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DIRECTOR’S MESSAGE

Dear Colleagues and Administrators,

Writing reports will never rank high among my favorite pastimes. A rare exception is the IMBS annual activity report. The reason is that the strength of any research institute derives from the activities, new insights, and efforts of its members. As such, and even though most of us have some sense of what others have been doing during the year, an enjoyable part of putting together this annual report is the opportunity to review “who has done what” during the last year.

A considerable amount has been accomplished! Indeed, I recommend that the reader start with the overview given in Section II-D (pages 7 – 21), which demonstrates the variety and impact of the kinds of research being done. Research ranges from the mathematical/game theoretic modeling of religion to cognitive processes to concerns about visions and color to decisions (both in theory and in practice) and the modeling of interactions with games. Jeff Barrett, for instance, describes how the complexity of self-assembling games can be better understood through a game’s composition of simpler games, while Michael Lee’s work on modeling higher-order cognitive processes is helping to understand issues such as Alzheimer’s disease and related disorders. In a very different direction, let me mention Bernie Grofman’s work with a panel of three federal judges to draw a congressional map for the State of Virginia. In a more theoretical direction is Hongkai Zhao’s work in resolving some of the computational complexities in creating models for 3-D shapes.

Beyond measuring contributions through the publications of members (pages 55 – 73), the large number of invited talks (pages 75 – 90), and extramural funding (pages 40 – 46), is the way in which new directions are explored through our several study groups (pages 21 – 23), two weekly colloquia (see pages 36 – 38 for list of speakers), and our several conferences and workshops (see pages 29 – 33 for topics and the agendas). As an example of how presentations can promote new directions, Steve Frank’s colloquium presentation about patterns in nature created such interest that several extra sessions were organized (with graduate students and faculty) to further explore these notions. Similarly, to exploit the interdisciplinary nature of our program, graduate students, from several disciplines, would meet on Tuesday nights to examine new ideas.

As a sampler of the many awards and recognitions that have been received by IMBS members, let me call attention to Kim Romney receiving the “Outstanding Emeritus Award;” Kim, only 91, usually is the first in the office and always full of new research ideas. Then, Simon Levin, an IMBS member from Princeton who normally spends January with us in Irvine, received the President’s Medal for Science. Robin Keller received the highest award of the Decision
Analysis Society of INFORMS, and Kimberly Jameson’s cutting edge research of vision and color is receiving considerable press coverage including BBC, Vogue, etc., and then Rein Taagepera received another major international award recognizing his contributions to mathematical political science: the Karl Deutsch Award from the International Political Science Association.

Our graduate program, directed by Louis Narens, remains strong. Beyond those graduate students directly enrolled in our program are the many students who play an active role in IMBS activities, but who are officially students in some other program (pages 97 – 98). A prime example of this is Michael Sacks who, for several years, directed our Friday lunch discussion series (pages 25 – 26) and our annual graduate student conference (pages 26 – 27). Michael also is the recipient of this year’s Jean-Claude Falmagne Award for his PhD thesis. This division, where several students receive a Master’s degree from our program, reflects our recognition that several areas prefer to hire only students receiving a degree from that discipline.

As always, my warm thanks to Joanna Kerner for her extraordinary contributions to, well, everything we do at the IMBS! Thanks to her, conferences, colloquia, working group facilities, visitors, and everything moves smoothly.

An active and successful year! We are looking forward to 2016 – 17.

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 2015-16

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 65 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, Johnson, 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, and Saari

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, Duffy, 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 188 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 187 talks listed in Appendix D. Their awards and achievements for this year can be found in Appendix E.
D. Summaries of Research Findings

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

*Measurement Theory, Foundational Issues, and Scaling Models*

**Jeff Barrett**

This year there have been three main areas of research. First, Brian Skyrms and I have been working on self-assembling games. Game theorists model various types of interaction by way of games. We show how such games might form from simple actions of the agents that become ritualized. We then show how complex games may form by way of the modular composition of simpler games. Second, we have extended the notion of self-assembling games to show how social networks may similarly self-assemble. I have also been studying how such composite games might allow for the evolution of truth predicates and probabilities in a language. Third, I have been working with a small research group to study the relationship between various evolutionary games and the learning dynamics that perform best for each type of game. Specifically, we have found hybrid learning dynamics that do extremely well in the context of signaling games, orders of magnitude better than the competition. These hybrid dynamics combine the virtues of reinforcement learning with trial-and-error learning yet are nevertheless very simple.

**Bill Batchelder**

I am continuing work on my three main areas of research: (1) Cognitive Psychometrics, (2) Cultural Consensus Theory, and (3) Multinomial Processing Tree Models. All three of these areas involve the creation and application of parametric statistical models for cognitive processes. It is with great pleasure that others, especially in the United States and Europe, have added ideas and research in these three areas.

**Michael Burton**

I have been developing statistical models to explain why some households in Micronesia maintain health, locally-produced foods to a great extent than others. These ideas are tested against data from household surveys that my colleagues and I did about 20 years ago.

My most recent work is with James A. Egan and Karen L. Nero, and is about the organization of farming and fishing labor in two of the four states (Yap and Kosrae) of a single nation – the Federated States of Micronesia. We find greater levels of collective labor in one of these states than the other, and are now working out the explanation for those differences. This is one small piece of a more extensive set of chapters that we will write about these two societies.
Louis Narens

During the last academic year my research has focused on four areas: (1) Modeling how context influence behavioral phenomena; (2) studying through computer simulations how concepts evolve in a communicating society; (3) using evolutionary dynamics to demonstrate that interpersonal comparisons of value are illusory; and (4) incorporating psychological concepts into utilitarianism and showing the limits of such theories.

(1) Context is a tricky problem for science. In psychology context is usually dealt with by attempting to eliminate it by adding conditions that fixing it or adding parameters to a mathematical model. Such methods can only account for a limited kind of context effects. What is needed are theories for different kinds of contexts and how contexts of a kind are related. This has been successful accomplished in quantum mechanics. I have pursued a new approach to context---one that develops a more general form of probability theory that is applicable to context problems found in the behavioral sciences.

(2) Working with IMBS members Sean Tauber, Kimberly A. Jameson and Natalia Komarova and mathematics PhD candidate Nicole Fider and Computer Science Junior Jungkyu Park, new mathematical and simulation models of the evolution of color categorization terminology have been developed and some of these have been tested on data from 110 languages and over 2,000 subjects from isolated non-technological societies.

(3) Working with IMBS member Brian Skyrms, new dynamic modeling theory and techniques have been for describing how people might obtain joint perceptions of just distributions. The theory and modeling inherent in this work will be tested later through crowd sourcing experimentation.

(4) (3) deals with a longstanding problem of how to legitimately compare values (utilities) across people. This has some formal and mathematical similarities with the psychophysical problem of comparing perceived intensities within an individual across different modalities (e.g., comparing the perceived ratios of the brightness of lights (or stars) with the perceived ratios of loudness of tones). Such psychological comparisons give rise to psychophysical laws. Working with IMBS member Brian Skyrms, it is investigated how the psychological methods of intermodal comparisons within an individual might apply to the economic and philosophic issue of proper interpersonal comparisons of value across people.

Michael Lee

My work continues to focus on modeling higher-order cognitive processes, especially through the application of Bayesian methods and real-world data. Highlights for this year have included two papers based on industry collaborations. One involves cognitive modeling to understand and
measure how semantic memory deteriorates with Alzheimer’s disease and related disorders, and involved analyzing large clinical databases. The other involved wisdom-of-the-crowd applications of cognitive models to crowd-sourced ranking data, and involved collaboration with the Ranker Company.

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 & Sprouse (2015) and Pearl & Goldwater (2016) discuss how computational and mathematical modeling are invaluable tools for scientists who want to understand the language acquisition strategies that 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.

Both Pearl, Ho, & Detran (in press) and Pearl (in press) demonstrate this more concretely with a case study in English metrical phonology, which concerns the stress patterns that words have (e.g., emphasis has stress on the first syllable: Emphasis). While there are systematic patterns that English speakers unconsciously internalize and use, there’s also a lot of “noise” — that is, English stress patterns that buck the normal trend and which English speakers effectively have to memorize. The noise in the input makes the process of acquiring English stress patterns a big challenge, and yet every typically developing English child gets it right. A current theory for why English children can manage this feat is that children come innately equipped with ideas about how human language stress systems operate. By taking this idea seriously, we can then investigate if the different proposals for the innate stress biases children have actually do make the acquisition of the English stress system possible. Both Pearl et al. (in press) and Pearl (in press) describe mathematical analyses of the input English children encounter that illuminate which innate stress representations are more helpful, when, and (most importantly) why. One interesting theoretical result is that many current proposals for the target stress knowledge of English would benefit from small changes that make this knowledge more easily learnable from the English data children actually encounter. If we don’t make these changes, it’s ridiculously hard to learn the “right” English stress knowledge from English data.

Another set of findings in this vein concern the acquisition of structural knowledge about language (called syntax). In Pearl & Mis (2016), 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) and Pearl (in press), 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.

Studies by Phillips & Pearl (2015) and Pearl & Phillips (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 mathematical formalizations, and apply them to realistic language data that infants would hear. One interesting problem concerns the evaluation of these segmentation strategies — given how young children are segmenting speech (six months), it seems unlikely they would achieve perfect adult segmentation immediately. In fact, we know that segmentation errors persist for several years after (ex: undersegmentation errors like “That’s a” segmented as a single word “thatsa”, and oversegmentation errors like “behave” segmented as “be” and “have”). So how do we tell if a segmentation strategy is generating good enough segmentations (and importantly, the kind a six-month-old might generate)? We discuss assessing the utility of the generated output, with the idea that language acquisition is a process that unfolds over several years. So, the output of one process is the input to the next. Using various ideas for what segmented output might be used for later on in acquisition, we discover that segmentation strategies that produce more adult-like segmentations may not be the best ones for infants to have. Instead, strategies that generate undersegmentation errors may actually be preferable to ones that generate oversegmentation errors, irrespective of which strategy generates a more adult-like segmentation.

