The Mathematical Sociologist

Newsletter of the Mathematical Sociology
* Section of The American Sociological Association   *
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FROM THE NEWSLETTER EDITOR

Barbara Meeker **bmeeker@socy.umd.edu**
              This issue is supposed to reach you just as you leave for ASA; it has information about ASA sessions, the new section officers, and the publication award winner. It also has reports on two

mathematical sociology activities during the year and a copy of the Section By-Laws as amended by you, (I mean, of course, us; I'm not sure how the 'editorial we' applies to Section Newsletters) the section members, in the spring 2000 election. The tradition that our section newsletter should publish some reports on substantive work or issues is continued by publication of abstracts from the Hawaii conference and the report on the CASOS conference. See you at ASA!

FROM THE SECTION CHAIR

Folks,
  Barbara Meeker has been the newsletter editor for the mathematical sociology section for the last 2 years. After this year, her stint as editor is over. She has done an outstanding job, but now it is time to transition. I hope you will join me in thanking Barbara for her exemplary and selfless development of the newsletter. Barbara's perseverance helped us to move from a paper based newsletter to an electronic forum. She has truly helped to make this a vibrant and active section.   We will need to find a new newsletter editor at the business meeting this year. Please come ready to volunteer. The newsletter editor would ideally be a senior member of the field. The editor has to know 'who' and 'what' in the mathematical sociology field in a way that Ph.D. students do not.
Kathleen

AND THE WINNERS ARE:

New Section Officers: Skvoretz, Doreian, Land, Sell and Butts

Incoming Chair (current chair-elect)
John Skvoretz skvoretz-john@sc.edu
Newly elected personnel
Chair Elect - Pat Doreian pitpat+@pitt.edu
Council (terms end in 2003) Ken Land kland@soc.duke.edu and Jane Sell jane_sell@yahoo.co
Student Member on the Council Carter Butts
ctb+@andrew.cmu.edu   (responsible for web pages)

Publication Award Winner: Watts

The Committee for Outstanding Article Publication in Mathematical Sociology has selected Duncan Watts' paper "Networks, Dynamics, and the Small-World Phenomenon", AJS, 1999 for this award. The committee consisted of Noah Friedkin (Chair), Patrick Doreian, Michael Hannan, Aage Sorensen, and Kazuo Yamaguchi.

COMING UP AT ASA

Mathematical Sociology Section day is the first day of ASA, **August 12 (Saturday).**
8:30 am Section on Mathematical Sociology. **The Evolution of Social and Organizational Networks**
Organizer and Presider: Kathleen M. Carley
Patrick Doreian; Univ of Pittsburgh "Evolution of Social Networks in Fragments'

Noah Mark, Stanford Univ, 'The Cultural Evolution of Altruism, I: Cooperation'
Rob Axtell, Brookings Institute, 'Emergence of "Small World" Networks in a Heterogeneous Population When Agents are Rewarded for Performance"   Discussion: Kathleen M. Carley
10:30 am. Section on Mathematical Sociology. Informal Discussion Roundtables (to 11:30 a.m.)
Organizer: Carter T. Butts
Ju-Sung Lee; Carnegie Mellon Univ, 'Structuration of Deviant Networks'
Walid Nasrallah, Stanford Univ. 'Interaction Value Analysis: When Structured Communication Benefits Organizations'
Edward T. Palazzolo, Dana Ann Serb, Yuechuan She, Univ of Illinois Urbana-Champaign 'Co-Evolution of Knowledge and Communication Networks: A Public Goods, Transactive Memory, and Social Capital Perspective'
Luigi Proserpio, SDA-Bocconi School of Management, Italy 'The Influence of Organizational Networks on Performance: A Computer Simulation'
Yuqing Ren, Kathleen M. Carley, David Krackhardt, Carnegie Mellon Univ, 'Measuring and Modeling Change in C31 Architecture'
Sampsa Samila, Columbia Univ ' Legitimacy and the Evolution of Organizational Populations'
11:30am Section on Mathematical Sociology Business Meeting (11:30 a.m.-12:10 p.m.)
12:30pm Section on Mathematical Sociology. **Social Theory: Mathematical and Computational Theorizing**
Organizer: Kathleen M. Carley, Carnegie Mellon Univ. Presider: Edward Brent, University of Missouri, Columbia
Edward Brent, Alan Thompson, Whitley Vale, University of Missouri, Columbia 'A Computational Approach to Sociological Explanations'

Ann Mische, Rutgers Univ, 'Global Structures, Local Processes II: Tripartite Models of Action, Identity, and Representation in Political Mobilization'
Joseph M. Whitmeyer, Rosemary Hopcroft;, UNC Charlotte 'Power of Groups through Effective Monitoring and Sanctioning'
James Montgomery, London School of Economics and Politics Science*,* 'The Logic of Role Theory'
6:30 p.m. Theory Section and Mathematical Sociology Section joint reception

Summary of MathSoc Section Activities at ASA 2000
Put this in your Palm Pilot now! The numbers in parentheses refer to ASA session numbers, so you can easily look up the room locations in the final ASA program. According to the ASA preliminary program, all MathSoc Section activities are in the Washington Hilton.
Saturday, August 12
8:30 am (#23) Section Session I The Evolution of Social and Organizational Networks
10:30 am (#49) Informal Discussion Roundtables, and **11:30am** Section Business meeting
Please come to the Business meeting- it's crucial for our Section that we have at least 25 members at the Business meeting
12:30pm. (#77) Section Session II Social Theory: Mathematical and Computational Theorizing
6:30 p.m. Reception (joint with Theory Section)

