physics.


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.


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


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.


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.


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. Dosher, (Ph.D. Experimental Psychology, University of Oregon). NAS Member, Distinguished Professor of Cognitive Sciences, School of Social Sciences, University of California, Irvine. Research areas: Memory, visual perception, depth from visual motion.


David A. Eppstein, (Ph.D. Computer Sciences, Columbia University). Chancellor’s 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.

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) Professor Emeritus of Sociology, University of California, Irvine. Research areas: Cognition of social structure, social networks.


Bernard Grofman, (Ph.D. Political Science, University of Chicago). Jack W. Peltason Endowed Chair, Professor of Political Science; Past 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 and Associate Professor of Logic and Philosophy of Science 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 Management, Paul Merage School of Business, University of California, Irvine. Research areas: Individual decision making, risk analysis, fairness, probability judgements, decision problem structuring.

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


Simon Asher Levin, (Ph.D. Mathematics, University of Maryland). NAS Member, Director, Center for BioComplexity, George M. Moffett 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 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). Professor of Economics, University of California, Irvine. Research areas: Microeconomics, game theory, and political economy.

Anthony McGann, (Ph.D. Political Science, Duke University). Professor in the School of Government and Public Policy, University of Strathclyde, Glasgow, Scotland. Research Areas: Party systems, democratic theory, formal models of political systems, European government

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.

Calin O’Conner, (Ph.D. Philosophy, University of California, Irvine) Assistant Professor of Logic and Philosophy of Science, University of California, Irvine. Research Areas: Philosophy of biology, philosophy of science, and evolutionary game theory.

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). Associate 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, Emeritus 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). NAS Member, Distinguished Professor of Mathematics and Economics, and Director of the 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). Clifford S. Heinz Chair, 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.


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). Professor of Cognitive Sciences, University of California, Irvine. Research areas: Perception, development and cortical dynamics.

Hal Stern, (Ph.D. Statistics, University of California, Irvine). Ted and Janice Smith Family Foundation Endowed Chair in Information and Computer Science, Dean and Professor of Information and Computer Science, 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.
Joachim Vandekerckhove, (Ph.D. Psychology, University of Leuven, Belgium) Assistant Professor of Cognitive Sciences, University of California, Irvine. Research areas: Response time modeling – Psychometrics- Computational methods – Bayesian statistics.

James Weatherall, (Ph.D. Philosophy, University of California, Irvine). Associate 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.


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-coding(s).


Sean Tauber (Ph.D. Psychology, University of California, Irvine) Assistant Project Scientist, University of California, Irvine. Research areas: Mathematical psychology, computer modeling of psychological phenomena, evolutionary game-theoretic algorithms.
## B. SCIENTIFIC PUBLICATIONS

### APPENDIX B

<table>
<thead>
<tr>
<th>SCIENTIFIC PUBLICATIONS OF IMBS MEMBERS, 2014-15</th>
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**William Batchelder**


**John Boyd**


**Bill Branch**


**Jan Brueckner**


**Carter Butts**


http://www.jstatsoft.org/v64/i05

Smith, Emily J.; Marcum, Christopher S.; Boessen, Adam; Almquist, Zack W.; Hipp, John R.; Nagle, Nicholas N.; and Butts, Carter T. (2015). The Relationship of Age to Personal Network


**David Eppstein**


**Steve Frank**


**Michelle Garfinkel**


**Simon Huttegger**


Huttegger, S.M. (2015). Bayesian Convergence to the Truth and the Metaphysics of Possible Worlds. Accepted for publication in *Philosophy of Science*.


Huttegger, S.M, Bruner, J.B., and Zollman, K. J. S. (2015). The Handicap Principle is an Artifact. Accepted for publication in *Philosophy of Science*.


**Kimberly A. Jameson**


**Marek Kaminski**


**L. Robin Keller**

**Journal articles (peer-reviewed)**

Lindsey E Minion, MD (Univ. of Arizona Cancer Center & Creighton University at St. Joseph’s Hospital and MedicaCenter, Phoenix); Jiaru Bai (Merage doctoral student); Bradley J Monk, MD (Gynecologic Oncology, UCI); L. Robin Keller, PhD; Ramez N Eskander, MD (Gynecologic Oncology, UCI); Gareth K Forde, MD, PhD, MBA (Gynecologic Oncology, UCI) ; John K Chan, MD (California Pacific Palo Alto Medical Foundation, Sutter Cancer Institute, San Francisco), Krishnansu S. Tewari (Gynecologic Oncology, UCI), “A Markov Model to Evaluate Cost Effectiveness of Antiangiogenesis Therapy Using Bevacizumab in Advanced Cervical Cancer”, *Gynecologic Oncology*, 137 (3), June 2015, 490-496. Accepted 2-28-2015. Available online on 10 March 2015. [http://www.sciencedirect.com/science/article/pii/S0090825815006769#](http://www.sciencedirect.com/science/article/pii/S0090825815006769#).