This idea that adult-like knowledge is not necessarily what children want to achieve immediately is also pursued in Bar-Sever & Pearl (in press). Here, we use a simple mathematical model of syntactic categorization, where children attempt to put individual words like kitty, penguin, and idea into categories like “noun” that capture how these words are used by the speakers in the
language. For example, nouns can be preceded by words like “some” and can often be pluralized (e.g., *kitties*). As adults, we have syntactic categories of many different kinds, which we learned from our native language input. In Bar-Sever & Pearl (in press), we implement a proposed categorization strategy called *frequent frames* (FFs) which is intended for the very beginning stages of syntactic categorization occurring around twelve months, and test this strategy on both English and American Sign Language. Irrespective of whether the language is spoken or signed, we find that FFs often don’t do a very good job of recovering adult categories. However, by implementing a mathematical definition of category utility derived from the information-theoretic concept of perplexity, we find that FFs always generate more useful categories for an infant learner with immature knowledge of language structure. Put simply, there seems to be a synergy between immature syntactic category knowledge and immature structural knowledge for the language.

A finding in the area of natural language processing concerns the automatic identification of character identity in novels. In Pearl, Lu, & Haghighi (2016), we investigate a famous epistolary novel which involves multiple characters writing letters to each other. Of course, the author of the novel writes all the character letters, but intends for the characters to be as distinct from each other as individual authors typically are. We investigate whether the author is successful at this by using an authorship identification technique first presented in Pearl & Steyvers (2012) that uses simple mathematical techniques to make distinctive author linguistic features stand out. This technique is very successful at distinguishing authors when the authors are in fact distinct. Using this technique, we find that the major characters in the epistolary novel aren’t as distinct as true authors are, though the characters do have distinct *writeprints* (writing fingerprints) that the author clearly manipulated in order to try to distinguish them. Notably, the linguistic features manipulated in these character writeprints don’t include the features typically used in author writeprints — instead, they are features that are easier to consciously manipulate. So, an author’s writeprint features, which are harder to consciously manipulate, are likely to remain consistent across different characters even when the author is trying to distinguish those characters.

**Sociological/Anthropological**

*John Boyd*

I’m just finishing page proofs on the chapter “Network analysis” with William H. Batchelder. It will appear as Chapter 4 pp. 194—273 in the *New Handbook of Mathematical Psychology Vol. 1.* Eds. William H. Batchelder, Hans Colonius, Ehtibar Dzhafarov, and Jay Myung, published by the Cambridge University Press. This chapter maintains a high level of modesty in that neither I nor my co-authors cites himself. Of course, we are very proud of this achievement. I have also refereed articles for the Journal of Social Networks, rejecting one.
Individual Decision-Making

Robin Keller

Working as a research team with two UCI doctoral alumni (Yitong Wang of the University Technology Sydney and Liangyan Wang of Shanghai Jiao Tong University), we conducted a laboratory experiment addressing the descriptive challenge to normative discounting models that decision makers in general do not obey discounted utility theory because their discount rates (using actual time lengths) are context dependent. Recent literature incorporates decision makers’ subjective perception of time into the classic discounted utility model and finds relatively constant discount rates over subjectively perceived time lengths. In addition to replicating previous work, we investigated the missing component – the magnitude effect, provided a holistic view via a more comprehensive experiment including multiple anomalies, and found that subjective time perception was able to explain most of the anomalies simultaneously in a single scenario.


Perception and Psychophysics

Kimberly A. Jameson

During 2015-2016 I continued research along six related areas of empirical investigation and basic research and development.

1) Discovery Eye Foundation Funded empirical and theoretical work on Adult Macular Degeneration (AMD) and color photopigment opsin genetics in collaboration with Maria Cristina Kenney MD PhD at the Gavin Herbert Eye Institute in UC Irvine Medical School.

2) I collaborated with A. Kimball Romney and Tim Satalich, IMBS, on developing novel psychophysical investigations of color perception metameric relations, and supervised related research for a campus wide honors thesis by Kirbi Joe (Math. and Econ. undergraduate).

3) Collaborated with Vladimir Bochko (Vaasa University, Finland) and Keith Goldfarb (Blackthorn Media, Los Angeles, CA) on the development of image processing algorithms and filters for depicting color scene processing variations across observers with dissimilar photopigment opsin phenotypes.

4) National Science Foundation funded research into the mathematical modeling of color category evolution among communicating artificial agents (with Louis Narens Sean Tauber, and Natalia
Komarova, IMBS) which yielded an IMBS technical report, and two research manuscripts in-progress. With Komarova (as doctoral thesis chair), and Narens, I assisted and advised Department of Mathematics Graduate Student Nicole Fider on thesis research which has now developed into manuscripts in-progress for submission to peer-reviewed journals in Summer 2016.

5) Ran the cognitive research lab (imbs.uci.edu/colorcoglab/ColorCognitionLab.html) consisting of Psychology and Social Behavior undergraduates and Sponsored IMBS Junior Specialists, Prutha Deshpande, on empirical investigations into individual variation and universals in human color cognition, color naming and categorization. During 2015-2016 the group empirically investigated the ways bilingual individuals name and conceptualize color. This color categorization project produced novel research that was presented in an oral presentation by 3 students at the Undergraduate Research Opportunity (UROP) Conference 2016, and is the basis for two new co-authored manuscript by the research group to be submitted for publication in Summer 2016.

6) Also for NSF funded research, I directed a large research group, assisted by Sergio Gago PhD, in Calit2 for the NSF funded project. This group includes two Computer Science Undergraduates carrying out machine-learning convolution algorithms in Optical Character Recognition research for transcribing archival data, two Informatics Undergraduates working on developing interfaces and backend software for conducting online crowdsourcing research for transcribing archival data, three Computer Science Undergraduates building both front-end and back-end software for a public-access research archive platform and wiki. And two IMBS associates working on building data handling and analytics for the public-access platform and basic research analyses into aggregation of novel crowd-sourced data.

George Sperling

Recently we have been developing an efficient new method to study visual selective attention to features, as contrasted to selective attention to a location in space or to an interval in time, which was described in previous reports. The method, centroid judgments, enables the measurement of a human attention filter: i.e., the precise amount of attention in a brief visual display allocated to each of the attended features as well as the precise amount of unavoidable attention spillover to each of the unattended features. Publications include an outreach methodology paper that contains examples and computer code and is designed to enable others to use the method, an article that describes an unexpected inability of humans to selective attend to a particular feature (absolute orientation), as well as talk abstracts and articles in press that describe other applications of the centroid procedure to new measurements of feature attention.

Jack Xin

The first project is on non-convex sparse optimization methods with applications in compressed sensing, computer vision and finance.
The second project is on analysis and computation of extended trajectories in three dimensional Arnold-Beltrami-Childress flows with applications to flame speeds of advection-reaction-diffusion equations. Also a spectral variational principle is developed for effective diffusion in space-time periodic flows.

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, “Heterogeneous Beliefs and Trading Efficiencies” joint with Bruce McGough, we construct a model of trade where the two parties in the trade, i.e. buyers and sellers, have different beliefs about the value of money and inflation. In the model, buyers and sellers are randomly matched, the buyer makes a take-it-or-leave it offer to the seller for some quantity of goods in exchange for a certain amount of money. To the seller, whether they accept the buyer’s offer depends on their expectations about inflation, or the purchasing power of the money that they receive from the buyer. We show that if beliefs are not common knowledge to buyers and sellers, then buyers will behave like a Bayesian and place a prior on the sellers’ beliefs. By explicitly taking into account that the seller might reject an offer if buyer’s are much more optimistic about inflation than the seller, this builds in caution into the offer that they make to sellers; a willingness to accept fewer goods for the amount of money that they hand over. We show that our framework can explain experimental puzzles that find a high rate of rejections and low average trades in monetary laboratory experiments. The results also have implications for the negative effects of uncertainty and inflation volatility on the macro economy.

David Brownstone

Professor Michael McBride and I are building an experimental platform to examine drivers’ route choice behavior in a laboratory setting where we can control the information they receive. Our setup allows us to vary information about congestion on the road ahead as well as real-time toll pricing. By varying the endowments of the experimental subjects we can also control their value of time, and this allows us to test current theories about road pricing with heterogeneous values of time. Our preliminary results show that drivers do respond to credible information about road conditions, but their response is not optimal. This suggests that we can design information and tolling systems that will improve the performance of our highway networks.
Jan K. Brueckner

Researchers have long studied the effect of various types of land-use restrictions on housing markets, usually finding a positive effect on prices. But, with the exception of one method, little work has been done to measure the stringency of land-use regulations, namely, the extent to which they cause a divergence from free-market outcomes. A recent paper with three coauthors attempts to measure the stringency of building-height regulations in China using a remarkable data set containing thousands of land-lease transactions. The data include the allowed building height for an undeveloped parcel along with the selling price per square foot. Loosening the regulated height should raise the selling price of the parcel, but theory shows in addition that the elasticity of the effect increases with the stringency of the regulation (the ratio of the free-market and regulated heights). Using the data, the paper estimates city-specific elasticities of transaction prices with respect to regulated building heights, and those cities with bigger elasticities have tighter height regulations. Exploiting data for a single big city (Beijing), the method shows how regulatory stringency depends on site characteristics. The results show that the most stringent height regulations exist around the historical area of Tiananmen Square.