Regular ASA Sessions on Mathematical Sociology
In addition to the Section sessions, there will be two *regular ASA sessions* on Mathematical Sociology:
Sunday, August 13 2:30(#215) Mathematical Sociology I: Models of the Emergence of social structure
Gungor Gundoz: u Teknik Universitesi, Ankara, Turkey 'The Nonlinear Growth of Ottoman Empire and her Fractal Dimension'
John Bramsen: Chicago, Illinois 'Opposition Relations: An Algebraic Formulation of Spinoza's Theory of Human Relationships'
Sun-Ki Chai: University of Arizona 'Explaining Norms of Cooperation: Nested Hierarchies'
Joseph M. Whitmeyer: UNC Charlotte 'The Power You Need for A Cost You Can Afford: How to Use Individual and Collective Sanctions'
Monday August 14 8:30 (#274) Mathematical Sociology II: Models of individual beliefs and behaviors
Lingxin Hao, Johns Hopkins University; *V. Joseph Hotz*, UCLA and NBER; and *Ginger Zhe Jin*, UCLA 'Games Daughters and Parents Play: Teenage Childbearing, Parental Reputation and Strategic Transfers'
Geoffrey Tootell, San Jose State Univ; *Alison Bianchi*, Stanford Univ; *Paul T Monroe*, Stanford Univ 'Status Generalization as a Mathematical Game'
John Levi Martin, Rutgers and *James Wiley*, Public Health Institute, Berkeley, CA 'Algebraic Representations of Belief and Attitudes II; Microbelief Models for Dichotomous Belief Data'
Mamadi Corra, South Carolina 'A Theory of Structural Ordering: Ordering in Exchange Networks, A Theoretical Extension'

There's Still Time
To attend the 13th annual Group Processes Conference, Friday, August 11, at the Hilton in Washington DC. There is a lot of overlap between MathSoc and the mailing list for this conference. For information and a registration form, check Web page http://www.bsos.umd.edu/socy/meeker/groupconf.htm. Or e-mail Murray Webster mwebster@nsf.gov or Barbare Meeker

Report on Hawaii Conference
From Phillip Bonacich
The "Mathematical Sociology in Japan and America" Conference, Honolulu, June 23-25, was co-sponsored by the Mathematical Sociology Section and the Japanese Association of Mathematical Sociologists (JAMS). A second conference is being planned for Vancouver in 2002 (contact Yoshimichi Sato, ysato@sal.tohoku.ac.jp, for more details). The conference attracted

forty participants, with approximately equal numbers of Japanese and American sociologists. Topics included social networks, rational choice, social psychology, and methods.

The conference achieved its intended purpose: to bring together members from two distinct communities with the same interests. It was gratifying to see that we were all working on related problems and referred to the same classic works. At the same time, there were complementary differences. It was my impression that the Japanese mathematical sociologists were more advanced in rational choice while the Americans were doing more sophisticated in social networks.

Program and Abstracts from Hawaii
Mathematical Sociology in Japan and in America: A Joint Conference: Co-organizers: Phillip Bonacich, University of California, Los Angeles and Yoshimichi Sato, Tohoku University
Methods
1. Games Social Agents Play: A Complex Form. *David L. Sallach*, University of Chicago

This paper defines a game form through which a dialog between game theory and agent simulation may be mutually advanced. The new form is designed to combine the respective strengths of the two research programs, formality and complexity, in a way that facilitates the representation of dynamic social phenomena. The informal basis of the proposed interchange can be said to involve: 1) a game theoretic framework that 2) supports models representing social complexity, while facilitating 3) a fluid boundary between representation and rigor. More specifically, a complex game form to support agent-based simulation models is introduced. The complex form is oblique to the previously defined game forms. Rather than defining games in which the strategic alternatives are fully specified, the complex form provides a formal framework that facilitates expression of diverse types of social simulation.
2. Data Without (Operational) Variables. *Joel Levine*, Dartmouth College, *Aaron Klein*, Princeton School of Public Policy, and *James Mathews*, Dartmouth College

Quantitative sociology has grown by borrowing methods from the experimental sciences even though, for the most part, our data are observational. Where the experimental method can be applied, data are simplified because the experiment removes correlations among independent variables as well as effects on unmeasured variables. By contrast, where nature must be observed, without experiments, these simplifications cannot be guaranteed and thus, the statistical techniques developed for experimental data – which have these simplifications built-in to their assumptions – may not be valid and conclusions reached by the application of these techniques are in doubt.

This paper explores an alternative to the statistics associated with experimental methods. Specifically, it explores generalizations of the quantitative method and theory used by physical surveyors, generalizing them to the needs of sociological data and other forms of observation.

Application of these generalizations to texts and to (social) survey data support their validity for these purposes. Results suggest that micro theories embedded in these methods reduce the load of a priori assumptions required for data analysis. And the results suggest a research path application to ordinary sociological variables, including education, income, occupation, and gender, that does not require the experimental or quasi-experimental methods.
3. Measuring Opportunity. *Daniel H. Krymkowski*, University of Vermont

Philosophers and social scientists often distinguish between result and opportunity. The former involves outcomes, while the latter has to do with chances to realize these outcomes. Despite this conceptual distinction, researchers often utilize outcomes as measures of opportunities. For example, a difference in an outcome between groups is taken as evidence of inequality of opportunity. In this paper I propose an operationalization of opportunity that retains the conceptual distinction. Specifically, opportunity is defined and operationalized as the chance of achieving a goal. Utilizing data from the Wisconsin Longitudinal Study, I estimate occupational opportunities for a sample of individuals. A multinomial logistic regression model is employed, in which the dependent variable is occupational outcome and the independent variables are certain social background characteristics. The inspiration for this choice of independent variables is the work of John

Roemer, who argues that "equality of opportunity for X holds when the values of X for all those who exercised a comparable degree of responsibility are equal, regardless of their circumstances." The results from the model are used to estimate the individuals' probabilities of attaining their occupational aspirations. Then, inequality measures, such as the GINI coefficient, are computed on the estimated probabilities, in order to produce inter-individual measures of inequality of opportunity. Finally, the estimated probabilities are averaged within groups and compared (e.g., men versus women), in order to provide an inter-group measure of inequality of opportunity

4. A Failure of Robustness: Why Many Sociological Conclusions May be Wrong. *Scott L. Feld*, Louisiana State University

Social scientists conduct and report significance tests to avoid putting too much confidence in research findings that have a reasonable risk of being wrong. However, statistical significance tests only provide warnings about one particular type of error, random sampling error. Other types of errors of sampling, measurement, and model specification also lead to errors in empirical findings. While researchers generally work to minimize these errors, I argue that it is not reasonable for them to act assuredly as if no such biases remain. I give several examples showing that even relatively small plausible biases can radically change the interpretations of findings that pass the minimal requirements of statistical significance. Consequently, I suggest adopting standards for the size of potential biases that need to be taken into account before one can confidently conclude that a theoretical parameter is even in the direction of the empirical findings. Furthermore, I suggest that we should consider adopting additional conventions for the size of parameters to be considered substantively important. Finally, I suggest procedures that extend statistical significance tests to take account of concerns for both potential bias and substantive importance.