**Chapters in Books**


**Working papers**

L. Robin Keller and Yitong Wang, “Framing Matters”, Jan. 2015, invited paper- to be reviewed- to expand on one area among the "Ten most important accomplishments in risk analysis, 1980-2010,"

May 2012, *Risk Analysis*, on "recognizing the personal decisions reflect different processes for evaluating and combining anticipated and actual losses, games, delays and surprises," invited by Editor-in-Chief Michael Greenberg to write this contribution.
Shijian Wang (graduate student of marketing, kasano@sjtu.edu.cn), Liangyan Wang (Merage alumna and Associate Professor of Marketing, Antai Management School, Shanghai Jiao Tong University, Shanghai, 200052, WLY@sjtu.edu.cn), L. Robin Keller, Jie Li (Assoc. Prof. of Market., Antai Mgt Sch.), “Exploring the Effects of Consumers’ Thinking Styles on Their Reactions to Corporate Strategic Response to a Brand Crisis”, March 2015.

Xiaona Zheng (former UCI doctoral student, graduated from Duke, Assoc. Prof., Peking University, xzheng@gsm.pku.edu.cn), Luping Sun (Business School at Central University of Finance and Economics, angelsunluping@163.com), Meng Su (Peking University, sumeng@gsm.pku.edu.cn), L. Robin Keller. “The Role of Brand Origin and Product Knowledge on Intention-Behavior Discrepancy: Evidence from China”, March 2015.

Natalia Komarova


lymphocytic leukemia (CLL). Proceedings of the National Academy of Sciences 111(38), 13906-13911.

**Igor Kopylov**


**Michael Lee**


**Simon Levin**

**Peer-Reviewed & Other Publications**


**2014 Peer-Reviewed & Other Publications**


Thompson, S.E., Levin, S., and I. Rodríguez-Iturbe. 2014. Rainfall and temperatures changes have confounding impacts on Phytophthora cinnamomi occurrence risk in the southwestern USA under climate change scenarios. *Global Change Biology* 20: 1299-1312.


Penelope Maddy


Maddy, P. (2014). ‘Foreword’ and ‘Afterword’ With Michael Ernst, Jeremy Heis, Bennett McNulty and James Weatherall) to a special issue of *Philosophia Mathematica* (June 2015) on the topic of Mathematical Depth. (Papers from an LPS workshop on this topic in April of 2014.)

Michael McBride

Louis Narens


Cailin O'Connor


Lisa Pearl


**Dale Poirier**


**Donald Saari**


**Stergios Skaperdas**


**Brian Skyrms**


Hal Stern


Rein Taagepera


Carole Uhlaner


James Weatherall


Weatherall, J. “Regarding the `Hole Argument'.” The British Journal for Philosophy of Science (forthcoming).


**Douglas White**


**Jack Xin**


Hongkai Zhao


## C. TECHNICAL REPORT SERIES

### APPENDIX C

IMBS TECHNICAL REPORTS, 2014-15

<table>
<thead>
<tr>
<th>MBS 15-01</th>
<th>Colorisms: A python package for evolving linguistic color naming conventions within a population of simulated agents</th>
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<td>Sean Tauber</td>
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<th>MBS 15-02</th>
<th>Modeling Decisions Involving Ambiguous, Vague, or Rare Events</th>
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<td>Louis Narens and Donald Saari</td>
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<th>MBS 15-03</th>
<th>On replacing “Quantum Thinking” with Counterfactual Reasoning</th>
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<th>MBS 15-04</th>
<th>Basis for Binary Comparisons and Non-Standard Probabilities</th>
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<td>Donald Saari</td>
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<th>MBS 15-05</th>
<th>Strategic and Behavioral Decomposition of Games</th>
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<td>Daniel Jessie and Donald Saari</td>
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<th>MBS 15-06</th>
<th>Decomposing Models of Bounded Rationality</th>
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<td>Daniel Jessie and Ryan Kendall</td>
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D. FACULTY PRESENTATIONS

APPENDIX D
COLLOQUIA AND CONFERENCES OF IMBS MEMBERS, 2014-15

William Batchelder


Bill Branch

Workshop on Expectations in Dynamic Macroeconomics, Bank of Finland, August 2014.

Southwest Search and Matching Workshop, U.C. Riverside, October 2014.


