STATEMENT OF RESEARCH INTERESTS

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While much conventional sociological research assesses statistical relationships among variables, my research has focused on elucidating social processes underlying those relationships. I have done so by developing formal theoretical models and methods of longitudinal data collection and analysis, as well as applying these theories and methods in research that investigates generative dynamics rather than correlations. Much of this research is in the domain of *computational social science*. Below I elaborate on two primary themes of my research: the dynamics of social networks and the dynamics of cooperation and competition within and across organizations.

Theme 1: Elucidating Dynamics of Social Networks

In researching social networks for the past 29 years, I have often represented social interaction conventionally as binary relations (where 'social ties' are present or absent). Although this allows us to analyze stable structures, it requires us to ignore crucial temporal dynamics of social interaction (such as interdependent sequences and timing of social behavior) playing out among actors. My recent research has aimed to go beyond conventional representations of networks to think instead about the temporal and structural dynamics of interaction. My first advance has been to model the generative dynamics underlying observed network structures, and to build principled statistical models to identify those interactive forces. My second advance has been to develop viable alternatives to conventional social network data (typically surveys), in the form of streaming data on social interaction collected automatically using wearable sensors. My third advance has been to cast new light on the temporal dynamics of interaction events (rather than aggregating those events into 'networks') and to then employ a new class of statistical models to directly analyze those social dynamics in time-stamped event data. Throughout my career, I have used computational models to examine real-time interaction dynamics in pure theoretical experiments. I will summarize these distinct areas of my research program below.

New Theory for Old Methods and Data: My Conventional Social Networks Research

A recent focus on my research agenda has been to bring conceptual clarity to the field of social network analysis and theory. In a series of papers, I have investigated the ways that the 'social tie' has been conceptualized, as *social interaction*, *social sentiments*, *role relations*, and *access* to resources [1, 2, 3], and defined the theoretical domain for each distinct network concept. One of my current projects operationalizes three of these concepts on a population of adolescents (friendship, liking/disliking, and a variety of different forms of interaction, both face to face and online) in a study of four diverse middle schools in a small city in the northeast. This study, funded by NIH[1], follows adolescents from age 11 to age 15 and tracks their social networks, health behavior, and health outcomes.

The first paper [4] from this study combined qualitative data from focus groups and interviews with statistical analysis of survey data to interrogate the meaning of friendship for adolescents. We discovered that when these adolescents use the label *friend* they typically mean something quite

1 National Institutes of Health (2016-) Principal Investigator (joint with John R. Sirard), "R01: Identifying Mechanisms of Peer Influence on Youth Weight-Related Behaviors." $3,062,718. (NIH: #R01HD086259)

different from what is assumed in social networks research, and boys and girls also use the label differently. These findings have deep implications for the field of social network analysis. A follow-up paper [5] investigated recent evidence for order effects in nominating ties for adolescents responding to sociometric surveys.

My early work applied conventional tools of social network analysis to conventional sociological questions. For example, I analyzed how and why citizens' network position may have affected involvement in a neighborhood activist organization [6], showing no apparent effect for centrality but a strong relationship between participation and position in a local field of affiliations. In my *Social Psychology Quarterly* article [7], I analyzed how individuals' social ties affected their perceptions of group norms in vegetarian cooperative houses, showing biases due to *selective exposure* to a biased sample of peers and *selective disclosure* of a biased sample of information by peers. My review paper in *Mobilization* [8], now widely cited in research on mobilization and networks, spurred efforts to identify social processes or mechanisms underlying observed patterns. The paper introduced *multivalent* influences (where network ties have negative as well as positive effects) to the literature on social movement organizations.

New Methods for Old Theory and Data: Using ERGMs to Understand Social Networks

Two of the most well-documented and consequential social network patterns are the tendency for social triads to be 'closed' (i.e., 'a friend of a friend is a friend') and the tendency for interaction partners to be similar to one another (i.e., 'birds of a feather flock together'), respectively called *triad closure* and *homophily*. My co-authored paper in *Demography* [9] questions the ways social scientists have conceptualized and studied both patterns, showing that both folk wisdom and decades of research may have exaggerated homophily and triad closure by failing to realize how much they are dynamically interrelated (and statistically interdependent). That is, a strong observed pattern of homophily may be a byproduct of the dynamics of triad closure, or vice versa. And both patterns may partly reflect what we call *sociality*, or heterogeneity among subsets of actors in how highly-connected they are.