5. Power Laws for Remembering Members of Target Subpopulations in Surveys of Personal Networks. *Eugene C. Johnsen*, University of California, Santa Barbara

Bernard, Killworth, McCarty, Shelley and the author have been attempting to develop a methodology for accurately estimating the sizes of hard-to-count subpopulations as well as of the personal networks of members of the population. This involves conducting a survey of a representative sample of the population in which subjects are asked how many members of various subpopulations of different known sizes they know. Underlying this methodology has been the Simple model, which assumes that the proportion of members of a subpopulation in a personal network is the same as the proportion of that subpopulation in the total population. Although this implies that the average number of a subpopulation known to respondents is proportional to the size of the subpopulation, linear regressions to date of the former against the latter have fit poorly. However, linear regressions of the logarithm of the former against the logarithm of the latter show reasonably good fits, suggesting a power law relationship of the former vs. the latter with exponent 1/2. Also, for the proportion of the sample who report knowing someone in a subpopulation, linear regressions of the logarithm of the proportion against the logarithm of the subpopulation size suggest a power law relationship of the former vs. the latter with exponent 1/3. Here we present mathematical models which formally appear to account for these two results, while still invoking at the beginning a form of the Simple model. The second result is approached via the implied power law relationship of the proportion vs. the number known, with exponent 2/3. It is interesting to see that the model for the former power law is psychological, in the reception, storage and recall of information about personal encounters in the minds of respondents, while that for the latter is sociological, in the transmission of information about members of subpopulations through the interlinked personal networks of respondents, their alters, the alters of their alters, etc..

Session: Group Processes

1. Analyzing Household Structure with Graphical Models via Markov Chain Monte Carlo. *Tim Futing Liao*, University of Illinois

The conventional method for the analysis of household structure classifies households into aggregate categories such as solitary, simple-family, and complex-family types, most notably according to the Cambridge classification system. The purpose of this paper is to go beyond the conventional method by focusing on a flexible graphical model of household and the strength of relations between household member types (e.g., brother, sister-in-law) in the model. Directed acyclic graphs are first drawn, with nodes denoting household member types and directed links or arrows between nodes representing the relational links between member types. Because of the potential complexity of graphical models as well as the limited sample size of households especially in historical sociology, conventional estimation methods may not give solutions. Markov chain Monte Carlo, a resampling method based on conditional distributions, provides a feasible way of estimation. A directed acyclic graph model via Markov chain Monte Carlo is applied in an analysis of 213 surviving household registers from western China in the 5th-10th centuries.

2. Network Catastrophe: A Distributive Model for Organizing Collective Phenomena. *Jar-Der Luo*, Yuan-Ze University and *Fu Chang*, Academia Sinica

It is often observed that consolidated behavior, in either hierarchy by which consolidation is enforced by authority or network in which consolidation is automatically formed due to trust relations, is not simply an individual firm's behavior but a collective behavior within a certain industry during a given period of time. Transaction Cost Theory has proposed a comprehensive model to explain how a single firm chooses doing transactions between markets and hierarchies. However, it focuses only on micro-level cost-benefit analysis, and has difficulty explaining such macro-level phenomena as the collective consolidated behavior of a group of firms. This paper proposes a theory named after "network catastrophe" to explain this collective phenomenon. We found that transaction cost can be multiplied in a dynamic process, which eventually drives the whole transaction system into collapse when the system's resources are constrained. To restore the functioning of the system, consolidated behaviors should be adopted to overcome this inefficiency.

3. The Affective Basis of Attributional Processes among Japanese and Americans. *Herman W. Smith*, University of Missouri, St. Louis, *Takanori Matsuno*, Showa Women's University, and *Shuuichirou Ike*, Teikyo University

This paper expands the trait attribution literature through a comparison of Japanese and American amalgamation equations that link personal modifiers (emotions, trait dispositions, and status characteristics) with role-identities. We deduce over 10 principles, or heuristics, that underlie American attributional processes. The Japanese amalgamation equations that we then derived suggest three broad Japanese principles differentiating their values from those of Americans. First, Americans value attributions underscoring equality of the sexes by contrast to Japanese who honor attributional variations differentiating men and women. Second, Japanese place different values on emotional expression, trait dispositions, and status characteristics while Americans do not make such distinctions. Third, Japanese are much more attuned to situational context than Americans are. The two American studies, upon which this study build, suggest three equations and only one interaction effect predicted by psychological consistency theories. By contrast, we find that Japanese attributions are more complex. Each of the 16 Japanese amalgamation equations has three or four interaction effects implying that Japanese are particularly attuned to the psychological consistency or congruency of the affective dimensions underlying personal modifiers and role-identities. Thus, we demonstrate the different means by which Japanese and Americans subjectively appraise situations in order to confirm their definitions of the situation and to reconstruct disconfirming information through reidentifications and attributions.

4. A Dynamic Model of Attitude Change in Group. *Ryuhei Tsuji*, University of Tokyo

This paper begins with criticizing Friedkin's interpersonal influence model (Friedkin and Cook, 1990; Friedkin 1991). The main point of the criticism is that his model does not provide the theoretical foundation of how one's initial attitude was created and how ones subsequent attitude is affected by people in the group. As the explanatory variables for both the initial attitude and group effects, I propose to consider the degree of relevance and the degree of favor, which have been taken into the consideration in persuasion studies in social psychology. The model is more complex but provides the mechanism of interpersonal influence process.

5. The Transmission and Persistence of 'Urban Legends': Sociological Application of Age-structured Epidemic Models. *Andrew Noymer*, University of California, Berkeley

This paper describes a model of rumor transmission in an age-structured population. 'Urban legends', as rumors are often called nowadays, share with communicable disease certain basic aspects, which means that formal models of epidemics may be applied to the transmission of rumors. Rumors spread by infected-to-susceptible contact. Once (if ever) a person comes to believe that a certain urban legend is false, that person becomes immune: communication of the rumor by that person halts, and susceptibility to that rumor ceases. Below a certain age, a child may not understand a rumor and is therefore immune due to youth. Insusceptibility to a rumor without previous exposure (skepticism) can also occur. All of these facets of rumor transmission have analogs in infectious disease transmission: contact transmission of pathogens; acquired immunity; immunity of newborns due to maternal antibodies; and vaccination, respectively. This paper adapts a formal model of measles transmission to the study of the spread of rumors. The model itself is a set of nonlinear partial differential equations. Equations of this class have proved difficult to solve analytically, due to the large number of states and the complications of looking at simultaneous changes in age and in time; but numerical solution is feasible. By looking at an age-structured population, greater realism is attained, and it becomes possible to answer questions about age structure and the spread of rumors.