**Jan Brueckner**

ITEA Conference on Transportation Economics, Oslo, June 2015.


OPTION Conference, Tinbergen Institute, Amsterdam, April 2015.

University of Nevada, Reno, April 2015.

University of Georgia, March 2015.

University of Geneva, February 2015.

University of Lausanne, February 2015.

American Real Estate and Urban Economics Association Meetings, Boston, January 2015.

Syracuse University, December 2014.

Cornell University, December 2014.

Regional Science Association International Meetings, Bethesda, November 2014.

University of Alberta, October 2014.
Carter Butts


Yu, Yue; Gibson, C. Ben; and Butts, Carter T. (6/2015). “How to Know When Your Partner's Sleeping Around: Imputing Concurrency in Dynamic Sexual Contact Networks.” 35th International Sunbelt Social Network Conference (INSNA), Brighton, UK.

Cici, Blerim; Markopoulou, Athina; Gjoka, Minas; and Butts, Carter T. (4/2015) “Seasonal Decomposition of Cell Phone Activity Series and Urban Dynamics.” NetMob 2015, Boston, MA.


Jean-Paul Carvalho

“Identity-Based Organizations”, Nuffield College, University of Oxford. 26 October 2014.

“Identity-Based Organizations”, University of Leicester. 29 October 2014.

“Identity-Based Organizations”, IMBS, UC Irvine. 20 November 2014.

“Identity-Based Organizations”, University of Western Australia. 2 December 2014.

“Identity-Based Organizations”, ASREC Conference, Boston. 21 March 2015.


David Eppstein

“Flat foldings of plane graphs with prescribed angles and edge length”, contributed talk, Graph Drawing, 2014, Würzburg, Germany.

“Planar induced sub-graphs of sparse graphs”, contributed talk, Graph Drawing, 2014, Würzburg, Germany.


Steve Frank

“Measurement invariance hierarchy and the relations between common probability distributions”, Santa Fe Institute, May 2014.

“Measurement scale and dissipation of information shape biological pattern”, March 2014.

Three invited talks at Mathematical Biology meetings in Osaka Japan, July 28- August 1, 2014.


“Three Conjectures on Organismal Design”, IST Austria, June 2015.

Michelle Garfinkle

“Trading with the Enemy: Could the Classical Liberals be Right?” ASSA, January 2015.

Simon Huttegger

“Analogical Inference in Inductive Logic”, IMBS, UC Irvine, June 2015.

“Inductive Learning in Small and Large Worlds”, University of Salzburg, April 2015.

“Cheaper Than Costly Signals: Experimental Evidence on Signaling Games”, UC Merced, April 2015.


“Convergence to the Truth and the Metaphysics of Possible Worlds”, Kansas State University, March 2015.

“How to Measure Phenotypic Variation”, PSA meeting in Chicago, November 2014.

“The Handicap Principle is an Artifact”, PSA meeting in Chicago, November 2014.

Kimberly A. Jameson


Marek Kaminski


“25 years after the fall of communism”, Adam Smith Center, Warsaw, July 2014.

L. Robin Keller


L. Robin Keller (poster presenter), with Tianjun Feng (UCI Merage doctoral alumnus, Associate Professor at Fudan University), Ping Wu (Fudan University), Yifan Xu (Fudan University), “An Empirical Study of the Toxic Capsule Crisis in China: Risk Perceptions and Behavioral Responses”, Society for Risk Analysis, Dec. 7-10, 2014, Denver.


L. Robin Keller also attended the Decision Analysis Affinity Group (DAAG) conference and the INFORMS Analytics conference, Spring 2015, Huntington Beach.

**Natalia Komarova**


Biomathematics Symposium to honor of Dr. Carol Newton, UCLA. March 2015.

Mathematical Approaches to Breast Cancer Initiation and Dormancy meeting, Bethesda.

ETH Zurich, Basel, Switzerland. December 2014


Ecology and Evolution of Cancer, MBI, Columbus, Ohio. September 2014.


**Igor Kopylove**


“Comparative Ignorance and Context Dependent Beliefs”, Robustness Conference, UC Santa Barbara, March 2015.

“Subjective Probability, Confidence, and Robustness”, IMBS, UC Irvine, January 2015.


**Michael Lee**


“Some advantages of Bayesian approaches for analyzing psychological models and data”, UCLA, January 2015.

“Cognitive modeling and the wisdom of the crowd“, CMU, January 2015.
Simon Levin


“Channeling Luca Pacioli: Multi-Disciplinarity and a Sustainable Future,” Lecture Given on Receiving the Luca Pacioli Prize, Ca’Foscari University of Venice, Italy (March 2015).


