

Carl P. Simon
CURRICULUM VITAE

September 2025

Current Position

University of Michigan:

Professor Emeritus of Mathematics, Economics, Complex Systems, and Public Policy
Founding Director, Center for the Study of Complex Systems (1999–2009)

Mail Addresses

Center for the Study of Complex Systems Weiser Hall The University of Michigan Ann Arbor, MI 48109-1042	Ford School of Public Policy Weil Hall The University of Michigan Ann Arbor, MI 48109-3091	Department of Mathematics East Hall The University of Michigan Ann Arbor, MI 48109-1109
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Personal Data

Born in Chicago, February 7, 1945, to Paul and Josephine Simon.
Two children: Ann (1968-2003; UC Berkeley PhD in Rhetoric, 2003)
and David (born July 1970; UCLA PhD in Political Science 2001).

Education

1966–1970: Northwestern University (M.S., June 1967; Ph.D. Mathematics, August 1970)
1964–1966: University of Chicago (B.S. Mathematics, June 1966)
1962–1964: St. Mary of the Lake Seminary Junior College, Niles, Illinois

Dissertation

“Non-genericity of rational zeta functions and instability in $\text{Diff}^r(T^3)$,” under the supervision
of Robert F. Williams, Northwestern University

Previous Positions

1988-2020: University of Michigan, Professor of Mathematics, Economics, Complex Systems,
and Public Policy
1978–1988: University of Michigan, Associate Professor of Mathematics and Economics
1978–1980: University of North Carolina, Associate Professor of Mathematics and Economics
1972–1978: University of Michigan, Assistant Professor of Mathematics
1970–1972: University of California, Berkeley, Instructor of Mathematics

Faculty Associate Positions

Center for Russian and East European Studies
Program in the Environment
Center for Population Studies
School of Urban Planning
Interdisciplinary Program in Infectious Diseases
Weiser Center for Emerging Democracies
Graham Environmental Sustainability Institute
Michigan Memorial Phoenix Energy Institute Faculty Fellow.

Visiting Positions

University of Maine Darling Marine Center, October, 1999.
Summer School of Economics, Olsztyn, Poland, August 1991, 1993, 1994, 1995, 1996, 1997, 1998;
Warsaw, Poland, February, 1993.
Institute for Mathematics and its Applications, University of Minnesota,
September 1983–August 1984; January–June 1990
University of Strasbourg: Department of Mathematics, May–July 1981 and June 1983;
Department of Economics, June 1984
Northwestern University, Department of Mathematics, January–June 1976

International Awards

Howard M. Temin Award in Epidemiology for Scientific Excellence in the Fight
Against HIV/AIDS, 1995.
Kenneth Rothman Epidemiology Prize for paper of the year in *Epidemiology*, 2005.

University Awards

U-M Graham Institute Distinguished Faculty in Sustainability, 2016-2018.
U-M Distinguished Faculty Achievement Award, 2012.
LS&A Distinguished Senior Lecturer for 2007.
Michigan Society of Fellows, 1997–2001.
LS&A Excellence in Education Award: 1993, 1995.
Michigan Association of Governing Boards of State Universities Distinguished Faculty
Award, 1992.
University of Michigan Faculty Recognition Award for 1983–1984, “for extraordinary
contributions as a teacher, scholar and member of the University community,”
Mathematics Department Nominee for University of California Excellence in Teaching
Award, 1972

Keynote Lectures

Keynote speaker for the Annual Meeting of the Metropolitan New York Section
of the Mathematics Association of America, 2017.
Keynote speaker to American Association of Artificial Intelligence in Arlington, VA., 2011.
Keynote speaker, S.I.A.M. Conference on Mathematics for Industry, UM Dearborn, 2004.
Gerald Ford School of Public Policy Commencement Speaker, 2004, 2006, 2013, 2015.
Keynote speaker, S.I.A.M. Conference on Mathematics for Industry, Toronto, 2003.
Charles Phelps Taft Lecturer, University of Cincinnati, October, 1990,

Other Honors

The October 2015 Midwest Dynamical Systems Meeting at Ohio State University was dedicated to me on the occasion of my seventieth birthday.

Research Grants

M-cubed Grant from U-M to model “the spread of crime.” 2013-14.