Session: Social Networks I

1. Changes in Personal Networks and its effect on Job-Loyalty. *Yuki Yasuda*, Rikkyo University

The purpose of this paper is to conduct an analysis concerning the stability of personal networks, and its effect on people's attitude and motivation. People are embedded in a social context, but in line with the changes in their environment, their personal network may show changes in their constituents. Two questions I set are; how stable an ego's network is; and how the changes in network structure affect the ego's attitude and behavior. Using a company panel-survey data, "Survey on Jobs and Networks of Employees at Advanced Info-Communications Enterprises," I will compare various kinds of networks employees hold inside and outside company and examine the stability of personal networks over time. My findings suggest that personal networks are relatively unstable except for institutionally defined relations, and changes in personal networks correlate with changes in people's attitude and behavior.

2. Modeling Empirical Ego-Nets. *Ju-Sung Lee*, Carnegie-Mellon University

The ego-network data of the 1985 and 1987 General Social Survey (GSS) is used to inform a simulation model of social interaction. The ego-net data contains information on both confidant and friendship networks and is treated as both a property of the individual and the filter through which the individual is linked to and interacts with the greater social environment. Multiple imputation techniques are used to correlate network structure to deviant behavior, specifically illicit drug use, which has been measured in other national surveys, such as the National Household Survey on Drug Abuse (NHSDA). Multiple imputation is required since these surveys contain little or no ego-network information. General patterns of interaction and the role of deviant behavior in network formation are observed in a simulation model that incorporates the merged datasets.

3. Trust in Triads: Effects of Exit, Control, and Learning. *Vincent Buskens*, Utrecht University

This paper provides theoretical background for some effects of social networks on trust. We study the implications of a model with rational actors in two settings with three actors. In the first setting, there are two trustees who are involved in transactions with one trustor implying that the trustor has an exit option. In the second setting, two trustors play with one trustee, which gives the trustors options for voice, i.e., complaining and informing each other about the trustee's behavior. We compare these models with a baseline model in which there is only one trustor and one trustee. It turns out that the opportunities for placing and honoring trust do not change for the exit model compared to the baseline model. The opportunities for trust in the voice model differ from the baseline model only if both trustors inform each other at a rate that is high enough. Only if the possibilities for receiving information and transmitting information are large enough for both trustors, trust will increase due to the information exchange possibilities in the voice model.
Keywords: Trust, social networks, game theory.

4. A New Equi-Dependence Theory for the Network-Power Experiments: The Meaning of Shapley Value. *Kazuo Seiyama*, University of Tokyo

Emerson's exchange-theoretical equi-dependence theory on power (Emerson 1962) has inspired much flourishing experimental and theoretical researches on social power in the network frameworks, and several attempts have been made to explain theoretically the experimental outcomes. However, as will be shown in this paper those explanatory theories are basically ad hoc and unsatisfactory. We will present a new theory, which can explain more satisfactorily the experimental outcomes. This is a new equi-dependence theory a la Emerson, but differs from it fundamentally. This theory is composed of axioms one of which represents the concept of the new equi-dependence, and the set of axioms is mathematically equivalent with that of the Shapley value on the bargaining game in general.

At the beginning, this paper shows the basic observation that the Shapley values calculated to the network-power experiment game are quite congruent with the various experimental outcomes, which have ever been conducted and reported. Then the reason for the congruence will be explored, which will result in a formulation of new set of axioms as the empirically effective principles of subjects' behavior in the experiments. At the final stage, the mathematical equivalence in the network-power experiment between Shapley's axioms and the new set of axioms will be proved.

Session: Social Networks II

1. Using Graphical Techniques for Social Network Data Analysis. *Linton C. Freeman*, University of California, Irvine

In this paper I propose an alternative to the standard numeric analyses of social network data. I will draw on a set of algebraic procedures based on singular value decomposition and a set of optimizing procedures based on multidimensional scaling and spring embedding. Any of these procedures can be used to produce either still or animated graphic images. My work will show how such images can yield important new insights about the structural properties of network data.

2. Properties of Core/Periphery Structures. *Stephen P. Borgatti*, Boston College and *Martin G. Everett*, University of Greenwich

Networks with core/periphery structures (Borgatti & Everett, 1999; Everett & Borgatti, 1999) are thought to promote cohesion and to transmit information quickly. In this paper, we present some empirical results addressing these claims, and also explore the upper bounds of mean graph theoretic distance for such networks. Comparisons are made with small world graphs (Watts, 1998) and random graphs (Bollobas, 1985). Implications are drawn for knowledge management in organizations and disease spread in populations.

3. Network Analysis Suite. *James Kitts*, Cornell University

This paper presents a free network analysis suite that may serve as an instructional and research tool. The simple interface may contribute to social network analysis by reducing start-up costs for new scholars, while the modular structure may provide a vehicle to disseminate new measures and routines as they are developed. Though the suite does not intend to be comprehensive, it presently implements a variety of network-analytic routines, giving output in simple text or graphical form. This presentation calls for collaboration from colleagues in the United States and Japan in developing new modules for the suite, through contributions of algorithms or source code.

4. Stochastic Models of Spatially Embedded Interpersonal Networks: Simulations from Tie Frequency Data. *Carter Butts*, Carnegie-Mellon University

Empirical studies of interpersonal networks suggest a strong relationship between physical distance and tie probability. Here, data drawn from a number of past studies relating physical space and tie frequency are analyzed using a hierarchical Bayesian modeling framework. Several specific models of tie probability are compared, and posterior distributions of model parameters are computed for the available data using Markov Chain Monte Carlo methods. Subsequent simulations then explore the implications of the most probable tie frequency model for large-scale interpersonal networks; questions of network diameter, density, mean geodesic distance, personal network

size and network centralization are examined in the context of particular population distributions.