“Microscopic Processes and Macroscopic Patterns” (with Juan Bonachela, University of Strathclyde, Scotland), Advances in the Plankton Ecosystem Model and the Evaluation of Biodiversity, Tokyo University of Marine Science and Technology, Shinagawa Campus (October 2014).


“Obstacles and Opportunities in Environmental Management,” IIASA-Austrian Academy Lecture Series, IIASA, Laxenburg, Austria (November 2014).


**Penelope Maddy**

The Phi Beta Kappa-Romanell Lectures, June 8, 10, and 12, 2015, at UCI. (Because of mobility limitations, I don’t travel.)

**Michael McBride**

Strategic Aspects of Terrorism, Conflict, and Security Workshop, Center for Game Theory in Economics, Stony Brook University, “An Experimental Study of Dark Network Formation and Disruption”, July 2014.


Preferences for Conflict and Cooperation in International Affairs Conference, UCLA, "Identity and the Escalation of Conflict”, January 2015.


**Louis Narens**

“The Logical Structure of Contextual Effects”, Mathematical Psychology Meeting, Quebec City, Canada. 2015.


“Issues in Center-Surround Color Perception”, Kiel University, Germany, 2015.


Cailin O’Connor


“Guilt as an Individual Level Benefit”, Philosophy of Science Conference, University of Southern California, Los Angeles, CA. March 2015.


“Evolving to Generalize: Trading Speed for Precision”, The Center for Philosophy of Science, University of Pittsburgh, Pittsburgh, PA. December 2014

“Evolving to Generalize”, Conference on Agent Based Models in Philosophy, Munich Center for Mathematical Philosophy, Ludwig Maximillian University, Munich, Germany. December 2014.


“Guilt as a Signal”, Philosophy of Science Association 2014 Biennial Meeting. Symposium:


Lisa Pearl


Donald Saari


“Using geometry to understand voting mysteries”, presentation at the Hokkaido University, Mathematics, Sapporo, Japan, August 2014.


“Voting: How can it go so wrong?” This was a public lecture sponsored by The Royal Canadian Institute for the Advancement of Science, October 2014.


“From Voting Paradoxes to the Search for ‘Dark Matter’” This was the featured MAA-AMS-SIAM Gerald and Judith Porter Public Lecture at the annual Joint Math Meetings, January 2015.

Finding Geometric Answers to Voting Problems. A joint invited lecture with T. McIntee at an invited session of voting and decision held at the Joint Math Meetings, San Antonio, TX, January 2015.

“Finding validation principles; going from parts to the whole”, conference talk at “Validation. What is it?” IMBS, UC Irvine, February 2015.

“From the evolution of the universe to voting perversities” invited presentation at the Finlandia Foundation, Pasadena, CA. February 2015.

“From voting paradoxes to the search for ‘dark matter’” 2015 Bullitt Public Lecture, University of Louisville, March 2015.


Stergios Skaperdas


“Greece and the Eurozone: Background, Context, and Prospects,” Colloquium in Comparative History and Social Theory, UCLA, March 9, 2015.


“Trade in the Shadow of Power,” Invited Keynote speaker of theme day on “Food and Resources; Conflict and Trade” of the International Agricultural Trade Research Consortium (IATRC) conference, San Diego, CA, December 2014.


Brian Skyrms

Economics-Biology Workshop Institute for Advanced Study, Toulouse University, June 2015.

Choice Group, London School of Economics, June 2015.
Peyton Young Conference, Oxford University, June 2015


Logic workshop University of Salzburg, April 2015.


David Kellogg Lewis Lecture Princeton University, November 2014.

Workshop on Naturalistic Approaches to Ethics NYU, October 2014.

Keynote DEON University of Ghent, July 2014.

**Hal Stern**

“Intro to ICS and Corporate Partnerships”, Southern California Society for Information Management (SCSIM), Long Beach, CA, March 2015.

“A Statistical Approach to Detecting Patterns in Behavioral Event Sequences”, Department of Biostatistics, University of California, San Diego, CA, November 2014.

“Bayesian Statistical Methods: When, When Not, and How to Use Them”, Data Science Initiative, University of California, Irvine, CA (Kickoff event), October 2014.


Participant, Panel on Working with Your Dean, Snowbird Computer Science Chair’s Meeting, Snowbird, UT, July 2014.

**Carole Uhlaner**

“Relational Goods and Participation in a Revolt: An Approach to Understanding the Arab Spring and the Role of Social Media”, coauthored with grad student Vahid Niayesh, Paper prepared for presentation at the 73rd annual Midwest Political Science Association Conference, Chicago, IL, April 19th 2015.