NIH/OBSSR grant: “Complex Systems Approaches to Population Health.” 2009-2014.

NSF Human and Social Dynamics grant: “Sustainable Mobility and Accessibility.” 2005-2007.

NSF IGERT grant to support Ph.D. theses using complex systems approaches to study political and economic institutions: 2002-2008.

NIH Grant: “Vaccine trials using individual and ecological units,” 2000-2003.

NIAID Grant to Model the Spread of AIDS: 1990–1993.

Grant from the University of Michigan Presidential Initiatives Fund:

for 1987–1990 for an interdisciplinary project on

“Parallel Adaptive Systems in the Social and Biological Sciences;”

and for 1988–1989 for an interdisciplinary project on

“Contact Pattern and Dynamic Analyses of HIV Transmission.”

National Science Foundation Research Grant: 1971 through 1981, 1983–84, 1990–93.

Editorial and Advisory Committees

S.I.A.M. Journal on Mathematical Analysis, 1981–1993.

Journal of Economic Behavior and Organization, 1983–1990

Southern Economic Journal, 1980–1982

National Academy of Sciences Boards

National Academy of Sciences Board on Mathematical Sciences and Applications, 2012-2016.

National Academy of Sciences Committee on Preparing the Next Generation of Policy Makers for Science-Based Decisions, 2014-2016.

National Academies of Sciences, Engineering, and Medicine Intelligence Science and Technology Experts Group (ISTEG), 2016-date.

Publications: Books

Growing Inequality: Bridging Complex Systems, Population Health, and Health Disparities (co-editor, with G. Kaplan, Ana Diez Roux, and Sandra Galea). Washington, DC: Westphalia Press. (2017) 316 pages.

Mathematics for Economists (with L. Blume). New York: W. W. Norton & Co. (1994) 930 pages.

Answers Pamphlet for Mathematics for Economists (with L. Blume). New York: W.W. Norton & Co. (1995) 243 pages.

Translation of: Martinet, Jean. *Singularities of Smooth Functions and Maps*. Cambridge: Cambridge University Press. (1982) 270 pages.

Beating the System: The Underground Economy. (With Ann Witte). Boston: Auburn House. (1982) 302 pages.

Publications: Journal and Book Articles

- "An allele-based evolution model of the population spread of SARS-CoV-2." (with J. Koopman, M. Eisenberg, and A. Polanco) MEDRxIV/2025/335781
- "A dynamical systems analysis of criminal behavior using national longitudinal survey of youth data" (with D. McMillon, J. Morenoff, and E. Lane). *PLoS ONE* (2025). <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0324014>
- "The Importance of Peer Imitation on Smoking Initiation Over Time: A Dynamical Systems Approach" (with David Mendez). *Health Care Management Science* (2022) 25(2): 222-236. <https://doi.org/10.1007/s10729-021-09583-z>
- "A runtime alterable epidemic model with genetic drift, waning immunity, and vaccination" (with WM Getz, R Salter, L Vissat, JS Koopman). *Journal of the Royal Society Interface* (2021, Nov.) 18(184): 20210648. doi: 10.1098/rsif.2021.0648
- "Modeling the population effects of escape mutations in SARS-CoV-2 to guide vaccination strategies." (with J. Koopman, W. Getz, and R. Salter). *Epidemics* 36 (2021). <https://doi.org/10.1016/j.epidem.2021.100484>
- "The geometry of reaction norms yields insights on classical fitness functions for Great Lakes salmon," (with J. Breck, E. Rutherford, B. Low, PJ Lamberson, M. Rogers). *PLoS ONE* 15(3): e0228990. (2020) <https://doi.org/10.1371/journal.pone.0228990>
- "Bridging Complex Systems, Population Health, and Health Disparities," (with G. Kaplan, Ana Diez Roux, and Sandra Galea). In *Growing Inequality: Bridging Complex Systems, Population Health, and Health Disparities*. (G. Kaplan et al., ed.) Westphalia Press (2017) 1-10.
- "Using Complex Systems Approaches in the Study of Population Health and Health Disparities: Seven Observations." (with G. Kaplan, Ana Diez Roux, and Sandra Galea). In *Growing Inequality: Bridging Complex Systems, Population Health, and Health Disparities*. (G. Kaplan et al., ed.) Westphalia Press (2017) 297-304.
- "Modeling the underlying dynamics of the spread of crime II, Agent-based Models." (with D. McMillon, J. Morenoff, and W. Rand). In: *Growing Inequality: Bridging Complex Systems, Population Health, and Health Disparities*. (G. Kaplan et al., ed.) Westphalia Press (2017) 201-228.
- "Developmental complexity: Modeling social inequalities in young children and macaques." (with T. Boyce, R. Riolo, S. Suomi, J. Brooks-Gunn, K. Groscurth, S. Cherng, M. Gardner, B. Low, A. Dettmer-Erard, J. Rosen). In: *Growing Inequality: Bridging Complex Systems, Population Health, and Health Disparities*. (G. Kaplan et al., ed.) Westphalia Press (2017) 41-80.
- "An anthropologically based model of the impact of asymptomatic cases on the spread of *Neisseria gonorrhoeae*." (with Ashley Hazel). *Journal of the Royal Society Interface* (2015) 12. [12 20150067; DOI: 10.1098/rsif.2015.0067. 25 March 2015]
- "Complications With Complexity in Requirements." (with John King). *ACM Transactions on Management Information Systems*. Special Issue on Complexity of Systems Evolution: Requirements Engineering Perspective. (2015) 5(3).
- "BACH and Progeny." In: *Exploring Complexity—Volume 1: Aha...That is Interesting!* (J. Vasbinder, editor.) World Scientific Publishing, Singapore (2014) 110-118.