Session: Rationality and Society

1. Evolution of Cooperation in a Situation with a Risk: Some Problems of Cooperation in a Closed Society versus an Open Society. *Hideki Fujiyama*, Dokkyo University

This paper analyzes the formation of cooperation and the problems of trust that is discussed in both Japan and the United States, using an evolutionary model. We consider the two-player "Prisoner's Dilemma Game" and "Trust Game." Cooperation is attained in the Long-Run Equilibrium (Kandori et al [1993]) if players form expectations about their payoffs simply based on their experiences and make a "cautious" experimentation. The closed society (Japanese society) is characterized by the low level of this experimentation and the open society (the United States society) is characterized by the high level of experimentation. Our model suggests that an appropriate level of experimentation is needed for the achievement of a social efficiency.

2. Properties of Learning Models in Simulation Studies: Rationality of Backward-looking Players. *Tatsuhiro Shichijo*, Osaka Prefecture University and *Yasuto Nakano*, Nara University

This article intends to clarify properties of learning models in simulation studies, and to compare preceding learning models. Learning models are often used in many simulation studies, but there is no uniform rule of learning. We introduce three technical characters (monotonicity, condition of probability, neutrality) and three rationality characters (rationality in fixed situation, rationality in first order stochastic domination, rationality with risk preference in stochastic situation). We examine Michael Macy's model, Erev & Roth model, and some other models. And we find these models have different properties. Though learning is treated as one of the solutions of social dilemma from the result of Macy's model (Kollock, 1998), Macy's model is a peculiar learning model. Learning is not always a solution of social dilemma. In this way, to compare learning models from the uniform point of view makes properties of each model clear, and helps to probe conformity of a learning model and human behaviors.

3. Trust, Assurance, and Inequality: A Rational Choice Model of Mutual Trust. *Yoshimichi Sato*, Tohoku University

Rational choice approach to trust has three problems: it has not explicitly explained findings verified in social psychological study of trust; it stands on a limited assumption of asymmetric relationship between a trustor and a trustee; it has not dealt with situations in which a rich person encounters a poor person. We build and analyze a game theoretic model of mutual trust to solve these problems. There are two groups in the model. A member of each group can exchange goods with another member of the same group for sure. If he/she leaves his/her group and exchanges goods with a member of the other group, one of the following four cases will occur: (1) he/she offers a certain amount of goods and his/her counterpart also does so; (2) he/she offers a certain amount of goods and his/her counterpart offers nothing; (3) he/she offers nothing and his/her counterpart offers a certain amount of goods; (4) he/she offers nothing and his/her counterpart offers nothing. In addition, he/she is assumed to know whether he/she is trustworthy, but not to know whether his/her counterpart is trustworthy.

We analyze an equilibrium of the model and derive some implications: the ratio between the transaction costs and the opportunity costs affects actors' trustfulness; a rich actor is more willing to trust his/her counterpart, that is, jump into transactions with his/her counterpart than a poor actor is; a trustworthier actor is easier to leave his/her group in search for higher returns.

4. Toward Resolving the Puzzle of the Household Division of Labor: The Role of Trust in Specifying Neoclassical Economic, Power-dependency, and Gender Theory Explanations. *Yoosik Youm*, University of Chicago

Three competing paradigms (Becker's neoclassical economic model, power-dependency theory, and gender theory) have attempted to solve the puzzle of persistent gender inequality in the division of housework, but with mixed results. We propose 'trust' between the couple as the basis for resolving this puzzle. We develop a game model adapted from the more general form of trust games, where the trust between partners is the key contingency specifying the relevance of neoclassical economics and power-dependency theory. Under the condition of high trust, partners behave as if they share a unitary utility function because they can safely assume their partners'

gain will be their own gain. This corresponds to the argument of neoclassical economics. Under the condition of low trust, however, partners can no longer assume a flow of future fair rewards and thus try to decrease their share of housework by using their resources (options outside marriage) as a threat in their bargaining with their partners. This corresponds to the power-dependency model. After measuring the level of trust by the social networks of the couple, we suggest the mechanisms through which trust plays once again the key role in specifying the relevance of gender-role theory. High trust decreases the need for 'gender display' and increases the couple's ability to create their own behavioral script without relying on institutionally given gender ideology. These three hypotheses are strongly supported by empirical data from the Chicago Health and Social Life Survey, a cross-section representative survey of 890 Chicago residents in 1995. In sum, neoclassical economics only has explanatory power under high trust, while power-dependency and gender theory only have explanatory power under low trust.

5. Elements of Coalition Stability. *Brent Simpson*, Cornell University

A recent analysis used game theory to predict coalition dynamics in exchange networks. Experimental results supported the predicted effects of coalitions on exchange-ratios, but not the predicted stability of coalitions over time: Contrary to the game-theoretic prediction, coalitions larger than the critical mass were slightly more stable than coalitions equal to the critical mass. This paper extends that work by comparing two competing explanations for the finding that subjects tended to remain in coalitions even though 1) their continued cooperation was not critical to the coalition's success, and 2) defection carried a higher individual payoff. The first explanation states that the commitment of low-power actors to a coalition rests on prudent self-interest, or the "shadow of the future." The second explanation states that, given the opportunity to form coalitions, low-power actors often respond to the group's interests, rather than unadulterated self-interest. Results from a new experiment designed to tease apart these alternative explanations are reported.

6. Status Generalization as a Continuous Game. *Geoffrey Tootell*, San Jose State University, *Alison Bianchi*, Stanford University, and *Paul Munroe*, Stanford University

We represent status characteristics theory (SCT; Berger, Fisek, Norman, and Zelditch 1977; Berger, Fisek, Norman, and Wagner 1998) as a contribution game (Hamburger 1979), a type of n-person cooperative general-sum mathematical game (Owen 1982). We preserve the basic assumptions of ACT, including its scope conditions, and graft them into a game format. In doing so, we incorporate concepts proposed by Balkwell (1991) and by Fisek (1999). Benefits include being able to consider cases in which group members of equal ranks disagree about goal attainment, or those in which status attainment, or other rewards, are achieved independently from quality of task performance. This lets us examine how status generalization relates to reward optimization and coalition formation. It also relates SCT to a strongly developed formal structure, one that can be used to relate to theories about power or networks, for example, Willer and Markovsky (1997).