“Relational Goods and Resolving the Paradox of Political Participation”, School of Political Sciences, Department of Political and Social Sciences, Department of Sociology and Economic Law, University of Bologna, Bologna, Italy, Large lecture. Featured Speaker. October 2, 2014.

“Relational Goods and Participation in a Revolt: An Approach to Understanding the Arab Spring and the role of Social Media”, School of Political Sciences, Department of Political and Social Sciences, Department of Sociology and Economic Law, University of Bologna, Bologna, Italy, Colloquium Seminar. Featured Speaker. October 1, 2014.


James Weatherall


**Jack Xin**


International Workshop on Optimization, Sparsity, & Adaptive Data Analysis, March 18, 2015, Beijing, China.


Third International conference on Modelling, Computation and Optimization in Information Systems and Management Sciences, MCO 2015


**Hongkai Zhao**


(Plenary) Conference on Waves and Inverse Problems, in honor of Bill Symes' 60th birthday, Michigan State University, April 2015.

BIRS (BANFF) workshop on Numerical Optimal Transportation, Banff, Canada, February 2015.

(Keynote) Statistics and Computational Interface to Big Data, IAS of HKUST, January 2015.

(declined)


International Conference on Applied Mathematics, City University of Hong Kong, Hong Kong, December, 2014.

William Batchelder

Appointed Advisory Board Member National Key Laboratory, Central China Normal University, Wuhan, China. 2015.

Appointed to Editorial Advisory Board *Journal of Mathematical Psychology*, 2014.

Bill Branch

Received the 2015 School of Social Sciences Teaching Innovation Award.

Jan Brueckner

2015 Quigley Medal Recipient.

Carter Butts

Elected to the Council of the ASA Section on Mathematical Sociology. Sean Fitzhugh (Sociology) is completing his PhD this month and transitioning to a postdoctoral research position at the Army Research Lab. Fitzhugh's skills in network analysis, computationally intensive data collection, and simulation have been key to both the success of his dissertation project, and to his successful job search. Sean's work deals with communication during disasters, a problem of considerable public significance; his work, and career to date, illustrate the value of IMBS at training students to take on difficult and important scientific problems with practical implications for public health and safety.

Jean-Paul Carvalho


Steve Frank

I headed the research group on Gene Regulation and Organismal Diversity at the Institute for Advanced Study, Berlin, during my sabbatical 2014 - 2015, with a lot of quantitative aspects of biology and also some game theory applications to biology.
David Eppstein
I was named a Chancellor's Professor by UCI in 2014.

Michelle Garfinkel

Simon Huttegger
Chancellor’s Fellow, UCI, 2013-2016.

Kimberly A. Jameson
May 2015: Invitation to serve as a National Science Foundation IBSS program advisory panel member. NSF’s Interdisciplinary Behavioral and Social Science Research (IBSS) competition is an interdisciplinary competition in the Directorate for Social, Behavioral, and Economic Sciences (SBE) at NSF.

**Calit2-UROP 2014-2015 Multidisciplinary Design Project Award**: “Designing Generalizable Crowdsourcing Methods for Large-Scale Database Transcription and Digitalization.”

Faculty: Kimberly A. Jameson, IMBS (Project Lead), IMBS; Ian G. Harris, Computer Science; Sergio Gago, Calit2; and Sean Tauber, IMBS.


**2015 SURF-IT Research Project Award. Title:** *Cloud-Based Tools to Empower Interdisciplinary Research: A Case Study on the Mesoamerican Color Survey Data Archive.*
**Faculty Mentor:** Dr. Kimberly A. Jameson, Institute for Mathematical Behavioral Sciences
**Description:** Additional Faculty Mentors: Sergio Gago, Ph.D. California Institute for Telecommunications and Information Technology.

**2013 - present: Advisory Board Member.** "New Horizon's Message Initiative" and "One Earth: New Horizons Message". ([www.oneearthmessage.org](http://www.oneearthmessage.org)).

**The Encyclopedia of Color Science and Technology:**
2010 - present: Associate Field Editor of the "Language and Cognition" section of the
Encyclopedia of Color Science and Technology.

**Community Service City of Newport Beach, CA:**
October 2006 -- present. Appointed member of the City of Newport Beach Environmental Quality Affairs Committee.

**Student Support and/or Supervision:**

Cognitive Sciences Honors Student Project: Prutha S. Deshpande, Cognitive Sciences
Campus-Wide Honors Student Project Advisor: Erin H. Moon, Psychology and Social Behavior
IMBS Associate Specialist, Sean Tauber (01/2015 to present)
IMBS Assistant Specialist, Alissa D. Winkler (through 06/2015).