Carter Butts

For decades, public warning messages have been relayed via broadcast information channels, including radio and television; more recently, risk communication channels have expanded to include social media sites, where messages can be easily amplified by user retransmission. In work published in *PNAS*, my group and the team of Jeannette Sutton (UKY) examine the factors that predict the extent of retransmission for official hazard communications disseminated via Twitter. Using data from events involving five different hazards, we identity three types of attributes—local network properties, message content, and message style—that jointly amplify and/or attenuate the retransmission of official communications under imminent threat. We find that the use of an agreed-upon hashtag and the number of users following an official account positively influence message retransmission, as does message content describing hazard impacts or emphasizing cohesion among users. By contrast, messages directed at individuals, expressing gratitude, or including a URL were less widely disseminated than similar messages without these features. Our findings suggest that some measures commonly taken to convey additional information to the public (e.g., URL inclusion) may come at a cost in terms of message amplification; on the other hand, some types of content not traditionally emphasized in guidance on hazard communication may enhance retransmission rates.

Online social networks (OSNs) enable time-resolved measurement of communication behavior during disasters, making it possible to probe the mechanisms by which messages are amplified or suppressed with precision unattainable by traditional data sources. To our knowledge, this research provides the first systematic study of the factors predicting the social amplification of risk communication in OSNs by examining the retransmission of official messages across five hazards. Our findings demonstrate the respective impacts of sender characteristics, message
content, and message style in determining whether an official message will be passed on during an emergency, as well whether these vary across hazards. These results contribute to the evidence base for policies guiding the delivery by emergency management organizations of lifesaving information to the public.

In collaboration with the lab of Rachel Martin (UCI), my group has produced two forthcoming papers on the genome of the Cape sundew (*Drosera Capensis*), a widely cultivated carnivorous plant. Our sequencing of *D. Capensis* marks the first published genome in the family Caryophyllales, and the third carnivorous plant ever to be sequenced. In our forthcoming work, we identify and model a large number of novel proteases from the Capensis genome, identifying promising targets for biotechnological applications such as the preparation of samples for mass spectrometry or attacking bacterial biofilms on sensitive medical devices. We have also identified a new “enzyme within an enzyme” with potential uses as an antifungal agent. In the spirit of UCI’s growing commitment to *convergence science*, this research fuses state-of-the-art computational methods (including structure prediction, docking, and molecular dynamics), methods adapted from social network analysis, and traditional genomic and biophysical techniques to move from genomic “source code” to useful biomolecules in a fraction of the time and cost of conventional approaches. Our work is forthcoming at *Proteins* and the *Computational and Structural Biotechnology Journal*.

**Jean-Paul Carvalho**

Thanks to an IMBS Seed Grant I visited the Department of Economics at New York University from 11-17 November. I attended seminars and met several key people in my field who I had either not met or met very briefly in the past, including Alberto Bisin, Debraj Ray, Raquel Fernandez, Suresh Naidu, Hannah Halaburda and Shankar Satyanath. This has led to future invitations and possible research collaborations. I am very grateful for the support.

**John Duffy**

I have been working on the question of whether and how a social norm of cooperative behavior in a social dilemma game can emerge and be sustained among randomly matched agents from a finite population of strangers. The method of analysis is theoretical and experimental. Theoretically, I showed that an implication of rational choice theory is that cooperative behavior should be easiest to sustain if the matching group of agents is a large as possible (equal to the population size) as this case effectively amounts to full public monitoring of the activity of others. Experimentally, however, this prediction does not find much support; free riding is pervasive in such large matching groups, as each agent perceives themselves to be a small actor relative to the larger population and punishment mechanisms only hurt cooperative types. Results from this project are reported in the paper "Group Size and Cooperation Among Strangers" with Huan Xie, published in the Journal of Economic Behavior and Organization, April 2016. Further research on this topic is ongoing, including a new working paper examining the impact of history or precedent for coordination on social norms of cooperation, "Equilibrium Selection in Similar Repeated Games: Experimental Evidence on the Role of Precedents," with Dietmar Fehr.
Steve Frank

In my article “Common probability patterns arise from simple invariances” I showed that a few simple assumptions about conservation and invariance lead to a nearly complete framework for understanding the commonly observed probability patterns in nature. In particular, the conservation of total probability plus the assumption that, on the proper scale for measurement, pattern remains conserved with respect to shift and stretch provide a simple geometric way to understand the common results of statistical mechanics and maximum entropy.

In my article “D'Alembert's direct and inertial forces acting on populations: the Price equation and the fundamental theorem of natural selection,” the abstract summarizes the key results:

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.

Bernie Grofman

Working as a Special Master for a three judge panel of federal judges I was asked to draw the congressional map for the State of Virginia to remedy a previously found constitutional violation in the way in which CD3 had been drawn by the legislature. I proposed two plans to the Court as ones that best fit the constitutional guidelines and between which I had no particular preference. I provided a 70 page report justifying the proposed plans and indicating why plans proposed by other parties did not fully or appropriately address the needed remedy for the constitutional violation. After a public hearing, the Court chose one of my two proposed plans for adoption. The Court’s line of reasoning was appealed to the U.S. Supreme Court in early 2016, but the Supreme Court declined to reverse the lower court, and so the plan is being implemented for the 2016 election, and will continue to be used for the rest of the decade unless and until the governor (now
a Democrat) and the state legislature (now under Republican control) agree on a plan. This activity took up much of my research time.

Marek Kaminski

Most of my recent work has been connected to the topic of electoral reform that has been floating in Polish politics since 2014. I have given several lectures and presentations for top Polish politicians, wrote an introductory paper, and, most recently, completed a book (forthcoming in October 2016) that was intended to provide the main source of references on electoral reform introducing single-member districts. In the book, I discuss both empirical findings on SMDs and the formal properties of voting methods in the context of Polish politics.

Igor Kopylov

This year I have worked on several projects ranging from highly abstract to experimental.

First, I have characterized a new class of canonical utility representations that have a constructive definition and exist whenever preferences have any utility representations at all. This construction generates some classic results, like the Debreu Theorem, and suggests some new insights about various continuity notions and extensions in metric spaces. The paper “Canonical Utility Representations and Continuous utility representations” is forthcoming in *Journal of Mathematical Economics.*

Second, I have characterized a model of ambiguity aversion (epsilon-contamination) where subjective probabilities are well-defined, are updated via Bayesian rule, and ambiguity aversion can be compared between any two agents that comply with this model. This comparison generates a new definition of comparative ambiguity aversion that has a potential experimental appeal. The paper titled “Subjective Probability, Confidence and Bayesian Updating” is forthcoming in *Economic Theory.*

Third, I have come up with a representation result for semiorders and search procedures. Roughly, I study a model where the choice is the best alternative among all those that do not require a “substantially deeper” search. “Substantially deeper” is captured by the subjective search semiorder. This is a new area for me; I plan to present this research at IMBS next fall.

Fourth, in collaboration with MBS Ph.D student Junying Zhao, I am studying how to identify several endogenous utility models (states) that are (i) not necessarily linear as in expected utility and (ii) are aggregated to evaluate a menu of alternatives to be chosen from later. At this point, we have a result for two utility states. Note that the Pareto model with two non-linear preferences turns out to be a very difficult model to characterize. It turns out that menus can provide another, more elegant solution.
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 Jacquelyn Rische and Timmy Ma we created a number of learning algorithms of the reinforcement-learning type, which exhibits patterns and suggest a way to explain them.

Another set of projects that I worked on with grad student Nicole Fider and in collaboration with Kimberly Jameson and Louis Narens is understanding color categorization in humans. In particular, we used the data collected in the World Color Survey to study the number of basic color terms that evolved in different cultures. We are also studying the role of gender in color categorization.

Over the last year I have also worked on several topics of mathematical biology. This includes stochastic dynamics of stem cells, virus dynamics, and investigating the role of spatial constraints in crossing fitness valleys in evolutionary dynamics.

Michael McBride

Graduate student Garret Ridinger and I conducted a theoretical and experimental study of the relationship between theory of mind ability and cooperativeness. We find that in whether theory of mind ability is correlated with cooperativeness depends on the context rather than being correlated with a fixed trait for cooperativeness. Theory of mind ability operates primarily through beliefs about others' cooperativeness.

Andrew Noymer

I work on demography, with an emphasis on health in general and mortality in particular. The human population is a complex system in constant motion among many dimensions; as such, my work fits very well in the IMBS rubric. My work in the recent past has focused on emerging and re-emerging infectious diseases. I have done some studies on the Ebola outbreak in West Africa as well as on the alarming emergence of *Clostridium difficile* colitis as a cause of death in the United States. I have also worked on nonlinear models of measles epidemiology recently, with a paper in process at this time.
Cailin O’Connor

Last September I won the NSF Standard Research Grant titled ‘Dynamics and Diversity in Epistemic Communities’. This project uses game theory and evolutionary game theory to model the emergence of bargaining, collaboration, and communication among academics, and especially across social categories such as race and gender. I am working on a book under contract with Oxford looking at the evolution of conventions of bargaining and social coordination in groups with social categories. Under this grant, my students and I are also using experimental methods to test whether actors use gender to facilitate coordination in games, and to look at how minority groups might be disadvantaged in the emergence of bargaining across social categories.

I have also been using the sim-max game, introduced by Jäger (2007), to model the evolution of natural kinds terms. This game is similar to the signaling game in that two actors transfer information about the world, but states in the sim-max game also bear similarity relationships to one another. As I argue, results from this game put pressure on claims that linguistic terms should be expected to evolve to track objective properties.

In the last year, I have also expanded previous work on the evolution of guilt and guilty apology.

Dale Poirier

I am an econometrician mostly working in the area of Bayesian statistics. Over the past two years I have been writing a monograph entitled Mostly Harmless Bayesian Econometrics. One chapter, “Implicit Distributional Assumptions,” was presented at the Econometric Society World Congress. Another chapter, “Bayesian Inference in Saturated Models with Bernoulli Outcomes,” will be presented in August at the Asian Meeting of the Econometric Society in Kyoto.