- “Modeling the underlying dynamics of the spread of crime.” (with David McMillon and Jeffrey Morenoff). *PLoS ONE* (2014) 9(4): e88923. doi:10.1371/journal.pone.0088923
- “A transmission model for the ecology of an avian malarial parasite in a temperate ecosystem.” (with Courtney Murdock). *PLoS ONE* (2013) 8(9): e76126. doi:10.1371/journal.pone.0076126
- “Modeling bacterial colonization and infection routes in health care settings: analytic and numerical approaches.” (with B Percha, RL Riolo, and B Foxman). *Journal of Theoretical Biology* (2013) 334:187–199.
- “Market failure and government failure.” (with W. Keech and M. Munger). *Public Choice World Congress, Miami*. (2012).
- “Markets and government: realizing the promise of gains from exchange and cooperation.” (with WR Keech, MC Munger) *International Journal of Economics and Finance Studies* (2012) 4(2): 287-295.
- “Emergent Behaviors in a Deterministic Model of the Human Uterus.” (with M Barclay and HF Anderson) *Reproductive Sciences* (2010) 17: 948-954.
- “PHEV Marketplace Penetration, An Agent-based Simulation,” (with John Sullivan and Irv Salmeen). University of Michigan Transportation Research Institute Technical Report 2009-32 (2009).
- “Culture, Science Fiction, and Complex Adaptive Systems: The Work of the Genre Evolution Project,” (with Eric Rabkin). *Biocomplexity at the Cutting Edge of Physics, Systems Biology and The Humanities*. Bologna, Italy: Bononia University Press, 2009.
- “Wastewater treatment contributes to selective increase of antibiotic resistance among *Acinetobacter spp.*” (with Yongli Zhang, Carl Marrs, Chuanwu Xi). *Science of the Total Environment* (2009) 407 (12) 3702-6.
- “Prevalence of antibiotic resistance in drinking water treatment and distribution systems.” (with Chuanwu Xi, Yongli Zhang, Carl Marrs, Wen Ye, Betsy Foxman, and Jerome Nriagu). *Applied and Environmental Microbiology* (2009) 75: 5714-5718.
- “Response to Rapatski, Suppe, Yorke: HIV Epidemics driven by Late Disease Stage Transmission.” (with James Koopman). *J Acquir Immune Defic Syndr* 41(5), April 15, 2006, p. 677.
- “Favored Places in the Selfish Herd: Trading Off Food and Security,” (with B. Low and D. Finkbeiner). In: *Perspectives on Adaptation in Natural and Artificial Systems*. (L. Booker, S. Forrest, M. Mitchell and R. Riolo, eds.) Oxford University Press (2005), pp. 213-238.
- “Who Really Shaped American Science Fiction?” (with James Mitchell and Eric Rabkin). *Prospects* (2005) 30:45–72.
- “When To Control Endemic Infections by Focusing on High-Risk Groups,” (with J. Koopman and C. Riolo). *Epidemiology* 15(5) (2005) 621–627.
- “A Complex Systems Approach to Understanding the HIV/AIDS Epidemic.” (with J. Koopman). In *Mathematics for Industry: Challenges and Frontiers. A Process View: Practice and Theory*. (David R. Ferguson and Thomas J. Peters, eds.) S.I.A.M. (2005) 199-221.
- “The Exaggerated Reports of the Death of Science Fiction.” (with Z. Wright and E. Rabkin). *New York Review of Science Fiction*. (2005) 18(4):1, 4-7.