In an analysis of US high school students, we consider generative forces that may explain the levels of friendship segregation we observe for race, gender, and age among adolescents. A pathbreaking development is our use of statistical models that closely link the dynamic theory to the empirical observables. Specifically, we introduce and apply Exponential family Random Graph (ERG) models to offer some purchase on these important questions, employing Markov Chain Monte Carlo estimation from computational statistics. To our knowledge the first empirical application of this method within a top tier social science journal, this paper has been awarded as 'highly-cited' (top 1% of its field in the publication year) by ISI Web of Science, with impacts not only across the social sciences but in the physical sciences as well.

New Data for Old Methods and Theory: Using Sensors to Observe Behavioral Interaction

A notable drawback of the *Demography* paper (and other survey research) is the fact that we were trying to statistically disentangle these generative processes by observing patterns in cross-sectional data on a single highly subjective relationship ('close friends'). Since 2004 I have been working on an NSF-funded panel study of two graduate student cohorts[2], which aims to resolve

2 Bilmes, Jeffrey, Kitts, James A., Fox, Dieter, Kautz, Henry, Choudhury, Tanzeem, and James Rehg. 2004. "Collaborative Research: Creating Dynamic Social Network Models from Sensor Data" National Science Foundation Grants IIS-0433637 and IIS-0433012.

these limitations by using longitudinal data on objective behavioral interaction, and using multiple measures (face to face two-party conversations, face to face group conversations, phone conversations, social visits, and work collaborations) to track and model the evolution of their social networks over 4 years. Using the ERG model within a longitudinal study design – comparing the five kinds of interaction networks over time – gives a more decisive answer to our above questions on homophily, triad closure, and sociality.

Again, computational social science offers transformative research programs. Our NSF-sponsored collaboration gives new leverage on classic questions and enables new kinds of questions by pairing conventional surveys with direct observation of face-to-face interaction using wearable computers with arrays of sensors [2]. In particular, we show how audio recordings of speech can be processed and analyzed to derive rich data on social interaction structures. This method also allows fine-grained analysis of conversational dynamics, including features such as voice pitch, volume, syllable rate, and turn-taking. We measure subjects' network centrality as the average length of paths to peers in the conversation network, weighted by the quantity of speech along those paths. (Central actors were connected to peers by short paths of conversations, with much talking on the paths.) We also measured subjects' influence on each other's low-level speech behavior, to show that people may be more influenced by central peers even in their unconscious speech features. We published some results from this research in 2008 and 2011 for an engineering audience [10,11], but in ongoing work we aim to analyze the coevolution of interpersonal power and network position for a general science audience.

The opportunity to rigorously and automatically collect social network data from audio recordings may have a transformative impact for basic research on social networks and group dynamics. This method can be used with phone conferences or group meetings, such as legislatures, juries, or corporate boards, as well as job interviews or annual appraisals. Although our 2004 study was to our knowledge the first social science application of these methods, wearable sensors are now rapidly disseminating in sociological research.

New Methods and Theories for New Data: Networks as Dynamic Processes

In the past decade I have largely moved *beyond* networks to directly model the structure and dynamics of social interaction, marrying my interests in networks to my interests in dynamic patterns of history. In recent reviews and theoretical essays [1, 2, 3] I showed how lenses from computational social science are uniquely suited to this dynamic view of networks. Taking time-stamped contact data from emails, texts, calendar meetings, and sensors, we can apply a variant of event-history analysis to the behavioral events that constitute social relationships. These models allow us to directly analyze the temporal and structural dynamics of social interaction. Although the statistics are straightforward, I see this conceptual leap as the greatest step toward realizing the promises of computational social science.