Don Saari

Over the last year, my research emphasized unexpected consequences of aggregation methods. The prototype is voting; the goal is to discover how and why all of the paradoxical behaviors can arise. The basic reason has been identified; what remains are many complicated details. (“Paradoxical” means unexpected, with the consequence that the outcome need not represent the intent of the voters.) Surprisingly, these negative aggregation effects exposed by voting extend to explain problem in nonparametric statistics, aspects of game theory (which is being explored with D. Jessie in terms of a decomposition of games into their strategic and cooperative terms), apportionments (which is being explored with B. Grofman, where reasons why Arrow’s impossibility theorem hold also affect apportionment methods), and even the physical sciences (showing that techniques to identify dark matter are flawed).
Carole Uhlaner

I have been extending my work on relational goods, a concept which has recently been gaining traction among others. Many other scholars have discussed various specific relational goods as important components of individuals’ utility functions – friendship, sociability, respect, identity-enhancement. My contribution has been to recognize that these are analytically similar and collectively different from either public or private goods. I have then also shown how to integrate them into formal models and that their inclusion transforms collective action problems. I have applied these insights to voting turnout, participation in protest (notably the Arab Spring), and participation in general. Other authors have used the concept to examine volunteering and happiness, among other topics.

III. IMBS FACULTY RESEARCH SEMINARS AND LABORATORIES

A. Research Seminars

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

- Carter Butts: Anthro 289 Networks and Organizations, Fall 2015
- Jean-Paul Carvalho: Econ 243B Theory, History and Development Seminar, Spring 2016
- Marek Kaminski: Game Theory, Fall 2015
- Robin Keller: HCEMBA 283, Fall 2015
- Robin Keller: Mgmt. MBS 283, Spring 2016
- Natalia Komarova: Mathematics Graduate seminar series, Spring 2016
- Penelope Maddy: The theory of vision (from the ancients to Marr), F&W 2015-16
- Louis Narens, Don Saari: Social Dynamics, F&W 2015-16

B. Research Laboratories

**Mathematical Reasoning for the Sciences**

Faculty Organizer: Don Saari

A weekly discussion group (usually on Wednesday afternoons) where the focus is to understand how to use mathematics and/or mathematical reasoning to address problems from the social, behavioral, (and now) medical sciences.
**Experimental Social Science Laboratory (ESSL)**  
Faculty Organizer: **Mike McBride**  
The Experimental Social Science Laboratory (ESSL) is a computer laboratory for the experimental study of individual and interactive decision making. Located at SBSG 1240, the laboratory can conduct computer-based experiments of up to 40 subjects, but ESSL also has capabilities to conduct internet-based experiments. ESSL is available for use by researchers of all social scientific disciplines who conduct experiments according to the standards of experimental economics. ESSL personnel are affiliated with many departments in the UCI School of Social Science, including Economics, Anthropology, Cognitive Sciences, Logic and Philosophy of Science, Political Science, and Sociology, and also with departments in the School of Social Ecology and Paul Merage School of Business.

**Social Network Research Group (SNRG)**  
Faculty Organizer: **Carter Butts**  
The objective of the UCI Social Network Research Group is to provide an informal setting for discussion of current and ongoing network-related research at UCI (and elsewhere), facilitate the exchange of information regarding new techniques, tools, data sources, and research findings, support graduate student training in the network field, and encourage collaboration among faculty and students on network-related topics. The SNRG meets weekly throughout the academic year, at a time and place that is determined on a quarterly basis. Attendance is open to all interested members of the university community, and "drop-ins" are welcome.  
Meets on Wednesdays from 3:30-4:30 p.m. in Calit2 3355.  
The SNRG also is an activity of the UCI Center for Networks and Relational Analysis ([www.relationalanalysis.org](http://www.relationalanalysis.org)).

**Cognition and Color Reading Group**  
Research Organizer: **Kimberly Jameson**  
A weekly discussion group of published research articles, or participants' on-going research interests, on topics of cognition and color perception. Topics covered in recent years include: Color perception correlates of photopigment opsin genes, psychophysical investigations of heterochromatic luminance discrimination, adaptive optics imaging of the human retina, comparative color vision behavior, neural correlates of human color perception, individual variation and color perception, color vision diagnostics and clinical applications, etc. Research topics discussed typically focus on higher-order aspects of color processing, exploring front-end processing issues when they bear on phenomenology. Meeting location: SSPA 2142  
Meeting time: Fridays, 11:00 am - 12:30 pm; meeting dates designated at the beginning of each quarter. Schedule posted at: [http://www.imbs.uci.edu/~kjameson/ColorCogFALL2015.html](http://www.imbs.uci.edu/~kjameson/ColorCogFALL2015.html)

**Social Dynamics**  
Faculty Organizer: **Brian Skyrms**  
Social Dynamics is a research seminar, where graduate students and faculty present research projects, and there is vigorous critical discussion.  
Instructors: Louis Narens, Don Saari, and Brian Skyrms  
Meets fall quarter on Tuesdays, 2:00 - 5:00 p.m. on 7th floor of the Social Science Tower

**Computational Models of Language Reading Group (CoLa)**  
Faculty Organizer: **Lisa Pearl**  
Topics of interest for the group include computational models of language learning,
computational learning theory, principles underlying models of language acquisition and language change, and models of information extraction from language by humans. We meet four times a quarter for about an hour, and it’s usually a nicely feisty discussion. Day/time to meet will be updated on the website
IV. 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 10 Ph.D. students, of whom 2 graduated this academic year. We are admitting 2 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.

Nikhil Addleman  
Kalin Agrawal*  
Calvin Cochran  
Steven Doubleday  
Santiago Guisasola  
Lisa Guo  
William Leibzon  
Bahattin (Tolga) Oztan*  
Shaun Stipp  
Junying Zhao

*Graduated in 2015-2016

In addition to MBS Ph.D, five Masters degrees were awarded Summer 2015 – Spring 2016:

Lisa Guo  
Santiago Guisasola  
Bennett Holman  
Natalie Nakamine  
Hannah Rubin

Noted academic and research related achievements by our MBS graduate students include Junying Zhao’s Andrew Vincent White and Florence Wales White Scholarship for the 2016-17 academic year. The $20,000 scholarship awarded for her work, “Hippocratic Paradox and Irrational Consensus: A Mathematical Behavioral Analysis of Medical Decision-Making.”

IMBS supported participation of two MBS graduate students, Santiago Guisasola and William Leibzon, at the Santa Fe Institute over the summer.

Santiago Guisasola contibuted the following to IMBS:

“This summer I had the incredible privilege of being a participant at the Santa Fe Institute Complex Systems Summer School. I attended many lectures by complexity science legends like
Liz Bradley and Jim Crutchfield. Lecture topics included Nonlinear Dynamics, Computation, Networks, Social Minds, and many others. In addition, I worked with 4 other participants on a project that models dominance hierarchy formation in rhesus macaques. We were an interdisciplinary team composed of a computer scientist, biologist, political scientist, economist, and myself. We are still in communication and plan to have a publication ready by December. I formed friendships with the members of my project, but also with the remaining 76 participants of the program. I am now connected to scientists all over the world. I return to Irvine inspired and more knowledgeable about my fields of interest.”

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 and our annual graduate conference. This past year the MBS 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. Friday Research Presentations

This IMBS activity was coordinated by Stergios Skaperdas and Jean-Paul Carvalho and directed by graduate student and 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>
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<tbody>
<tr>
<td>Oct 9</td>
<td>Junying Zhao, Graduate Student, MBS</td>
<td>&quot;The Possibility of Anonymous Social Orderings Using Curvature of Indifference Hypersurfaces&quot;</td>
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<tr>
<td>Oct 16</td>
<td>Rein Taagepera, Professor, Political Science</td>
<td>&quot;How Male and Female Literacy Interact: A Logical Model&quot;</td>
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<tr>
<td>Nov 13</td>
<td>Lisa Guo, Graduate Student, MBS</td>
<td>&quot;A Dual-Process Exploration of Intertemporal Choice&quot;</td>
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<td>Nov 20</td>
<td>Mayuri Chaturvedi, Graduate Student, Economics</td>
<td>&quot;Inequality and Rent Seeking&quot;</td>
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<tr>
<td>Jan 29</td>
<td>Michael Sacks, Graduate Student, Economics</td>
<td>&quot;Club size with private benefits when quality matters&quot;</td>
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<tr>
<td>Feb 12</td>
<td>Michael Guggisberg, Graduate Student, Economics</td>
<td>&quot;Strategic Recusals at the United States Supreme Court&quot;</td>
</tr>
<tr>
<td>March 4</td>
<td>Andrew Noymer, Associate Professor, Population Health and Disease Prevention Public Health</td>
<td>&quot;Summertime, and the livin’ is easy, or Winter and summer pseudo seasonal life expectancy in the United States&quot;</td>
</tr>
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</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 14th Annual conference were Santiago Guisasola, Michael Sacks, and Junying Zhao.