- “Redundancy and Diversity: Do They Influence Optimal Management?” (with B. Low, E. Ostrom, J. Wilson). *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. (F. Berkes, J. Colding and C. Folke, eds.) Cambridge: Cambridge University Press (2003) 83-114.
- “The Biodemography of Modern Women: Tradeoffs When Resources Become Limiting.” (with B. Low and K. Anderson). In: *The Biodemography of Human Fertility and Reproduction*, (Rodgers, J.L. and Kohler, H.P., eds.) Kluwer Press (2003) 105-134.
- “L’Utopia e i suoi rapporti con il fantastico e la *Fantasy*” (originally written as “Fantasy and Utopia”), (with Eric Rabkin), in *Dall’utopia all’utopismo: Percorsi tematici*. (Vita Fortunati, Raymond Trousson, Adriana Corrado, eds.) Naples: CUEN (2003) 127-139.
- “Qualitative Theory of Compartmental Systems with Lags,” (with J. Jacquez). *Mathematical Biosciences* 180 (2002) 341-362.
- “Percolation on Heterogeneous Networks as a Model for Epidemics,” (with L. Sander, C. Warren, I. Sokolov, and J. Koopman). *Mathematical Biosciences* 180 (2002) 293-305.
- “Stochastic Effects on Endemic Infection Levels of Disseminating Versus Local Contacts,” (with J. Koopman, S. Chick, C. Riolo and G. Jacquez). *Mathematical Biosciences* 180 (2002) 49-71.
- “An Introduction to Mathematical Models in Fisheries Ecology,” *Institutions, Ecosystems, and Sustainability*. (R. Constanza, B. Low, E. Ostrom and J. Wilson, eds.) CRC Press (2001) 119-148.
- “Infection Transmission Dynamics and Vaccination Program Effectiveness as a Function of Vaccine Effects in Individuals,” (with James Koopman). *Mathematical Approaches for Emerging and Reemerging Infectious Diseases, Part II: Models, Methods and Theory*, (C. Castillo-Chavez, S. Blower, P. van den Driessche and Abdul-Aziz Yakubu, eds.) Springer-Verlag (2001), 143-155.
- “Age, Sex, and Evolution in the Science Fiction Marketplace,” (with Eric Rabkin). *Interdisciplinary Literary Studies* (Spring, 2001) 45-58.
- “Ferrets as a Transmission Model for Influenza: Sequence Changes in Type A (H3N2) Virus,” (with M.L. Herlocher, S. Elias, R. Trucson, S. Harrison, D. Mindell, A. Monto). *Journal of Infectious Diseases* (2001) 542-546.
- “An Evolutionary Ecological Perspective on Demographic Transitions: Modeling Multiple Currencies,” (with B. Low and K.G. Anderson). *American Journal of Human Biology* 14 (2001) 149-167.
- “Human-Ecosystem Interaction: A Dynamic Integrated Model,” (with B. Low, R. Costanza, E. Ostrom, J. Wilson). *Ecological Economics*, 31 (1999) 227-242.
- “The Role of Primary HIV Infection in the Spread of HIV Through Populations,” (with J. Koopman, J. Jacquez, B. Foxman, S. Pollock, D. Barth-Jones, A. Adams, G. Welch, K. Lange) *Journal of A.I.D.S.* 14 (1997), 249-258.
- “Modeling Progression of HIV Infection: Staging and The Chicago MACS Cohort,” (with J. Jacquez, J. Koopman & I. Longini). *Models for Infectious Human Diseases*. (V. Isham & G. Medley, eds.) Cambridge University Press (1996) 197-199.