**Eight poster presentations at The 22nd Annual UCI Undergraduate Research Symposium. May 16, 2015. Irvine, CA:**

(1) Designing Crowdsourcing Methods for the Transcription of Handwritten Documents.
Stephanie Chang
Mentors: Sergio Gago, Ian Harris, Kimberly Jameson

(2) A Cultural Consensus Theory Analysis of Crowdsourced Transcription Data.
Prutha Deshpande
Mentors: Sergio Gago, Ian Harris, Kimberly A. Jameson

(3) An Affordance Based Approach to Large Data-Set Navigation.
Nathanial Benjamin
Mentors: Sergio Gago, Ian Harris, Kimberly A. Jameson

(4) Optical Character Recognition of Handwritten Tabular Data.
Yang Jiao
Mentors: Sergio Gago, Ian Harris, Kimberly Jameson,

(5) Color Categorization Model with Punishment/Reward Emphases.
David Massatt, Philip Pachigalla
Mentors: Kimberly Jameson, Natalia Komarova, Louis Narens, Sean Tauber, Dominik Wodarz

(6) Simulating the Evolution of Color Categories using Individual Reinforcement Learning Models in Populations of Artificial Agents.
Jungkyu Park
Mentors: Kimberly Jameson, Natalia Komarova, Louis Narens, Sean Tauber, Dominik Wodarz

(7) The Effect of Asymmetric Information on Learning Models of Color Categorization in Artificial Agent Populations.
Bojun Jiao
Mentors: Kimberly Jameson, Natalia Komarova, Louis Narens, Sean Tauber, Dominik Wodarz

(8) Comparing Different Learning Models of Color Categorization in Artificial Agent Population.
Katie Khuu
Mentors: Kimberly Jameson, Natalia Komarova, Louis Narens, Sean Tauber, Dominik Wodarz


2014-2015 Ad Hoc REVIEWING:

Journal of Vision
Color Research & Application
Journal of the Optical Society of America
Cognition
PNAS

L. Robin Keller

Serve as editorial board member for Decision Analysis.


Marek Kaminski

Reviews of my book Games Prisoners Play.
Igor Kopylov


Associate Editor: Theoretical Economics.

Simon Levin

Honorary Doctorate of Science, McMaster University (award ceremony Fall 2015).

Tyler Prize for Environmental Achievement.

Luca Pacioli Prize, Ca’Foscari University of Venice, Italy.

Elected Foreign Member, Istituto Lombardo, Milan.

IIASA Distinguished Visiting Fellow.

Penelope Maddy

The Phi Beta Kappa-Romanell Professorship -- ‘intended to recognize not only distinguished achievement but also the recipient’s contribution or potential contribution to public understanding of philosophy.’ There was a $7500 prize and the opportunity to deliver the public lectures in #3 above.

Interview in the online literary magazine, 3am:
http://www.3ammagazine.com/3am/the-stuff-of-proof/.

Michael McBride

Promotion to (full) Professor of Economics.


Cailin O’Connor

Co-organizer for the Perspectives on Gender Conference held at UCI, Fall 2014.
Lisa Pearl

Recipient of the 2015 Excellence in Undergraduate Teaching Award, Fall Quarter 2014, School of Social Sciences, University of California, Irvine.


2010-current Organizer and faculty leader of the interdisciplinary discussion group “Computational Models of Language”: http://www.socsci.uci.edu/~lpearl/colareadinggroup/.

Dale Poirier

Associate Editor, Journal of Econometrics.

Invitation to nominate candidates for 2015 The Sveriges Riksbank Prize in Economic Science in Memory of Alfred Nobel.

Donald Saari

Site Review Committee, Banff International Research Station, Banff Alberta, April 2015.

Chair, Governing Council, International Institute for Applied Systems Analysis, Vienna.

Chair, Section 32, National Academy of Sciences.

Chair, Conference Board of Mathematics Sciences.

Chair; NRC Board on Mathematical Sciences and their Applications.

Faculty “Honorary Member,” UCI Golden Key Honor Society.

Stergios Skaperdas

Keynote speaker at International Agricultural Trade Research Consortium (IATRC) conference, San Diego, CA, December 2014.

Hal Stern

Chair, American Statistical Association (ASA), Committee on Publications, 2015 – present.
Chair, External Review Committee, Department of Statistics, University of Pittsburgh, PA, 2015 – present.

Member, Advisory Committee for AAAS/Arnold Foundation, “Quality and Gap Analysis of the Forensic Science Literature”, 2014 – present.