Luce Graduate Student Conference
Friday, May 27, 2016
9:00 a.m. – 5:00 p.m.
SSPA 2112

Session I: Decision Making (9:00 – 10:00)
9:00 – 9:30 Steve Doubleday
Spatial Navigation During Simulated Motion in Rats
9:30 – 10:00 Junying Zhao
Hippocratic Paradox: A Mathematical Analysis of Medical Decision-Making

10:00 – 10:10 BREAK

Session II: Evolution and Learning (10:10 – 12:15)
10:10 – 10:40 Timmy Ma
Regularization of Languages: A New Mathematical Framework of Learning from an Inconsistent Source
10:40 – 11:10 Calvin Cochran
Learning Dynamics in the One-Armed Bandit Problem

11:10 – 11:15 SHORT BREAK

11:15 – 11:45 Aydin Mohseni
Fundamental Disagreements in Evolutionary Dynamics and Infinite Idealizations
11:45 – 12:15 Jennifer Briner
Sexual dimorphism in UV color vision in Heliconius doris

12:15-1:15 LUNCH

Session III: Games and Networks (1:15 – 3:20)
1:15 – 1:45 William Leibzon
Altruism as a Network Parameter in a Game Theoretic Framework
1:45 – 2:15  Nikhil Addleman  
Invasion Dynamics in Coordination Games Played on Networks

2:15 – 2:20  SHORT BREAK

2:20 – 2:50  Michael Schneider  
What it Means for a (Particular) Social Norm to Affect Scientific Inquiry

2:50 – 3:20  Santiago Guisasola  
A Model of Collaboration

3:20-3:30 BREAK

Session IV: Social Inquiry (3:30 – 4:30)

3:30 – 4:00  Jessica Kizer  
The Relationship Between Family Background, Skin Color, and the Likelihood of Adult Arrest

4:00 – 4:30  Pat Testa  
Education, Social Capital, and Social Control

4:30 – 5:00  RECEPTION

E. Jean-Claude Falmagne Dissertation Award

Each year, 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 IMBS 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.”

This year the committee selected Michael Sacks, 2016 graduate of Economics for his dissertation, “The Economics of Collaborative Production and Consumption with Applications in Digital Technologies.”
Michael Sacks (pictured) completed his undergraduate degree at Towson University, near his hometown in Maryland. He came to UCI to complete his master’s degree in mathematical behavioral science (MBS) before earning his Ph.D. in economics. His research interests include game theory, industrial organization, the economics of innovation, and more. He will be joining the Department of Economics and the Center for Free Enterprise at West Virginia University this fall.
V. 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.

**IMBS CONFERENCE ON SYSTEMATIC DATA COLLECTION & APPROPRIATE MATH MODELING**

*Celebrating Kim Romney’s 90th Year*

**NOVEMBER 5 & 6, 2015**

**Social Science Plaza A, Duncan Luce Conference Room**

**Thursday, November 05, 2015**

9:00 am to 9:15 am  Welcome, Don Saari
9:15 am to 10:00 am  Susan Weller, *Free-lists, Sample Size, & Saturation*
Discussion
10:15 am to 11:00 am  Jean-Claude Falmagne, *Comparing the Psychomotor Development of Black Infants in Johannesburg and White Infants in Brussels*
Discussion
11:15 am to 11:30 am  Break
11:30 am to 12:15 pm  Tim Satalich, *Modeling Color Appearance*
Discussion
12:30 pm to 1:30 pm  Lunch
1:30 pm to 2:15 pm  Devon Brewer, *A Systematic Review of Post-Marital Residence Patterns in Prehistoric Hunters-Gatherers*
Discussion
2:30 pm to 3:15 pm  Jeffrey Johnson, *What Does Social Network Knowledge and Estimation Accuracy Get You?*
Discussion
3:15 pm to 3:30 pm  Break
3:30 pm to 4:15 pm  Louis Narens, *From Psychophysics to Utilitarianism: Measuring and Combining Subjective Intensities*
Discussion
4:30 pm  Adjourn for the day

**Friday, November 06, 2015**

9:00 am to 9:15 am  Morning remarks
9:15 am to 10:00 am  Katie Faust, *Comparing Triadic Structure in Social Networks*
Discussion
10:15 am to 11:00 am  Bill Batchelder, *Cultural Consensus Theory: Observations about Past, Present, and Future*
Discussion
11:15 am to 11:30 am  Break
11:30 am to 12:15 pm  Jack Yellott, *Remedial Typography: Correcting Presbyopic Defocus by Spatial Filtering*
Discussion
12:30 pm to 1:30 pm  Adjournment and Informal Reception
CULTURAL CONSENSUS THEORY, MULTINOMIAL PROCESSING TREES,
AND COGNITIVE PSYCHOMETRICS
Celebrating Bill Batchelder’s 75th Year
NOVEMBER 16 & 17, 2015
Social Science Plaza A, Duncan Luce Conference Room

Monday, November 16, 2015

9:00 am to 9:15 am  Welcome, Bill Maurer and Don Saari
9:15 am to 10:00 am  Zita Oravecz, Extensions to the general Condorcet model in the hierarchical Bayesian framework
10:15 am to 11:00 am  Stephen France, Continuous CCT: The FlexCCT Software and Associated Models
11:30 am to 1:00 pm  Speakers’ Lunch
1:00 pm to 1:45 pm  Jeff Johnson, Measurement in Cultural Consensus Theory: The Development of Cultural Consensus Statements
2:00 pm to 2:45 pm  David Kellen, Comparing Signal Detection and High-Threshold Models of Recognition Memory
3:00 pm to 3:15 pm  Break
3:15 pm to 4:00 pm  Christoph Klauer, Multinomial Processing Trees and Response Time Distributions?
4:15 pm to 5:00 pm  Xiangen Hu, MPT & SRA: Research, Development, and Selected in Advanced Learning Environments
5:15 pm  Adjourn for the day

Tuesday, November 17, 2015

9:00 am to 9:15 am  Morning remarks
9:15 am to 10:00 am  Katie Faust, Can we Infer any Meaningful Global Network Properties When we Modify Social Network Measurement Scales?
10:15 am to 11:00 am  E.J. Wagenmakers, Subjective Reflections on the Work of William H. Batchelder (and a New Model for Confidence Ratings in Recognition Memory)
11:15 am to 11:30 am  Break
11:30 am to 12:15 pm  Joachim Vanderckhove, Cognitive psychometrics and cognitive latent variable models
12:30 pm to 1:30 pm  Adjournment and Information Reception
IMBS Conference on
Crowdsourcing, Big Data, and Social Media in the Behavioral Sciences:
Applications, Methods and Theory
December 3 & 4, 2015
Social Science Plaza A, Duncan Luce Conference Room

Thursday, December 03, 2015

8:45 am to 9:00 am  Welcome
9:00 am to 10:00 am  Ulf-Dietrich Reips, University of Konstanz, Research in with Social Media
10:10 am to 11:10 am  Norbert Schwarz, USC & David Hauser, University of Michigan, Online attention checks: Attentive Turkers and unintended consequences
11:20 am to 12:20 pm  Patricia Greenfield, UCLA, Cultural evolution in China and the U.S.: Using the Google Ngram Viewer to study implications of social and political change for cultural values and human development
12:30 pm to 1:30 pm  Lunch
1:30 pm to 2:30 pm  Mark Steyvers, UCI, Combining Human Judgments
2:40 pm to 3:40 pm  Siddharth Suri, Microsoft, Crowdwork’s Invisible Engine: Valuing the Organic Collaboration that Drives Crowdsourcing Labor Markets
3:50 pm to 4:50 pm  Niloufar Salehi, Lilly Irani, Michael Bernstein, Ali Alkhatib, Eva Ogbe, Kristy Milland, and Clickhappier, Computer Science and The Human Computer Interaction Group, Stanford University, We Are Dynamo: Overcoming Stalling and Friction in Collective Action for Crowd Workers
5:00 pm to 5:30 pm  Discussion
5:30 pm  Adjourn for the day

Friday, December 04, 2015

9:00 am to 10:00 am  Kimberly A. Jameson, Sean Tauber, Prutha S. Deshpande, Stephanie M. Chang, and Sergio Gago, Crowdsourcing the transcription of archival data
10:10 am to 11:10 am  Michael D. Lee, UCI, Making sports predictions by applying cognitive models to crowd-sourced data
11:30 am to 1:00 pm  On site: Lunch and Student Poster Session
1:00 pm to 2:00 pm  Alexander Ihler, UCI, Computational Choices for Crowdsourcing
2:10 pm to 4:10 pm  Ulf-Dietrich Reips, Tutorial Session: Tools and methods in crowdsourcing and Internet-based experimenting
4:20 pm to 5:20 pm  Gary H. McClelland, University of Colorado Boulder, Visualization for Big Data and Internet Research
5:30 pm to 6:00 pm  Discussion and informal reception
6:00 pm  Adjournment
<table>
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<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>9:00 – 9:10</td>
<td>Welcome</td>
</tr>
<tr>
<td>9:40 – 10:10</td>
<td>Testable Implications of Models of Intertemporal Choice: Exponential Discounting and Its Generalizations, Taisuke Imai, (with Federico Echenique and Kota Saito), Caltech</td>
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<tr>
<td>10:40 – 11:00</td>
<td>Break</td>
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<tr>
<td>11:00 – 11:30</td>
<td><em>When to Quit: Narrow Bracketing and Reference Dependence in Taxi Drivers</em>, Vincent Leah-Martin, UCSD</td>
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<tr>
<td>11:30 – 12:00</td>
<td><em>Learning from Prices in Models of Models of Higher Order Beliefs</em>, Radhika Lunawat, UCI</td>
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<td>12:00 – 1:30</td>
<td>Lunch, 3rd floor terrace</td>
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<tr>
<td>1:30 – 2:00</td>
<td><em>Communication Without the Cooperative Principle: A Signaling Experiment</em>, Cailin O’Connor, (with Simon Huttegger, Justin Bruner and Hannah Rubin), UCI</td>
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<tr>
<td>2:00 – 2:30</td>
<td><em>Information Transmission and the Shadow of the Future</em>, Emanuel Vespa, (with Alistair Wilson), UCSB</td>
</tr>
<tr>
<td>2:30 – 3:00</td>
<td><em>Experimenting with Measurement Error: Techniques with Applications to the Caltech Cohort Study</em>, Ben Gillen, (with Erik Snowberg and Leeat Yariv), Caltech</td>
</tr>
<tr>
<td>3:00 – 3:30</td>
<td>Break</td>
</tr>
<tr>
<td>3:30 – 4:00</td>
<td><em>Equilibrium Selection in Stable Matching Mechanisms: Experimental Evidence</em>, Ahrash Dianat, (with Marco Castillo), Caltech</td>
</tr>
<tr>
<td>4:00 – 4:30</td>
<td><em>Population Uncertainty in Voluntary Contributions of Public Goods</em>, Duk Goo Kim, Caltech</td>
</tr>
<tr>
<td>5:30 – 8:00</td>
<td>Dinner, Plenary Speaker Shyam Sunder, Yale School of Management, UCI University Club (<em>by invitation</em>)</td>
</tr>
</tbody>
</table>