- “A Liapunov Function Approach to Computing R_0 ,” (with J. Jacquez & J. Koopman). *Models for Human Infectious Diseases*. (V. Isham & G. Medley, eds.) Cambridge University Press (1996) 311-314.
- “Core Groups and the R_0 ’s for Subgroups in Heterogeneous SIS Models,” (with J. Jacquez, J. Koopman). *Epidemic Models: Their Structure and Relation to Data* (D. Mollison, ed.) Cambridge University Press (1995) 279-301.
- “Understanding Compartmental Systems with Lags,” (with J. Jacquez). *Differential Equations and Applications to Biology and to Industry*, (M. Martelli, K. Cooke, E. Cumberbatch, B. Tang, H. Thieme, eds.) World Scientific Press (1995) 217-232.
- “Assessing Contagiousness Effects of Vaccines and Risk Factors for Transmission,” (with J. Koopman, J. Jacquez). *Modeling the AIDS Epidemic*, (E. Kaplan & M. Brandeau, eds.) New York: Raven Press, (1994) 439-460.
- “Role of Primary Infection in Epidemics of HIV Infection in Gay Cohorts,” (with J. Jacquez, J. Koopman & I. Longini). *Journal of A.I.D.S.* (1994) 7:1169-1184.
- “Qualitative Theory of Compartmental Systems,” (with John Jacquez). *S.I.A.M. Review*, 35 (1993) 43-79.
- “The Stochastic SI Model with Recruitment and Deaths: I. Comparison with the Closed SIS Model. (with John Jacquez). *Mathematical Biosciences*, 117 (1993) 77-125.
- “Decentralized Dynamic Processes for Finding Equilibria,” (with Stan Reiter). *Journal of Economic Theory*, 56 (1992) 400-425.
- “Reproduction Numbers and the Stability of Equilibria of SI Models for Heterogeneous Populations,” (with John Jacquez). *S.I.A.M. Journal of Applied Mathematics*, 52 (2) (1992) 541-576.
- “The Reproduction Number in Deterministic Models of Contagious Diseases,” (with J. Jacquez and J. Koopman). *Current Topics in Theoretical Biology*, 2(3) (1991) 159-209.
- “Assessing Risk Factors for Transmission,” (with J. Koopman, I. Longini, J. Jacquez, D. Ostrow, W. Martin and D. Woodcock). *American Journal of Epidemiology*, 133(12) (1991) 1199-1209.
- “The Effects of Population Structure on the Spread of the HIV Infection,” (with L. Sattenspiel, J. Koopman, and J. Jacquez). *American Journal of Physical Anthropology*, 82(4) (1990) 421-430.
- “AIDS: The Epidemiological Significance of Two Different Mean Rates of Partner Change,” (with John Jacquez). *IMA Journal of Mathematics Applied to Medicine and Biology*, 7 (1990) 27-32.
- “Some Fine-Tuning for Dominant Diagonal Matrices.” *Economics Letters*, 30 (1989) 217-221.
- “Structured Mixing: Heterogeneous Mixing by the Definition of Activity Groups,” (with J. Jacquez and J. Koopman). *Mathematical and Statistical Approaches to AIDS Epidemiology*. (C. Castillo-Chavez, editor.) Springer-Verlag Lecture Notes in Biomathematics, 83 (1989) 301-315.
- “Selective Contact Within Structured Mixing; With an Application to the Analysis of HIV Transmission Risk from Oral and Anal Sex,” (with J. Koopman, J. Jacquez, and T. Park). *Mathematical and Statistical Approaches to AIDS Epidemiology*. (C. Castillo-Chavez, editor.) Springer-Verlag Lecture Notes in Biomathematics, 83 (1989) 316-348.