I make this claim more strongly with an empirical article, which aims to demonstrate how we can understand social structures by analyzing the sequence and timing of exchange events. In a collaborative project published in the *American Journal of Sociology* [12], I studied the dynamics of exchange of patients among Italian hospitals, including reciprocity at the dyad level and generalized exchange and status hierarchy formation at the population level. Just as our paper in *Demography* introduced ERG models to new audiences by applying the method in a prominent empirical study, this article similarly showcases relational event modeling and introduces a new way of thinking about networks to generalist audiences.

More Mileage Out of Theory: Using Agent-Based Models to Explore Social Processes

The field of computational social science is actually two fields, served by different professional associations, journals, and conferences. The older CSS (associated with the social sciences, mathematical modeling, and simulation) focuses on formal models as virtual laboratories for investigating abstract theoretical questions. The newer CSS (associated with machine learning and data science) focuses on collecting and processing massive complex relational data from online commerce, social media, geolocated event streams, text analysis, wearable sensors, and the like. Despite sharing a title, the older and newer CSS fields speak little to one another, with one focusing on building theories often with little concern for empirical data, and the other focusing on collecting and analyzing data often with little concern for theory. I have been active in both fields and have sought to join them intellectually in my role as a series editor of the major Springer book series, *Computational Social Sciences.*

Several of my research papers have investigated social scientific theories with computational models, translating my ideas and discursive arguments into precise mathematical or logical formalisms. A primary goal of this form of research is to clarify the mechanisms and constituent social processes underlying a social science theory, offering an intelligible explanation for observed empirical correlations and formal derivation for hypotheses. In some cases, my formal model has led to challenging the internal logic of theories and suggesting new directions for empirical research programs. For example, I responded to decades of research in organizational demography that found correlations between team diversity and the turnover rate based on cross-sectional data. In a pending project (conditionally accepted at *Computational and Mathematical Organization Theory*) I develop a mathematical model of the dynamics of organizational affiliation [13], showing that such cross-group correlations should be expected as a spurious byproduct of very basic dynamics of recruitment and exit processes. Thus the research challenges previous work on the weakness of workplace diversity, and reveals a new strength of diversity. In another collaborative project (published in *PLOS ONE*), I model the dynamics of regulatory regimes and cooperation on inter-organizational networks [14], evaluating intervention scenarios for facilitating cooperation in different patterns of organizational alliances. In a series of related computational modeling articles, I examine the dynamics of networks within organizations, including cultural convergence, factionalism, and opinion polarization [15,16,17], showing the conditions under which subgroups should merge or differentiate, and the dynamics of inter-firm supply networks [18]. Two papers examined these same dynamics in the case of task-oriented groups, and applied them to enforcement of counterproductive norms by cliques [19, 20]. A review essay developed implications of peer interdependence (21) for the diffusion of behavior (and for behavioral interventions).

Theme 2: Elucidating Dynamics of Cooperation and Competition

I have studied cooperation and competition among individuals through their shared participation in organizations, and I have studied cooperation and competition among organizations through their sharing a space of (potential) members. I see social networks and organizational affiliations as an elusive 'micro-macro link' to help us understand the interplay between interpersonal interaction and macro-level social structures.

Computational and Behavioral Experiments on Cooperation and Competition

My micro-level research investigates the dynamics of cooperation and competition in social groups. For example, my articles in *American Sociological Review* [22] and *Journal of*

Mathematical Sociology [23] use a game theoretic model to explore an interaction of formal and informal sanctioning systems, revealing how competitive incentives can paradoxically lead to counterproductive norms among group members. This article challenged canonical rational choice arguments on norms by demonstrating conditions where a centralized system of incentives may foster counterproductive 'antisocial' norms among members, undermining cooperation. This observation challenged three accepted principles in collective action research: (1) giving members incentives to cooperate enhances collective action, (2) increasing the strength of peer pressure enhances collective action, and (3) diminishing 'second order free riding' (e.g., reducing peer sanctions) enhances collective action. These ideas are getting some traction, with other articles on antisocial norms now appearing in top social science journals.

I investigated cooperation further in interdisciplinary team research using human subjects experiments at the Dartmouth *Institute for Security Technology Studies.* Those collaborative papers investigated trust in online exchange [24], manipulating features of the online reputation system and attributes of prospective partners, and also investigated privacy preferences and cooperation among people in location-aware computing environments [25].