Session: Others

1. On the Decline of Marital Fertility Caused by Diffusion of the Number of Children. *Shuitirou Ike*, Teikyo University

The Decline of completed fertility in western developed countries is well described by logistic model with certain exceptions. We think the decline process of fertility as diffusion process of the number of children. And the change of the rational distribution of the number can be regarded as Markov process, which is another diffusion model.

Keywords: Fertility decline, logistic model, Markov Diffusion Process

2. A Boolean Model of Role Discrimination. *Kazuto Misumi*, Kyushu University

This paper analyzes, based on Boolean approach by C.C.Ragin, how the subjective internal structures of social roles condition the possibility of role discrimination. I postulate, in an individual's image, a role consists of some role elements, which construct an internal hierarchical structure (role image) depending on each element's contribution to the role discrimination as a whole. Then the role discrimination is formulated as a Boolean equation, taking the role elements as independent variables and the role discrimination itself as a dependent variable. Suppose a role X, and a performer who has

image X' and an observer who has image X" communicate each other. In general, between such two given actors, X can be discriminated by an observer under the condition that X'X" equals to X", or at least that X'X" and X" share one or more Boolean products; however, X is never discriminated otherwise. At first, I take a simple case of two elements and examine the possibility of role discrimination for all possible combinations of images. After that, some general propositions as to the possibility of role discrimination that hold regardless of the number of role elements are derived.

Keywords: Role, Boolean approach, Role discrimination

3. Rights as Dual Social Closure: The Cooperate Game-theoretic Formalization of Weber's Theory on Rights. *Hiroshi Tarohmaru*, Koka Women's College

  The aim of this paper is to formalize and develop Max Weber's theory on rights and social closure with the cooperative game theory. Through the formalization, I argue that the establishment of rights and social order is often accompanied by dual social closure. After summarizing Weber's theory, I formalize it with the cooperative game theory. Finally, I discuss the implications of this theory to the Hobbesian problem of order, comparing it with social contract theory.

4. Evolution of Opinion Formation. *Jun Kobayashi*, University of Chicago

  How do we form our opinions when we aim to reach a consensus unanimously? I examine how rational individuals change their opinions when aiming at a unanimous consensus. To answer this question, I model the interdependent process of opinion formation, and then model rational imitation of successful opinion formation.

  From the model, I derive the following three results: first, in consensuses reached by two individuals, if an individual sympathizes with the most misfortunate person, this opinion formation will remain behind and thus be adopted by all individuals in the long run. Second, this result is robust for consensuses comprising two or more individuals. Finally, in general, if individuals transform opinions by conforming to any specific one person, this opinion formation will prevail among all individuals.

  So far, rational choice theory has succeeded in explaining many social phenomena by assuming that individuals have preferences, but it has not specified how those preferences are formed. It is true that we can explain some human behavior and social structures successfully without examining the process of preference formation. However, without it, we will fail to distinguish the same preferences from different motivations, or to identify different preferences from similar motivations.

  Therefore, to better understand preference formation, I examine which type of opinion formation prevails in unanimous consensus makings. I concentrate on opinion formation because it is a special case of preference formation in the sense that it is most empirically observable. I examine unanimous consensus makings because they represent the simplest preference formation. I use evolutionary game theory because if a way of opinion formation is widely adopted after a long time, it can be captured as an evolutionarily stable strategy, a concept of equilibrium in evolutionary game theory.

5. Metatheoretical Issues in Decision Threshold Models: A Case Study of the "Socion". *James F. Hollander*, Texas Instruments

  A social particle concept, names the "socion" here, focuses analysis on as single binary choice of what is conventionally regarded as the individual level, while incorporating the influences of all binary choices in the population on that single binary choice. The socion comprises an experience point and an adjacency tensor, also called $A=[Wijkl]$, $D=SIGN(Uij + Djkl\ Wijkl)$. The socion concept is robust. Consistent with qualitative remarks of many theorists, the socion in deterministic and probabilistic formulations applies to multiple choice and answer scoring as well as binary choice, decision tree analysis, dyads, emotions and decision-making, rational and non-rational choice, organizations, stratification, collective behavior, economic sociology, and sociology of values. However, metatheoretical issues include definitional dependencies, lumpability of the adjacency tensor, sign inversion, and issues of context.

Report of CASOS 2000 Summer Institute and Conference
From Kathleen Carley

 On July 16-21, 35 students from all over the world participated in an intense hands-on introduction to computational social and organizational science at CMU's 1st annual CASOS summer institute. Through out the week students engaged in lectures and labs to learn how to design, analyze, validate computational models of complex social and organizational processes. Special attention was given to state of the art computer modeling tools, social network analysis techniques, and optimization techniques.

  This was truly an inter-disciplinary, inter-college, inter-university event. Faculty included Richard Burton (Duke University Fuqua Business School), Kathleen Carley (CMU - SDS, Hienz, EPP), Tsuhan Chen (CMU - ECE), Michael Cohen (University of Michigan School of Communication), David Krackhardt (CMU - Heinz), Raymond Levitt (Stanford - Civil Engineering), Bill Mcevily and Ray Reagans (CMU - GSIA). As noted by one of the students "This was like listening to the who's who in social simulation." ECE, Heinz, and ICES at CMU provided infrastructure support.

  Support for this institute was provided by the National Science Foundation integrated graduate education and research training (IGERT) program and Aptima, Inc. The CASOS summer institute is part of the new IGERT graduate program in Computational Analysis of Social and Organizational Systems. This program is designed to change the way graduate education is conducted in the social sciences, to provide students with an in-depth interdisciplinary training and understanding of how to link computer science, mathematics, sociology, and organization science to enable better understanding of complex social and organizational systems, and to enable social and computer scientists to work together to develop more socially realistic computer science applications. The curriculum is a blend of computational and mathematical model building, analysis, validation, and social network analysis applied to social and organizational problems.

  Running the summer institute was a joint brainstorm of Richard Burton, Michael Cohen, Kathleen Carley, and Raymond Levitt. As noted by Carley, "we saw the need for an inter-university venue for teaching computational modeling to social and organizational scientists. Each of us had a number of interested students, but there was no integrated curriculum, no textbooks, no teaching materials on which we could collectively draw. We were all re-inventing the wheel. This institute has pushed us over this hurdle and created a venue for giving people insight into the scope, depth, and promise of the field."