Chair, National Academy of Sciences Panel on Research Methodologies for Understanding Driver Fatigue, 2013 – present.

Vice Chair, Ad Hoc Advisory Committee on Forensic Statistics, American Statistical Association, 2012 – present.

**Douglas White**

Recognized as the founder of the Social Science Gateway for Comparative Analysis and its instructional and research capabilities and was honored by the founders of Science Gateways by asking him for a letter of recommendation for NSF renewal for the major grant renewing the development of Science Gateways for the Sciences generally.

Working on implementing a Science Gateway funded that provides a research and instructional site at his UCI [http://intersci.ss.uci.edu/wiki/](http://intersci.ss.uci.edu/wiki/) supporting an online Complex Social Sciences Gateway. On July 14, 2014 at the San Diego Supercomputer he gave a talk, the second of two, to the Science Gateways Community, ECSS: the Extended Collaborative Support Services of XSEDE, which hosts a monthly symposium. ECSS provides me with NSF funding for Argonne National Laboratory programs to develop and improve the CoSSci Gateway for the third year.

As Emeritus Professor I assist former TA, Assistant Professor Ren Feng in Sociology at Xiamen University, China, in teaching a course that is fully organized around White’s UCI Complex Social Sciences Gateway and its access system at [http://socscicompute.ss.uci.edu](http://socscicompute.ss.uci.edu).

Continuation as External Research Professor, Santa Fe Institute, 2009-2016.

**Jack Xin**

Elected, Member-at-Large, Mathematics Section of the American Association for the Advancement of Science, to serve a 4 year term starting February 17, 2015.
F. FACULTY ADVISING

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)

<table>
<thead>
<tr>
<th>Student</th>
<th>Advisor</th>
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<tr>
<td>* Kalin Agrawal</td>
<td>Batchelder</td>
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<td>* Gregory Alexander</td>
<td>Batchelder</td>
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<td>** Blake Allison</td>
<td>McBride/Skaperdas</td>
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<td>Jerrod Anderson</td>
<td>Carvalho/McBride</td>
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<td>Brian Asquith</td>
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<td>** Jiwon Baek</td>
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<td>Jiaru Bai</td>
<td>Keller</td>
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<td>Beth Baribault</td>
<td>Vandekerckhove</td>
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<td>Galia Bar-sever</td>
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<td>Michael J. Bannister</td>
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<td>Zach Becker</td>
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<td>Andrew Berdahl</td>
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<td>Mark Bloxsom</td>
<td>McBride/Skaperdas/McBride</td>
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<td>Bonnie Bui</td>
<td>Faust</td>
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<td>Justin Bruner</td>
<td>Huttegger/Skyrms</td>
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<td>Eleanor Brush</td>
<td>Levin</td>
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<td>Michael Caldara</td>
<td>McBride</td>
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<td>Anne Carpenter</td>
<td>McBride/Skaperdas</td>
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<td>Eric Casavant</td>
<td>Butts</td>
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<td>Charlotte Chang</td>
<td>Levin</td>
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<td>Jack Zhanpeng Cheng</td>
<td>Eppstein</td>
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<td>Stephen Cole</td>
<td>Branch</td>
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<td>Andrew Colopy</td>
<td>Kaminski/Skaperdas</td>
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<td>Scott Crawford</td>
<td>Smyth</td>
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<td>Irina Danileiko</td>
<td>Lee/Vandekerckhove</td>
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<td>Tyler Dean</td>
<td>Chubb</td>
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<td>Archie Delshad</td>
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<td>* William E. Devanny</td>
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<td>Steve Doubleday</td>
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<td>Chris DuBois</td>
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<td>Christopher Elias</td>
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<td>Ali Esmaeeli</td>
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<td>Ben Feintzeig</td>
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<td>Jie Feng</td>
<td>Zhao</td>
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<td>Nikki Fider</td>
<td>Komarova</td>
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<td>Katelyn Finley</td>
<td>Kaminski</td>
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<td>Sean Fitzhugh</td>
<td>Butts</td>
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<td>Samuel Fletcher</td>
<td>Weatherall</td>
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Jimmy Foulds
Andrew Frank
Emma Fuller
Ben Gibson
Nancy Gonzalez
** Giorgio Gosti
Hongyang (Maime) Guan
Michael Guggisberg
Santiago Guisasola
Lisa Guo
Christopher Ha
Yuhong He
Kevin Heins
Christian Herrera
Michael Ho
Candice Huynh
Matt Inverso
** Fan Jiang
** Justin Jarvis
** Kip Jackson
** Rolf Johnson
** Deven Kapadia
John Kennison
Katelyn Finley
Alex Keena
Bart Knijnenburg
Alejandro Komai
Si-Yuan Kong
Colin Kupitz
Paulos Lakew
Simon Leblanc
Francis Lee
** Michael Lefors
William Leibzon
David Licata
Robert Lichtman
Alicia Lloro
** Xiaolong Long
** Dan Luo
Timmi Ma
Amine Mahmassani
Joshua Malnight
Daniel Mann
* Brian Marion
Justin Mark
** Thomas McIntee
Lisa McManus
Greg McWhirter
Peter Miller
Percy Mistry