- “The Spread and Persistence of Infectious Diseases in Structured Populations,” (with L. Sattenspiel). *Mathematical Biosciences*, 90 (1988) 341–366; and in: *Nonlinearity in Biology and Medicine*. (A. Perelson, B. Goldstein, M. Dembo, and J. Jacquez, editors). New York: Elsevier (1988) 341–366.
- “Sexual Partner Selectiveness Effects on Homosexual HIV Transmission Dynamics,” (with J. Koopman, J. Jacquez, J. Joseph, L. Sattenspiel, and T. Park). *Journal of Acquired Immune Deficiency Syndromes*, 1 (1988) 486–504.
- “Modeling and Analyzing HIV Transmission: The Effect of Contact Patterns,” (with J. Jacquez, J. Koopman, L. Sattenspiel, and T. Perry). *Mathematical Biosciences*, 92 (1988) 119–199.
- “Convergence of Myopic Firms to Long Run Equilibrium via the Method of Characteristics,” (with P. Artzner and H. Sonnenschein). *Models of Economic Dynamics*. (H. Sonnenschein, editor). New York: Springer Lecture Notes in Economics and Mathematical Systems 264 (1986) 157–183.
- “Scalar and Vector Maximization: Calculus Techniques with Economic Applications,” *Studies in Mathematical Economics*. (S. Reiter, editor). Washington, D.C.: Mathematical Association of America (1986) 62–159.
- “Electoral and Welfare Consequences of Political Manipulation of the Economy,” (with W. Keech). *Journal of Economic Behavior and Organization*, 6 (1985) 177–202.
- “Comments on the Role of Catastrophe Theory in the Social Sciences,” and “Comments on Some Current Dynamic Problems in Economic Modeling,” *Catastrophe Theory: State of the Art and Potential Applications*. (F.C. Johnson and R.C. Lacher, editors.) Arlington, VA.: Office of Naval Research (1984) 88–91, 91–94.
- “Inflation, Unemployment, and Electoral Terms: When Can Reform of Political Institutions Improve Macroeconomic Policy?” (with W. Keech). *The Political Process and Economic Change*. (K. Monroe, editor). New York: Agathon Press (1983) 77–107.
- “Counting Groves-Ledyard Equilibria Via Degree Theory,” (with T. Bergstrom and C. Titus). *Journal of Mathematical Economics*, 12 (1983) 167–184.
- “The Impact of Unrecorded Economic Activity on American Families,” (with Ann Witte). *American Families and the Economy*. (R. Nelson and F. Skidmore, editors). Washington, D.C.: National Academy of Science Press (1983) 145–178.
- “Size and Growth of the Underground Economy: Implications for American Business,” (with Ann Witte). *The Economic Outlook for 1983*. (S. Hymans, editor). Ann Arbor: U.M. Research Seminar in Quantitative Economics (1983), pp. 209–236.
Also revised and reprinted as: “The Underground Economy: The Prisoners’ Dilemma in our Not-so-Cashless Society.” (with Ann Witte). University of Michigan *LSA Magazine* (Winter, 1984) 7, 4–10.
- “Perturbations of Degenerate Singularities,” (with C. Titus). *Dynamical Systems*. (A. Bednarek and L. Cesari, editors). New York: Academic Press (1982) 375–402.
- “The Underground Economy: Estimates of Size, Structure and Trends,” (with Ann Witte). U.S. Congress. Joint Economic Committee. *Special Study on Economic Change, Vol. V. Government Regulation: Achieving Social and Economic Balance*. Washington, D.C.: U.S. Government Printing Office (1980) 70–120.