  Carley commented that: "We knew that this was going to be a technology intensive event. We had two different computer labs, and 8 different modeling and analysis tools. However, we never realized how invaluable having wireless access would be. I was able to stay with the students and faculty throughout the event, while using my portable to communicate constantly with catering, parking, secretaries, other faculty and student about issues as they arose. This made the whole event look seamlessly organized."

  The capstone event was CASOS 2000 (July 21-24, 2000) an international conference on advances in computational and mathematical social and organizational science. This conference and institute are the intellectual children of the Carnegie School hence who better the Herb Simon to give the first keynote address. Herb Simon (CMU Psychology) spoke on "Organizations and Markets as Complex Systems." Over 70 participants from all over the world came together to hear papers and see demos in the computational and mathematical social and organizational science area relating the state of the art in model analysis, model development, theoretical development, and tools. Conference attendees included Ph.D. students, faculty, and industry and government representatives.

  The keynote address and best student paper for 2000 will be published in the journal Computational and Mathematical Organization Theory. Plans are underway to hold both events again next year, in mid July, at CMU. NSF support through the IERT program is enabling the summer institute to continue for at least five years. For additional information see www.ices.cmu.edu/casos or contact Kathleen Carley kathleen.carley@andrew.cmu.edu for details.

By-Laws of the Mathematical Sociology Section of the American Sociological Association

Originally Adopted: at Section-in-Formation Business Meeting Aug.1996 - ASA Approved, Fall 1996
Amended: Sec. Bus. Meet., Aug.1997 - Ratified, Spring Election 1998
Amended: Sec. Bus. Meet., Aug. 1998 - Ratified, Spring Election 2000
BYLAWS OF THE MATHEMATICAL SOCIOLOGY SECTION OF THE AMERICAN SOCIOLOGICAL ASSOCIATION (as amended)
Preamble.

The purpose of the Mathematical Sociology Section of the American Sociological Association (ASA) is to encourage, enhance and foster research, teaching and other professional activities in mathematical sociology, for the development of sociology and the benefit of society, through organized meetings, conferences, newsletters, publications, awards, and other means deemed appropriate by the Section Council. The Section seeks to promote communication, collaboration, and consultation among scholars in sociology in general, mathematical sociology, and allied scientific disciplines.

I. Officers of the Section.

.A. The Officers of the Section shall be a Chair, a Chair-Elect, a Past-Chair, a Secretary-Treasurer, and seven Council members, all of whom are voting members of the ASA and members of the Section. Six of the Council members shall be regular members of the ASA and one shall be a graduate student member. These eleven together shall form the Section Council.

B. The Chair-Elect shall serve in that position for one year before automatically succeeding to a one-year term as Chair, followed by a one-year term as Past-Chair (making a combined three-year term). The Secretary-Treasurer and the six Regular Council members shall each serve three-year terms, with two of the Council member positions being vacated each year. The Graduate Student Council member shall be elected each year for a one-year term.

Officers shall not succeed themselves in the same position, with the exception that a Graduate Student Council member may be elected to this position for up to three one-year terms in total. Unless otherwise prevented by these Bylaws, an Officer occupying an Acting position may succeed her/himself in the corresponding non-Acting position. For the sole purpose of permitting this succession, an Acting position is not considered to be the same position as the corresponding non-Acting position.

C. The Chair, Chair-Elect, Past-Chair and Secretary-Treasurer have the following specific duties among possibly others: The Chair of the Section shall serve as Chair of the Section Council, preside at the Annual Section Business Meeting and serve as Chair of the Program Committee. The Chair-Elect shall be an ex-officio member of the Program Committee. The Past-Chair shall serve as Chair of the Nomination Committee. The Secretary-Treasurer shall record and circulate the minutes of all Section Council Meetings and Section Business Meetings, and as required, receive, keep and present official documents and financial records of the Section and execute all financial transactions of the Section. All financial expenditures executed by the Secretary-Treasurer shall be explicitly authorized by the Section Council either directly or by delegation of such authorization to the Chair. In the absence of the Chair at an ASA or Section function or activity at which the Chair has a responsibility, the Chair-Elect shall serve as Acting Chair. In the absence of both the Chair and the Chair-Elect, the Past-Chair shall serve as Acting Chair.

D. In the first election of Section Officers following establishment of the Section within the ASA as a Section-In-Formation, a Chair, a Chair-Elect,
a Past-Chair, and a Graduate Student Council member shall be elected for a term of one year, a Secretary-Treasurer shall be elected for a term of three years and seven Council members shall be elected. Of the six Regular Council members to be elected, two shall be identified for a one-year term, two for a two-year term, and the remaining two for a three-year term. Thereafter, each annual election will be for a Chair-Elect, two Regular Council members, and a Graduate Student Council member, with the Secretary-Treasurer elected every third year.

E. A Section office becomes vacant when one of the following events occurs:

1) the office holder submits a written resignation to the Secretary-Treasurer, except that a resigning Secretary-Treasurer submits a written resignation to the Chair,

2) the office holder ceases to be a member of the Section or a voting member of the ASA,

3) the office holder is removed from office by a vote of at least eight members of the Section Council or of two-thirds of the Section Members present at a Section Business Meeting at which a quorum is present,

4) the office holder is deceased, or

5) the office holder is elected to another office on the Section Council.

F. If the position of a Section Officer other than the Chair becomes vacant before the term of that position is completed, it shall be filled for the unexpired part of the term through an Acting appointment by the Chair, subject to confirmation by a simple majority of the Section Council (either at a meeting or by a fairly conducted poll of all Council members) within forty-five days of official notice of the vacancy. An Acting Chair-Elect shall serve the remainder of the term until the next Annual Meeting of the ASA, but without automatically succeeding to the position of Chair. If the position of Chair becomes vacant before the term of that position is completed, the Chair-Elect shall complete the term of the Chair, serving as Acting Chair and relinquishing the position of Chair-Elect. The resulting procedural vacancy in the position of Chair-Elect shall be filled by an Acting appointment as provided above. The next year the Acting Chair shall succeed to a one-year term as Chair. The resulting next-year vacancy in the office of Past-Chair shall be filled by an election vote.