**Saturday, May 21, 2016**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 – 9:30</td>
<td><em>Candidate entry and political polarization: An experimental study</em>, Jens Grosser, FSU, (with Thomas R. Palfrey, Caltech)</td>
</tr>
<tr>
<td>9:30 – 10:00</td>
<td><em>Dump, Date, or Marry: Endogenous Group Formation with Varied Contract Length</em>, Sean D’Evelyn, LMU</td>
</tr>
<tr>
<td>10:00 – 10:30</td>
<td>A Theory of Mind Ability and Cooperation in Prisoners Dilemma, Garret Ridinger,</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10:30 – 10:50</td>
<td>Break</td>
</tr>
<tr>
<td>10:50 – 11:20</td>
<td>Persistence of Power: Dynamic Multilateral Bargaining, Marina Agranov, (with Christopher Cotton and Chloe Tergiman), Caltech</td>
</tr>
<tr>
<td>11:20 – 11:50</td>
<td>An Empirical Investigation of Wagering Behavior in a Large Sample of Slot Machine Gamblers, Florina Salaghe, (with James Sundalie, Mark Nichols, Federico Guerrero), University of Nevada, Reno</td>
</tr>
<tr>
<td>11:50 – 12:20</td>
<td>Tra i Lioni: The Economics of Supersition, Joshua B. Miller, (with Tommaso Coen, Martin Dufwenberg, Giovanna Invernizzi and Luiz Oliviera), Bocconi University</td>
</tr>
<tr>
<td>12:20 – 12:30</td>
<td>Closing remarks</td>
</tr>
<tr>
<td>12:30</td>
<td>Adjournment</td>
</tr>
</tbody>
</table>

### B. Conferences/Seminars Organized By IMBS Members

**Carter Butts**


Workshop for students in the Chemistry and MaterialsPhysics (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 and RNA folding. UC Irvine, September 2015.

**John Duffy**


**Michelle Garfinkle**


**Bernie Grofman**

Organizer of Peltason Center for the Study of Democracy "signature" conference around the theme of “Political Persuasion.” Participants were leading scholars in political science, psychology, and economics. Laguna Beach, CA, January 2016.


Kimberly Jameson


Robin Keller

Program Committee Member and Special Track Organizer, “12th INTERNATIONAL CONFERENCE on Operations Research (ICOR 2016),” co-sponsored by INFORMS. Organized a set of talks by INFORMS members for the program committee. Havana, Cuba, March 2016.

Michael McBride


Cailin O’Connor


Michael Lee


George Sperling


James Weatherall


Hongkai Zhao

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 continues work with Professor Kim Romney, and Robert Forbes continues 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 colloquium. Most papers are also downloadable from the IMBS web site at http://www.imbs.uci.edu/newsevents/events/colloquia.php.

The following talks were presented in the IMBS Luce Conference Room during the 2015 – 2016 academic year:

**OCTOBER 1**
NATALIA KOMAROVA  
Professor of Mathematics  
UC Irvine  
“Networks of control in stem cells”

**OCTOBER 15**
JOHN DUFFY  
Professor of Economics  
UC Irvine  
“Voting with Endogenous Information Acquisition: Theory and Evidence”

**OCTOBER 29**
PAUL TUPPER  
Joint with Applied and Computational Mathematics  
Associate Professor of Mathematics  
Simon Fraser University  
“Exemplar dynamics and sound merger in language”
NOVEMBER 20
RUSSELL GOLMAN
Assistant Professor, Social & Decision Sciences
Carnegie Mellon University
“Polya’s bees: A model of decentralized decision-making”

JANUARY 14
CAILIN O’CONNOR
Assistant Professor
UC Irvine
“Power, Bargaining, and Evolution”

JANUARY 21
PATRICK FORBER
Associate Professor
Tufts University
“The Coevolution of Recognition and Social Behavior”

JANUARY 28
STEVE FRANK
Distinguished Professor
UC Irvine
“The Common Patterns of Nature”

FEBRUARY 18
KEITH DOUGHERTY
Professor
University of Georgia
“Coalitional Stability: Apportioning the Legislature at the U.S. Constitutional Convention”

FEBRUARY 25
IGOR KOPYLOV
Associate Professor
UC Irvine
“Approximation Formulas in Continuous Utility Models”

MARCH 10
ASEN KOCHOV
Assistant Professor
University of Rochester, New York
“Stationary Cardinal Utility”
APRIL 7
JAMES LU
Assistant Professor, Economics
UCLA
“Bayesian Theory of State Dependent Utilities”

APRIL 21
MARK SATTERTHWAITE
Professor of Strategy
Northwestern University
“Price Discovery Using a Double Auction”

APRIL 28
JACOB FOSTER
Assistant Professor, Sociology
UCLA
“Made to know: science as the social production of collective intelligence”

MAY 12
DAVID EPPSTEIN
Chancellor’s Professor, Information and Computer Sciences
UC Irvine
“Linear-time Algorithms for Proportional Apportionment”

MAY 19
SEAN TAUBER
Assistant Research Scientist, IMBS
UC Irvine
“Bayesian models of cognition revisited: Setting optimality aside and letting data drive psychological theory”

MAY 26
KIMBERLY JAMESON
Research Scientist, IMBS
UC Irvine
“Can we rule out the potential from Potential Human Tetrachromacy?”

JUNE 2
EHUD KALAI
Professor of Managerial Economics & Decision Sciences
Northwestern University
“Learning and Stability in Big Uncertain Games”
### VI. BUDGET

#### A. Appropriations and Expenditures

**Appropriations:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-16 IMBS Budget allocation</td>
<td>$ 90,000.00</td>
</tr>
<tr>
<td>Visitor Allocation</td>
<td>$ 17,430.00</td>
</tr>
<tr>
<td>2015-16 Overhead return</td>
<td>$ 15,540.00</td>
</tr>
</tbody>
</table>

**Total budget for 2015-16:** $122,970.00

**Expenditures:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries &amp; Benefits (Dir., Admin., Visitor)</td>
<td>$ 62,823.37</td>
</tr>
<tr>
<td>School Administrative Support</td>
<td>$ 7,500.00</td>
</tr>
<tr>
<td>Social Sciences Business Office</td>
<td>$ 15,540.00</td>
</tr>
<tr>
<td>Conference/Colloquia</td>
<td>$ 21,854.67</td>
</tr>
<tr>
<td>Supplies &amp; Expenses</td>
<td>$ 2,001.96</td>
</tr>
<tr>
<td>Graduate Student Support</td>
<td>$ 13,250.00</td>
</tr>
</tbody>
</table>

**Total Expenditures:** $122,970.00

*Closed fiscally solvent*
B. Extramural Funding Activity

GRANTS AWARDED AND ACTIVE:

IMBS faculty research was supported by research grants totaling $37,764,418. 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: NSF  
Amount: $299,787  
Award Period: 2015-2018  
Title: Statistical Extensions and new Application of Cultural Consensus Theory  
Role: Co-PI

David Brownstone

Source: UCCONNECT  
Amount: $119,554  
Award Period: 1/1/2015 – 3/30/2016  
Role: Co-PI

Source: UCCONNECT  
Amount: $66,982  
Award Period: 8/1/2015 – 9/30/2016  
Role: Co-PI

Source: UCCONNECT  
Amount: $172,314  
Award Period: 5/1/2016 – 9/30/2017  
Role: Co-PI
Carter Butts

Source: ARO
Amount: $303,284
Award Period: 2014 – 2016
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 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 IIS
Amount: $499,758
Award Period: 2015 – 2018
Title: III: NeTS: Small: Network Sampling and Construction Methods for Inference and Anonymization
Role: Co-PI with Markopoulou, Athina (PI)
Jean-Paul Carvalho
Source: IMBS
Award Amount: $1,500
Award Period: 2015-2016
Title: IMBS Seed Grant
Role: Investigator

John Duffy
Source: NSF
Amount: $79,056
Award Period: 2016-2017
Title: Experimental Evidence on Monetary Policies
Role: Co-PI (with Daniela Puzzello)

Steve Frank
Source: NSF
Award Amount: $275,000
Award Period: 2013 – 2017
Title: ABR: 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)

Marek Kaminski
Source: Center for the Study of Democracy
Award Amount: $2,500
Award Period: Winter 2016
Title: CSD Seed Grant
Role: Investigator

**Natalia Komarova**

Source: NSF
Award Amount: $980,923 (calculated with Jameson’s award)
Award Period: 2014 - 2017
Title: 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)

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: IMBS Seed Grant
Award Amount: $1,500
Award Period: 2015-2016
Title: Subjective Model Uncertainty and Second Model Uncertainty and Second-Order Beliefs
Role: Investigator

**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 McBride**

Source: UC Connect Faculty Research Grant
Award Amount: $172,314
Award Period: 2016-2017
Title: Experimental Studies for Traffic Incident Management with Pricing, Private Information, and Diverse Subjects
Role: Co-PI
Source: Army Research Office  
Award Amount: $68,439  
Award Period: 2016-2017  
Title: Instrumentation for the UC Irvine Experimental Social Science Laboratory  
Role: 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

**Cailin O’Connor**

Source: National Science Foundation (NSF) Science, Technology, and Society  
Award Amount: $305,986  
Award Period: 2015 – 2018  
Title: Dynamics and Diversity in Epistemic Communities  
Role: PI

**Lisa Pearl**

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

**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 Date 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
Amount: $249,928
Award Period: 2013 – 2016
Title: Comprehending and Regulating Financial Crises
Role: Co-PI

Jack Xin

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
Award Amount: $419,691
Award Period: 2012 – 2016
Title: Reaction-Diffusion Front Speeds in Chaotic and Stochastic Flows
Role: PI

Source: NSF
Award Amount: $299,890
Award Period: 2015 – 2018
Title: Theory and Algorithms of Transformed L1 Minimization with Applications in Data Science
Role: PI

Hongkai Zhao

Source: NSF
Award Amount: $328,860
Award Period: 2014 – 2017
Title: Shape and data analysis using computational differential geometry
Role: PI

Source: NSF
Award Amount: $249,964
Award Period: 6/1/2016 - 05/31/19
Title: BIGDATA: Theory and practice for exploiting deterministic structures of probability models in big data analysis
Role: PI
VII. APPENDICES

A. CURRENT FACULTY MEMBERS

APPENDIX A
IMBS FACULTY, 2015 - 2016

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 and Chair 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). Donald Bren Professor of Ecology and Evolutionary Biology, University of California, Irvine. Research areas: Evolution of social behavior; design of reliability.