- “Effective Price Mechanisms,” (with D. Saari). *Econometrica*, 46 (1978) 1097-1125.
- “Singularity Theory of Utility Mappings I: Degenerate Maxima and Pareto Optima,” (with D. Saari). *Journal of Mathematical Economics*, 4 (1977) 217-251.
- “Conditions for Constrained Pareto Optima on a Banach Space with a Finite Number of Criteria,” *Dynamical Systems: Proceedings of a University of Florida International Symposium*. (R. Bednarek, editor). New York: Academic Press (1977) 323-334.
- “Fixed Point Index of Area-Preserving Maps,” *Dynamical Systems—Warwick 1974*. (A. Manning, editor). New York: Springer-Verlag Lecture Notes in Math 468 (1975) 59-60.
- “Removing Index-Zero Singularities with C^1 -Small Perturbations,” (with Charles Titus). *Dynamical Systems—Warwick 1974*. (A. Manning, editor). New York: Springer-Verlag Lecture Notes in Math 468 (1975) 278-286.
- “The Fixed Point Index of Symplectic Maps,” (with C. Titus). *Géométrie Symplectique et Physique Mathématique*. (J-M Souriau, Editor). Paris: C.N.R.S. (1975) No. 237, 19-28.
- “Characterization of Optima in Smooth Pareto Economic Systems,” (with C. Titus). *Journal of Mathematical Economics*, 2 (1975) 297-330.
- “A Bound for the Fixed-Point Index of an Area-Preserving Map with Applications to Mechanics,” *Inventiones Math.*, 26 (1974) 187-200.
- “Generic Properties of the Complementarity Problem,” (with R. Saigal). *Mathematical Programming* (1973) 4: 324-335.
- “Bounded Orbits in Mechanical Systems with Two Degrees of Freedom and Symmetry,” *Dynamical Systems*. (M.M. Peixoto, editor). New York: Academic Press (1973) 515-525.
- “Instability in $\text{Diff}^r(T^3)$ and the Nongenericity of Rational Zeta Functions,” *Transactions of the American Mathematical Society*, 174 (1972) 217-242.
- “A Three-dimensional Abraham-Smale Example,” *Proceedings of the American Mathematical Society*, 34 (1972) 629-630.
- “Instability in $\text{Diff}^r(T^3)$,” *Symposium on Differential Equations and Dynamical Systems*. (D. Chillingworth, editor). New York: Springer-Verlag Lecture Notes in Mathematics 206 (1971) 94-97.
- “On a Classification of a Baire Set of Diffeomorphisms,” *Bulletin of the American Mathematical Society*, 77 (1971) 783-787.

Book Reviews

- “Organismal versus Organizational Evolution: A Review of ‘The Evolutionary Dynamics of Organizations,’ Edited by J.A.C. Baum and J.V. Singh.” (with Bobbi Low). *Academy of Management Review* 20(3) (July 1995).

Discussion Papers and Submitted Papers

- “High Risk Group Turnover and PHI Transmissions,” (with J.S. Koopman) .
- “On the Eigenvectors of Singular Compartmental Matrices,” (with John Jacquez), (1991).

“Calculus Review for Students of Economics,” 150 booklet.

“Generic Properties of Smooth Transformations of n -space,” (with D. G. Saari). (1988).

“The Removal of Index Zero Critical Points of Real Analytic Functions on $\mathbb{R}^2$; I. Functions Regular of Odd Order,” (with C.J. Titus). (1978).

“Ellet’s Transportation Model of an Economy with Differentiated Products and Consumers I: Generic Cumulative Demand Functions,” (1979).

Work in Progress

“A Differential Equation Approach to Classifier Systems: n -armed Bandit Problem.”

Mathematics for Economists, Book Two (with L. Blume).

“Ellet’s Transportation Model of an Economy with Differentiated Commodities and Consumers II: Equilibria.”

“Necessary and Sufficient Conditions for Degenerate Local Maxima,” (with D.G. Saari).

Ph.D. Students

Mark Schmidt, 2008 (Epidemiology: Modeling Meningitis) (with Janet Gilsdorf).

Debra Hevenstone, 2008 (Public Policy/Sociology: Atypical Employment) (with Yu Xie).

Xiang Cheng, 1998 (Economics: Essays on Designing Mechanisms) (with Michael Wellman).

Junko Nakai, 1996 (Economics: On the Economies of Developing Countries) (with John Laitner).

Michael Orszag, 1994 (Economics: Autoregressive Pursuit: A New Approach to Nonstationarity in Macroeconomics and Finance).

Malcolm Robinson, 1991 (Economics: Rational Noncooperation in International Monetary Policy Games).

Patricia J. Carstensen, 1983 (Mathematics: The Complexity of Some Problems in Parametric Linear and Combinatorial Programming) (with K. Murty).

David S. Anker, 1980 (Mathematics: On Removing Isolated Zeros of Vector Fields by Perturbation).

Conferences Organized

(with Jenna Bednar and Dean Andrew Martin), Workshop on “Law and Complexity,” Rackham Auditorium, February 22, 2017.