If, through a combination of circumstances, both the Chair-Elect and Chair positions fall vacant simultaneously, so that the above procedures are unavailing, the Section Council shall fill both positions on an Acting basis by majority vote for the remainder of the term of these offices. In these deliberations the Past-Chair or, in the absence of the Past-Chair, a Regular Council member with the most Council service shall be chosen to serve as Acting Chair. If a vacancy in the Chair-Elect position (not a procedural vacancy) or in the Chair position or a simultaneous vacancy in both positions occurs, the resulting next-year vacancy in the office of Chair, Past-Chair or both, respectively, shall be filled by an election vote, either in the next scheduled Section election or at the next Section Business Meeting, whichever is possible first. If the official date of the vacancy is after the adjournment of a Section Business Meeting and before the final preparation of ballots for the next scheduled election of Section Officers, that election shall also include the vote for a new Chair, Past-Chair, or both, respectively. If such vacancy occurs after final preparation of ballots for a scheduled Section election and before the adjournment of the next Section Business Meeting at the Annual ASA Meeting, a special election of the next Chair, Past-Chair, or both, respectively, shall occur at that next Section Business Meeting.

G. Anyone serving in an Acting position shall possess all the rights, duties and responsibilities of the corresponding non-Acting position while occupying that position.

H. All members of the Section who are voting members of the American Sociological Association are eligible for election as Officers of the Section.

II. Powers of the Officers.

A. The Section Council is vested with the power to carry out all necessary operations of the Section, acting as the representative of the membership of the Section. The Council shall make decisions at its scheduled meetings by a majority vote of its attending members and between meetings by a majority vote using any method designed to allow all Council members a reasonable chance to register their votes, e.g., by mail, e-mail, conference phone call, provided a quorum of at least six members participates in the vote. Section Council may decide by majority vote to put to a vote of the Section membership any question it deems necessary or appropriate. Any action of the Council shall be brought to the next Section Business Meeting for ratification if requested by either three or more Council members or by a written petition submitted to the Secretary-Treasurer and signed by at least ten percent of the members of the Section or 25 members of the Section, whichever is less.

B. Each year the Section Council shall appoint an Editor for the Section Newsletter, who shall be a Section member. The Editor shall serve in a staff capacity to the Council.

C. Unless otherwise provided in these Bylaws, all appointments to Committees shall be made by the Chair with the concurrence (i.e., no opposing majority of six or more members) of the Section Council.

III. Elections and Voting.

A. The elections of the Section shall be carried out in cooperation with the American Sociological Association and coordinated to its schedule. With the exception of the first election, which shall be conducted at the first Business Meeting of the Section-In-Formation at the Annual Meeting of the ASA in 1996, elections will normally be conducted in the spring of the year.

B. In the election for any position other than Regular Council member the candidate

receiving the largest number of votes shall be elected. In the case of a tie vote, the tie shall be broken by a random process conducted by the Committee on Nominations. In the election of Regular Council members (normally with at least four candidates for two positions), each voter shall have two votes and the two candidates with the largest number of votes shall be elected. In the case of a tie vote for either one or both Council seats, the tie shall be broken by a random process conducted by the Committee on Nominations. Unless otherwise provided in these Bylaws, a simple majority of the members voting on an issue or referendum shall determine the outcome. Newly elected officers of the Section shall assume office immediately upon adjournment of the next Annual Meeting of the ASA.

C. For any vote of the membership to be valid, whether on a Section position, an item of business or an amendment to these Bylaws, it is required that a quorum of twenty-five or ten percent of the Section membership participate, whichever is larger.

D. If no candidate for the graduate student Council member seat is available at the time of the election a graduate student member of the ASA shall be appointed to this position by the new Chair, subject to confirmation by a majority vote of the new Section Council as soon as possible after the Annual ASA Meeting.

IV. Committees.

A. There shall be a Committee on Nominations of at least five members, chaired by the Past-Chair, the remaining members of which are appointed each year by the Section Council when it convenes at the Annual Meeting of the ASA. All members of this Committee shall be members of the Section. This committee is charged with soliciting suggestions for nominations from Section members; it shall name at least two candidates who are Section members for each office to be filled. These candidates shall not be announced until they have consented to serve. If requested by the Chair or the Section Council, the Committee on Nominations shall submit to the Chair or the Council, respectively, the names of Section members to be considered for appointment to other committees of the Section.

B. There shall be a Program Committee of at least four members, chaired by the Section Chair and with the Chair-Elect as ex officio member, the remaining members of which are appointed each year by the Section Council. All members of this Committee shall be Section members. This committee is charged with arranging and implementing the various events and activities of the Section authorized by the Section Council, in particular, the Section events and activities during the Annual Meeting of the ASA.

C. Other Ad Hoc Committees may be established by the Chair of the Section with the concurrence of the Council, or by the Council, for a period of time not to exceed one year. Such Committees may be continued from year to year only by a majority vote of re-authorization of the Section Council.

V. Section Membership.

A. Membership in the Section is open to any member of the ASA, without regard to classification of membership, who has an interest in the area of mathematical sociology. Section members who cease to be members of the ASA shall be dropped from the membership of the Section immediately. Section members who remain members of the ASA but fail to pay their Section dues shall be suspended and classified as Inactive Members. They shall be ineligible to vote in Section elections and to hold any Section office or committee position, and shall be dropped from the membership roll of the Section after two years.

VI. Dues.

A. Section dues shall be set by the Section Council to cover the operation of the Section in accordance with the requirements of the American Sociological Association.

VII. Section Business Meetings.

A. Section Business Meetings shall be held at a stated place and time during the Annual Meetings of the ASA. A quorum for conducting any business of the Section at this meeting shall consist of at least twenty-five or ten percent of the members of the Section, whichever is larger. Unless specified to the contrary in these Bylaws, all business at this meeting shall be conducted in a parliamentary manner according to Robert's Rules of Order.

B. For each Section Business Meeting, Section Council shall select a Parliamentarian, who shall be charged with the interpretation of these Bylaws or Robert's Rules of Order as needed for the proper and expeditious conduct of Section business.

VIII. Amendment of these Bylaws.

A. These Bylaws may only be amended by a two-thirds favorable majority vote of those voting at a Section Business Meeting, provided this action is subsequently confirmed by a favorable majority vote of those voting in a mail ballot of the Section membership. The number of Section members participating in each of the Business Meeting and mail ballot must be at least twenty-five or ten percent of the members of the Section, whichever is larger. The amended Bylaws go into effect only upon the favorable outcome of the mail ballot.