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 Hutteregger, (Ph.D. Universität Salzburg). Chancellor’s Fellow and 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.

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.


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

Calin O’Connor, (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.

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, and Director of Salzburg Exchange Program, 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, and Department of Neurobiology and Behavior, 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, 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.

Carole Uhlaner, (Ph.D. Political Science, Harvard University). 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) Associate 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). 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). 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
SCIENTIFIC PUBLICATIONS OF IMBS MEMBERS, 2015 - 2016

Jeff Barrett


Bill Batchelder


John Boyd


Bill Branch


Jan Brueckner


**Carter Butts**


Jean-Paul Carvalho


Carvalho, J.P. A further paper titled “Resisting Education” with Mark Koyama has been revised and resubmitted to the *Journal of Urban Economics*.

**Charlie Chubb**

Journal articles:


Book Chapters:


Steve Frank


Bernie Grofman


Simon Huttegger


**Kimberly Jameson**

Selected Publications:

**Published Public-Access Research Platform:**


**Peer-Reviewed Research Articles:**


**Paper submitted for publication:**

Peer-Reviewed Research Posters:


Marek Kaminski


Robin Keller

Journal articles (peer-reviewed):

Yitong Wang (University Technology Sydney), Liangyan Wang (Shanghai Jiao Tong University), L. Robin Keller, “Discounting over Subjective Time: Subjective Time Perception Helps Explain


Liangyan Wang (Merage alumna and Associate Professor of Marketing, Antai Management School, Shanghai Jiao Tong University, Shanghai, 200052, WLY@sjtu.edu.cn), Shijian Wang (just graduated student of marketing, kasano@sjtu.edu.cn), L. Robin Keller, Jie Li (Assoc. Prof. of Market., Antai Mgt Sch.), “Thinking Styles Affect Reactions to Brand Crisis Apologies”, Forthcoming, *European Journal of Marketing*, accepted in March 2016.


Working papers:

L. Robin Keller and Yitong Wang, “Information Presentation in Decision and Risk Analysis: Answered and Unanswered Questions”, February 2016, peer 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 former Editor-in-Chief Michael Greenberg to write this contribution; submitted to Editor-in-Chief Tony Cox (under review).

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,


Liangyan Wang (Merage alumna and Associate Prof. Shanghai Jiaotong), Qin Wang (graduate student, Shanghai Jiaotong), L. Robin Keller, "Counterfeits can Benefit Original Products when People are Caught using Counterfeits", April 2016.

**Natalia Komarova**


**Igor Kopylov**


**Michael Lee**


**Penelope Maddy**


Penelope, M. Set-theoretic foundations. To appear in a volume in honor of Hugh Woodin’s 60th birthday.

**Michael McBride**


**Louis Narens**


Narens, L., \& Saari, D. Modeling decisions involving ambiguous, vague, or rare events. G. Chichilnisky and A. Rezai (eds.), *The Economics of Global Environment*,


**Andrew Noymer**


**Cailin O’Connor**


**Lisa Pearl**


Pearl, L., Ho, T., & Detrano, Z. (in press). An argument from acquisition: Comparing English metrical stress representations by how learnable they are from child-directed speech. Language Acquisition.


Dale Poirier


Don Saari


Stergios Skaperdas


George Sperling


**Published Abstracts:**


**Brian Skyrms**


**Hal Stern**


**Carole Uhlaner**


Uhlaner, Carole Jean and Becki Scola*. “Collective Representation as a Mobilizer: Race/Ethnicity, Gender, and Their Intersections at the State Level.” State Politics & Policy Quarterly 16(2):227-263. Published online October 7, 2015. doi: 10.1177/1532440015603576

**James Weatherall**


**Book Reviews:**


**Jack Xin**


Hongkai Zhao


MBS 15-06
Decomposing Models of Bounded Rationality
Daniel Jessie and Ryan Kendall

MBS 16-01
Digitizing a large corpus of handwritten documents using crowdsourcing and cultural consensus theory
Prutha S. Deshpande, Sean Tauber, Stephanie M. Chang, Sergio Gago, and Kimberly A. Jameson
Bill Batchelder


Bill Branch


David Brownstone


**Jan Brueckner**


**Michael Burton**


**Carter Butts**


**Jean-Paul Carvalho**


Charlie Chubb


Steve Frank


Bernie Grofman

Simon Huttegger


Kimberly Jameson


Jameson, K. A. (2016, May). *Can we rule out the potential from Potential Human Tetrachromacy?* IMBS Colloquium. UC Irvine, CA.


Robin Keller


L. Robin Keller, Plenary speaker, Program Committee Member, and Special Track Organizer, 12th INTERNATIONAL CONFERENCE on Operations Research (ICOR 2016), Havana, Cuba; [http://samm.univ-paris1.fr/12th-ICOR-2016](http://samm.univ-paris1.fr/12th-ICOR-2016), co-sponsored by INFORMS.


**Marek Kaminski**

Kaminski, M. (2015, July). *25 years after the fall of communism*. Adam Smith Center, Warsaw, PL.


**Natalia Komarova**


Komarova, N. (2015, December). Speaker at the seminar `Evolution of language`, Max Planck Institute, Ploen, Germany.

Igor Kopylov


Michael Lee


Penelope Maddy


Michael McBride


**Louis Narens**


**Andrew Noymer**


Colloquia and Seminars:


**Cailin O’Connor**


O’Connor, C. (2015, September). *Dynamics and Diversity in Epistemic Communities*. The Center for Philosophy of Science, University of Pittsburgh, Pittsburgh, PA.


**Lisa Pearl**


Dale Poirier


Donald Saari

Conferences:


Public Lectures:


Colloquia:


Saari, D. (2016, March). *Using a torus (or donut) to answer puzzles in psychology and even apportionments*. Mathematics Department, Vassar, NY.

**Stergios Skaperdas**


**Brian Skyrms**


Skyrms, B. (2016, May). Interdisciplinary Workshop on Deception, UCLA.


**George Sperling**


**Hal Stern**


Carole Uhlaner


James Weatherall


Idealizations in Science. Munich Center for Mathematical Philosophy, Ludwig-Maximilians University, Munich, Germany. Delivered by co-author Palacios, P.

Jack Xin

Xin, J. (2015, September). Epstein Institute Seminar, Industrial & System Engineering, USC.


Hongkai Zhao


E. FACULTY AWARDS AND ACHIEVEMENTS

APPENDIX E
IMBS FACULTY AWARDS AND ACHIEVEMENTS, 2015 - 16

Bill Batchelder

An IMBS Conference in my honor titled Cultural Consensus Theory, Multinomial Processing Tree Models, and Cognitive Psychometrics took place in November 2015.

Carter Butts

Joined the Board of Reviewing Editors at Science.

Jan Brueckner

Named Chancellor’s Professor in recognition of scholarly contributions in urban, public and transportation economics.

Jean-Paul Carvalho

The lead article in the June 2016 issue of the Journal of Economic Literature, titled “The New Economics of Religion”, cited three of my papers and devoted a paragraph to my paper titled ‘Veiling’.

Co-organizer, IMBS Friday lunch seminars. UC Irvine.

Faculty discussant, IRES Graduate Workshop, Chapman University.

Steve Frank

Appointed UCI Distinguished Professor, July 2015.

Appointed Donald Bren Professor of Biological Sciences, June 2016.

I taught a graduate course in evolution with strong emphasis on theoretical concepts.

Following my IMBS seminar in January (see above), I led a session to discuss the topic with a couple of IMBS students and visitors.

Michelle Garfinkel

Golden Key International Honor Society (honorary member), April 2016.
Bernie Grofman
I received a $5,000 grant from the Koch Foundation to fund a one week visit to UCI by a Distinguished Public Choice scholar, Professor Roger Congleton to give talks at UC Irvine.

Kimberly A. Jameson

Community Service City of Newport Beach, California:
June 2016. School of Physical Sciences. *Exceptional Faculty Mentor Recognition* for Advising of Mathematics Undergraduate Kirbi Joe.


Ad Hoc Reviewing:
PICS2016
Journal of Vision
Color Research & Application
Journal of the Optical Society of America
PNAS

Media:

During 2015-2016 news and media coverage highlighting Jameson’s research (sketched as (1), (3) and (5) above) appeared in a variety of public and campus media outlets, including BBC news, KPBS, Discovery channel, Interface Magazine, Vogue Magazine, and several others.

October 2006 -- present. Appointed member of the City of Newport Beach Environmental Quality Affairs Committee. A committee for advising and oversight, focusing on project environmental impact reports and notices of project descriptions for public and private work proposed within the city of Newport Beach.