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Brownstone/McBride
Vandekerckhove
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Sperling
Small
Xin
Brueckner
Komarova
Brownstone/McBride
Uhlanel
Chubb
Hoffman
Hoffman Saari
Levin
Uhlanel
Keller
Chris Mitsch  
David Montelongo  
Abraham Morrison  
*  Tolga Oztan  
Erick Peterson  
Lawrence Phillips  
Andrew Porter  
Garret Ridinger  
Jacquelyne Rische  
Patty Rodda  
Marian Rogers  
Sarita Rosenstock  
Hannah Rubin  
Michael Sacks  
K.J. Savinelli  
Ryan Shirah  
Joseph Simons  
Linley Slipetz  
Emma Smith  
Shawn Strausser  
Paul Stroik  
Andrew Tilman  
**  Heidi Tucholski  
**  Andrea Vandom  
Jamie Wang  
Alex Washburne  
Patricia Wellmeyer  
Cole Willaims  
Andrew Wisti  
*  Dan Wolf  
Tim Wong  
Howard Yang  
Penghang Yin  
*  Shuai Zhang  
Xuhong Zhang  
Penghe Zu  
Weatherall  
Butts  
Huttegger  
White  
Carvalho/McBride  
Pearl  
McBride  
McBride/Skaperdas  
Komarova  
Kaminski  
Weatherall  
Weatherall  
Huttegger  
Carvalho/McBride  
Pearl  
Uhlaner  
Eppstein  
O'Connor  
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McBride  
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Saari  
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Brueckner  
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Keller  
Carvalho  
D’Zmura  
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Dear Don,

This year, I spent most of January and February at UCI, primarily based in IMBS, but also with an affiliation with Ecology and Evolutionary Biology. I gave two lectures during that period,

(1) IMBS Workshop on Validation: Validation and the problem of relevant detail

This workshop dealt with the crucial problem of model validation, and what it means. This lecture focused on the identification of the objectives of the model, and the scale at which description is relevant. It distinguished among modeling for understanding, prediction and management, and emphasized that overly detailed models can be as ineffective as those without sufficient details, depending on the purposes of the modeling. In conclusion, what it means to validate a model depends critically on objectives and scale of description; validation often should be an iterative process involving finding the scale of detail at which prediction is robust; and the problem of validation is thus closely related to issues of scaling, simplification and coarse graining.

(2) IMBS Colloquium: Dealing with public goods and common pool resources

Dealing with public goods and common pool resources is a problem that faces organisms from microbes to human societies, and poses great challenges with reference to global environmental problems like climate change. Much can be learned from how evolution has dealt with such problems, and human societies rely on insurance arrangements, social norms, regulations and laws to avoid tragedies of the commons. As the scale of the ensemble increases, however, cooperation becomes more difficult to achieve. Global environmental management, therefore, will need to develop new approaches, possibly building on modularity and Vincent and Elinor Ostrom’s notions of polycentricity. This lecture will explore various dimensions of this problem.

Furthermore, I met on a regular basis with Adam Martiny (ESS/EEB), Steve Allison (EEB) and their research groups in connection with our NSF grant. During that period, in which two of my postdoctoral fellows also visited, we made substantial progress on research and publications, and began discussing the first stages of a new grant proposal.

I also met with you, discussing science and professional issues, including those related to the international global environmental institution, IIASA. We both attended the local meetings of
the NAS and the US NMO for IIASA. I also met with Natasha Komarova and Dominik Wodarz to discuss a possible joint project on demography, and had less formal interactions with Qing Nie, Fred Wan, Arthur Lander, Francisco Ayala, Susan Bryant, David Gardiner, Kimball Romney and others. I also served as the local host for IMBS Colloquium speaker Carl Bergstrom, and of course attended other seminars and colloquia.

Throughout the period, I carried out research on public goods, on ocean modeling, on collective decision-making and on other topics.

Simon Levin
Professor, Ecology and Evolutionary Biology
Princeton