Cooperation and Competition at Local, Regional, National, and Societal Scales

My interests in the micro-dynamics of cooperation and competition among individuals in groups scale up to strategic interaction among organizations in local communities. In studying citizens' participation in an anti-toxics coalition, I showed that prominent theories (based on perceived threats, interests, collective identity, or resources and availability) poorly predict participation, but a person's position in an ecology of interlocking memberships among religious, fraternal, and protest organizations powerfully predicts involvement.

The ecological model scales up further to regional communities of organizations. In my collaborative paper published in the *American Journal of Sociology* [12], I study strategic interdependence among organizations, where forces of competition and cooperation among hospitals channel their exchanges of patients in a region of Italy over five years.

The model scales up to the national level, building on my paper published in *Social Forces* [26]: I investigate cooperation and competition among utopian communes by analyzing organizational mortality rates over four centuries of American history. A first step in that project is analyzing the baseline rate of mortality as an organization ages over time. In addressing this classic question, I distinguish the aging of organizations from the aging of their designs. The paper shows the importance of conceptualizing and measuring aging processes at multiple levels, distinguishing the demographic maturation and senescence of individual organizations from the legitimation and obsolescence of their organizational "templates."

Lastly, my research on cooperation and competition extends over many thousands of years to study the evolution of culture at the scale of human societies, in my collaboration with an international team of prominent anthropologists, evolutionary biologists, and archaeologists [27].

These examples show how I use models of strategic interdependence to study problems of cooperation and competition among individuals in a laboratory, among members of a single group at one time, among organizations in a rural county engaged in conflict over several months, among hospitals in a region of Italy over several years, among social movements in America over nearly four centuries, even among tribes and clans in the evolution of large scale human societies over millennia. I am not attached to 'micro' or 'macro' scales of time or space. Instead, my research is motivated by general theoretical questions, and I use whatever lenses (participant observation, case

studies, surveys, experiments, historical records, formal models, or machine-collected interaction data) seem most powerful for my research question.

References

1 Kitts, James A. 2014. "Beyond Networks in Structural Theories of Exchange: Promises from Computational Social Science" *Advances in Group Processes*. 31: 263-298.

2 Kitts, James A. and Eric Quintane. 2020. "Rethinking Social Networks in the Era of Computational Social Science" pp 71-97. In Light, Ryan and James Moody (Eds.) *Oxford Handbook of Social Network Analysis,* Oxford University Press.

3 Kitts, James A., Grogan, Helene and Kevin Lewis. 2023. "Social Networks and Computational Social Science" In McLevey, John, Carrington, Peter J., and John Scott (Eds.) Sage Handbook of Social Networks (Second Edition)

4 Kitts, James A. and Diego F. Leal. 2021. "What Is(n't) a Friend? Dimensions of the Friendship Concept Among Adolescents." *Social Networks* 66: 161-170.

5 Liu, Shuyin, Nolin, David, and James A. Kitts. 2024. "Name Order Effects in Measuring Adolescent Social Networks Using Rosters." *Social Networks*. 76:68-78.

6 Kitts, James A. 1999. "Not in Our Backyard: Solidarity, Social Networks, and the Ecology of Environmental Mobilization." – *Sociological Inquiry* 69: 551-574.

7 Kitts, James A. 2003. "Egocentric Bias or Information Management? Selective Disclosure and the Social Roots of Norm Misperception." – *Social Psychology Quarterly* 66(3): 222-237.

8 Kitts, James A. 2000. "Mobilizing in Black Boxes: Social Networks and Participation in Social Movement Organizations." – *Mobilization: An International Journal* 5: 241-257.

9 Goodreau, Steven, Kitts, James A., and Martina Morris. 2009. "Birds of a Feather or Friend of a Friend? Using Exponential Random Graph Models to Investigate Adolescent Friendship Networks." – *Demography*, 46(1): 103-125.

10 Wyatt, Danny, Choudhury, Tanzeem, Bilmes, Jeff, and James A. Kitts. 2011. "Inferring Colocation and Conversational Networks Using Privacy-Sensitive Audio." *ACM Transactions on Intelligent Systems and Technology,* 2(1).