Marek Kaminski

Reviews of my book Gry Wiezienne (Games Prisoners Play)
Robin Keller

Ramsey Medal for distinguished contributions to decision analysis, highest award of the Decision Analysis Society of INFORMS, November 2015.

*Decision Analysis* editorial board member.

*EURO Journal on Decision Processes* editorial board member.

INFORMS (The Institute for Operations Research and the Management Sciences, [www.informs.org](http://www.informs.org))

- President, 2015.
- Past-President, 2016.
- Board Liaison to INFORMS History and Traditions Committee, 2016 (as Past President).
- Co-chair of INFORMS Strategic Planning Committee, 2016.
- President’s Award Committee, Chair, 2015; Member 2016 and 2017.
- Nominations Committee, Chair for 2017 election- 2016.

Appointment to Committee for a Study of Performance-Based Safety Regulation, Transportation Research.

Board, National Research Council of the National Academies, February 2016.

Elected to Committee on Academic Personnel, September 2016.

Igor Kopylov

Associate Editor: Theoretical Economics.

Simon Levin

National Medal of Science, December 2015.
**Louis Narens**

During the last academic year I served as Graduate Director for the Mathematical Behavioral Science PhD Program.

**Michael McBride**

I am one of the organizers for the Experimental Social Science Lunch that meets weekly.

**Lisa Pearl**

2016 Chancellor’s Award for Excellence in Fostering Undergraduate Research, Undergraduate Research Opportunities Program.

2016 Excellence in Undergraduate Teaching, Fall Quarter 2015, School of Social Sciences, University of California, Irvine.

Online media appearances discussing my modeling work:


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

**Dale Poirier**

Invitation to nominate candidates for 2016 The Sveriges Riksbank Prize in Economic Science in Memory of Alfred Nobel.

**Kim Romney**

Outstanding Emeritus Award, June 2016.

**Don Saari**

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

NAS  Chair: Section 32 (Applied Mathematics).

NAS: Nominating Committee.

NAS: Temporary Nominating Group, Foreign Associates.

NRC: Board on International Scientific Organizations.

NRC: Chair, Board on Mathematical Sciences and their Applications.

NRC: Chair, NMO, IIASA.

Chair: Conference Board of the Mathematical Sciences.

Science Board: Santa Fe Institute.

**Stergios Skaperdas**

Keynote speaker at the Australasian meeting of the Public Choice Society, Queensland University of Technology, Brisbane, Australia. December 2015.

**Hal Stern**


- 2015 – present, Chair, American Statistical Association (ASA) Committee on Publications.
- 2015 – present, Member, Board of Directors, National Institute of Statistical Science (NISS).
- 2015, Member, External Review Committee, Department of Statistics, University of Pennsylvania, PA.
- 2014 – present, Member, Scientific Area Committee for Physics/Pattern Forensic Evidence, Organization of Scientific Area Committees, National Institute of Standards and Technology (NIST).
- 2014 – present, Member, Advisory Committee for AAAS / Arnold Foundation, “Quality and Gap Analysis of the Forensic Science Literature.”
- 2013 – 2016, Chair, National Academy of Sciences Panel on Research Methodologies for Understanding Driver Fatigue.
• 2012 – present, Vice-Chair, Ad Hoc Advisory Committee on Forensic Statistics, American Statistical Association.

**Rein Taagepera**

Karl Deutsch Award presented by the International Political Science Association, June 2016.

**Carole Uhlaner**

Promoted to Full Professor.

**James Weatherall**

Visiting Fellowship at the Pittsburgh Center for Philosophy of Science, University of Pittsburgh, 2016.

Elected Visiting Fellow at Clare Hall College, Cambridge University for Summer 2016.

**Jack Xin**

Appointed to serve the 2nd term of Editor-in-Chief, SIAM Interdisciplinary Journal: Multi-scale Modeling & Simulations, by SIAM Vice President for Productions, May 2016.
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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<tbody>
<tr>
<td>Nikhil Addleman</td>
<td>Narens</td>
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<td>** Kalin Agrawal</td>
<td>Batchelder</td>
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<td>* Gregory Alexander</td>
<td>Batchelder</td>
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<td>* Jerrod Anderson</td>
<td>Carvalho/McBride</td>
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<td>Brian Asquith</td>
<td>Brueckner</td>
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<td>Galia Bar-sever</td>
<td>Pearl</td>
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<td>Michael J. Bannister</td>
<td>Eppstein</td>
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<td>Zach Becker</td>
<td>Eppstein</td>
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<td>Dennis Blew</td>
<td>Kaminski</td>
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<td>Alex Bower</td>
<td>Batchelder</td>
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<tr>
<td>Steven Brownlee</td>
<td>Poirier</td>
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<td>** Anne Carpenter</td>
<td>McBride/Skaperdas</td>
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<td>Deapriya Chakraborty</td>
<td>Brownstone</td>
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<td>Elliott Chen</td>
<td>Weatherall</td>
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<td>Mayuri Chaturvedi</td>
<td>Skaperdas</td>
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<td>Calvin Cochran</td>
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<td>Andrew Colopy</td>
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<td>John Cuffe</td>
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<td>Irina Danileiko</td>
<td>Lee</td>
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<td>Archie Delshad</td>
<td>Kaminski</td>
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<td>* Steve Doubleday</td>
<td>Lee</td>
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<td>** Ben Feintzeig</td>
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<td>Nikki Fider</td>
<td>Komarova</td>
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<td>** Ian Finn</td>
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<td>Katelyn Finley</td>
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<td>Marian Gilton</td>
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<td>Chubb</td>
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<td>Hongyang (Maime) Guan</td>
<td>Lee</td>
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<td>Michael Guggisberg</td>
<td>Brownstone/Poirier</td>
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<td>Santiago Guisasola</td>
<td>Saari</td>
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<td>Lisa Guo</td>
<td>McBride/Narens</td>
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<td>Christian Herrera</td>
<td>Chubb</td>
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<td>** Michael Ho</td>
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<td>Kurt Horner</td>
<td>McBride</td>
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<td>Matt Inverso</td>
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<td>** Keith Jarrett</td>
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<td>Brian Kaiser</td>
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<td>Student</td>
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<td>Alex Keena</td>
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<td>Amine Mahmassani</td>
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<td>Aydin Mohseni</td>
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<td>Fulya Ozcan</td>
<td>Poirier</td>
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<td>** Tolga Oztan</td>
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<td>Jason Ralston</td>
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<td>Jordan Rashid</td>
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<td>** Garret Ridinger</td>
<td>McBride</td>
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<td>Gerard Rothfus</td>
<td>Brian Skyrms</td>
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<td>Sarita Rosenstock</td>
<td>O’Connor/Weatherall</td>
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<td>Hannah Rubin</td>
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<td>Michael Sacks</td>
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<td>K.J. Savinelli</td>
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<td>Pele Schramm</td>
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<td>Linley Slipetz</td>
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<td>Emma Smith</td>
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<td>Shaun Stipp</td>
<td>Narens</td>
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<td>Pat Testa</td>
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<td>* Brian Vegetabile</td>
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<td>Jamie Wang</td>
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<td>Cole Williams</td>
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<td>Timothy Young</td>
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<td>Junying Zhao</td>
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<td>Irina Zotova</td>
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<td>Penghe Zu</td>
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G. VISITORS TO IMBS

APPENDIX G
VISITOR’S LETTERS

Donald G. Saari, Director
Institute for Mathematical Behavioral Sciences
University of California
Irvine, CA 92697-5100

Dear Don,

This year, I spent January 3-30 at UCI, primarily based in IMBS, but also with an affiliation with Ecology and Evolutionary Biology. I did make one short trip to the National Science Foundation for a ceremony honoring the recipients of the National Medal of Science. The ceremony at the White House, at which the Medal was to be formally presented, was delayed until May, due to the January blizzard in DC.

While at UCI, I had the pleasure to meet with Provost Lavernia and Don Saari to discuss new initiatives in Convergence at UCI; this is a very exciting direction, and complementary to activities we are developing at Princeton. I look forward to enhanced interactions as the programs develop. At IMBS, I interacted regularly with Don Saari, among others, attended the Thursday colloquia, and worked intensively with Adam Martiny and his group in Earth Systems Science (and EEB). As usual, Don Saari and I discussed a number of research topics, as well as international collaborations at IIASA and the activities of the Board on Mathematical Sciences of the National Academy of Sciences. At Don’s invitation, I agreed to join that Board. Also joining Martiny and me in our discussions were my Princeton postdoctoral fellow, George Hagstrom; a sabbatical visitor to Princeton (Ken Andersen, from Copenhagen); and, for one day, Andrew Hein. With Hagstrom, Martiny and I made substantial progress on a manuscript on nutrient patterns in the oceans, as part of our NSF Dimensions of Biodiversity grant; that paper will be submitted for publication this spring. With Andersen, we began a new collaborative project on trait-based modeling of marine systems, and will also explore funding for that. Martiny and I also worked on strategies for future funding to continue our collaboration, which has been highly productive, and met with Jacob Levin to explore funding strategies.

Inspired by discussions we had had previously, I also met with Arthur Lander, joined on Skype by Andrew Lo of MIT, as we explored collaboration on insights drawn from developmental biology for regulation of the financial system. I also met with Qing Nie, with whom I have collaborated recently, and we plan to travel together to Beijing in the fall to meet with our collaborator, Lei Zhang, at the Beijing International Center for Mathematical Research.
I met less formally with Fred Wan, Steve Frank, Francisco Ayala, Susan Bryant, David Gardiner, Kimball Romney and others. Frank and I discussed his latest work, which he presented (with me as host) to the IMBS Colloquium. Throughout the period, I also carried out research on public goods, on ocean modeling, on optimal search strategies, on collective decision-making and on other topics.

Simon Levin  
Professor, Ecology and Evolutionary Biology  
Princeton