11 Wyatt, Danny, Choudhury, Tanzeem, Bilmes, Jeff, and James A. Kitts. 2008. "Towards the Automated Social Analysis of Situated Speech Data." *Proceedings of the International Conference on Ubiquitous Computing*.

12 Kitts, James A. Lomi, Alessandro, Mascia, Daniele, Pallotti, Francesca, and Eric Quintane. 2017. "Investigating the Temporal Dynamics of Inter-Organizational Reciprocity: Patient Exchange among Italian Hospitals." *American Journal of Sociology* 123(3): 850-910.

13 Kitts, James A. "Diversity, Turnover, and the Dynamics of Organizational Demography." – Accepted at *Computational and Mathematical Organization Theory.*

14 Kitts, James A., Leal, Diego F., Jones, Thomas M., Felps, Will, and Shawn Berman. "Greed and Fear in Network Reciprocity: Implications for Cooperation among Organizations" *PLoS ONE* 11(2).

15 Kitts, James A. and Paul T. Trowbridge. 2007 "Shape Up Or Ship Out: Social Networks, Social Influence, and Organizational Demography." – *Computational and Mathematical Organization Theory* 13(4): 333-353.

16 Macy, Michael W., Kitts, James A., Flache, Andreas, and Steve Benard. 2003. "Polarization in Dynamic Networks: A Hopfield Model of Emergent Structure." – Pp.162-173 in *Dynamic Social Network Modeling and Analysis*. Washington, DC: National Academies Press.

17 Mäs, Michael, Flache, Andreas, and James A. Kitts. 2014. "Cultural Integration and Differentiation in Groups and Organizations" *Perspectives on Culture and Agent Based Simulations.* Studies in the Philosophy of Sociality. vol. 3: 71-90.

18 Lin, Zhiang, Kitts, James A., Yang, Haibin, and J. Richard Harrison. 2008. "Elucidating Strategic Networks Through Computational Modeling." *Computational and Mathematical Organization Theory*, 14(3): 175-208.

19 Kitts, James A., Macy, Michael W., and Andreas Flache. 1999. "Structural Learning: Attraction and Conformity in Task-Oriented Groups." – *Computational and Mathematical Organization Theory* 5: 129-145.

20 Kitts, James A. 2006. "Social Influence and the Emergence of Norms Amid Ties of Amity and Enmity." – *Simulation Modelling Practice and Theory*, 14(3), 407-422.

21 Kitts, James A. and Yongren Shi. 2018. "Toward an Analytical Framework of Social Influence: Behavioral Diffusion." *National Academy of Sciences, Exploring the Development of Analytic Frameworks*.

22 Kitts, James A. 2006. "Collective Action, Rival Incentives, and the Emergence of Antisocial Norms." – *American Sociological Review*, 71(2): 235-259.

23 Kitts, James A. 2008. "Dynamics and Stability of Collective Action Norms." *Journal of Mathematical Sociology,* 32(2): 1-22.

24 Anthony, Denise, Kitts, James, Masone, Christopher and Sean W. Smith. 2010, "Internet Exchange and Forms of Trust." In *Trust and Technology in a Ubiquitous Modern Environment*. Edited by Dominika Latusek and Andrea Gerbasi. IGI Global.

25 Anthony, Denise, Henderson, Tristan, and James Kitts. 2009. "Trust and Privacy in Distributed Work Groups." *Social Computing and Behavioral Modeling*, Edited by Huan Liu, Michael J. Young, and John J. Salerno. New York: Springer.

26 Kitts, James A. 2009. "Paradise Lost? Age Dependence in the Mortality of American Communes." – *Social Forces* 87(3): 1193-1222.

27 Carel van Schaik, Pieter Francois, Herbert Gintis, Daniel Haun, Daniel J. Hruschka, Marco A. Janssen, James A. Kitts, Laurent Lehmann, Sarah Mathew, Peter J. Richerson, Peter Turchin, Polly Wiessner. "Cultural Evolution of the Structure of Human Groups" Peer-reviewed volume: *Cultural Evolution*. Cambridge: MIT Press.