(with George Kaplan) Six workshops on “Population Health and Complex Systems,” supported by NIH Office of Behavioral and Social Science Research (OBSSR): June 19, 2009 (UM), Sep 18, 2009 (NIH), Jan 29, 2010 (UM), May 3, 2010 (UM), Jan 28-29, 2011 (SF) , May 12-13, 2011 (Columbia U)

Midwest Dynamical Systems Conference at University of Michigan, November 7-9, 2014.

Midwest Dynamical Systems Conference at University of Michigan, October 19-21, 2007.

Midwest Dynamical Systems Conference at University of Michigan, April 2-4, 2004.

International Conference on Compartmental Models and Disease Transmission, Oct. 17-19, 2001.

Midwest Dynamical Systems Conference at University of Michigan, April 16-18, 1999.

Midwest Dynamical Systems Conference at University of Michigan, April 26-28, 1996.

Midwest Dynamical Systems Conference at University of Michigan, November, 1992.

(with C. Aliprantis) By invitation of the American Math. Soc., Special Session on Mathematical Economics and Dynamical Systems at A.M.S. March 1991 Meeting in South Bend, Indiana.

(with H. Varian) 1989 National Meeting of the Econometric Society, at the University of Michigan, July, 1989. (100 speakers and 400 participants).

Minisymposium on Mathematical Epidemiology at the S.I.A.M. National Meeting in Minneapolis, July, 1988. (Speakers were C. Simon, H. Hethcote, K. Cooke, W. Schaffer.)

(with M. Brown) Midwest Dynamical Systems Conference at University of Michigan, October, 1985. (Speakers were C. Pugh, J. Harrison, D. Saari, C. Robinson, X.B. Lin, J. Robbin, G. Sell, D. Benardete, R. Moeckel, K. Meyer, E. Slaminka.)

(with John Aldrich) Workshop/Conference on Mathematical Models in Political Science at the Institute for Mathematics and its Applications, University of Minnesota, July 10-13, 1984. (Speakers included S. Brams, J. Chamberlin, G. Chichilnisky, J. Freeman, R. Harden, M. Hinich, W. Keech, R. McKelvey, J. Roemer, D. Saari, N. Schofield, H. Wagner.)

(with James Jordan) National Bureau of Economic Research Conference/Seminar on General Equilibrium Theory, at the Institute for Mathematics and its Applications, University of Minnesota, April 27-29, 1984. (65 participants; lectures by Richter, Mertens, McLennan, Axelrod, Mas-Colell, and Duffie.)

(with Ted Bergstrom) Midwest Mathematical Economics Conference at the University of Michigan, November 1981. (15 lectures and 50 participants).

(with Jeff Rauch) "Trends in Non-linear Analysis." A conference in honor of Professor L. Cesari on his 70th birthday, at the University of Michigan, October, 1980. (Speakers were A. Friedman, J. Hale, H. Lewy, J. Serrin, plus 15 shorter talks).

(with Ted Bergstrom) Midwest Mathematical Economics Conference at the University of Michigan, March, 1978. (12 lectures and 50 participants).

Midwest Global Analysis Conference at the University of Michigan, November, 1976. (Speakers included Hirsch, Robinson, Pixton, and Palmore.)

Departmental, University, and Professional Service

Departmental:

Undergraduate Math advisor (2014-date)

FSPP Executive Committee

Economics Department Admissions Committee (1992)

Economics Department Undergraduate Program Committee, Chairman (1987–1988)
 SPP Admissions Committee, Chairman (1986-1988, 1992-95, 2004-2006, 2015)
 Organizer and Coordinator of University of Michigan Competition in
 Mathematical Modeling (1987-date)
 Mathematics Department Executive Committee (1981-83)
 Useful Mathematics Colloquium Chairman (1976-78, 1980-81)
 Engineering–Mathematics–Physics–Statistics Liaison Committee
 (1975-78, 1981-83, 1985-1987, 1990-91)

University:

Principal Servant, UM Scientific Club (2016-2017)
 Steering Committee, Science Technology Public Policy Program, UM Ford SPP, (2016-2018)
 Co-organizer, Wiesner Symposium on Science Policy, 2015
 Provost’s Foundation Strategy Group (2012-date).
 Director, Science Technology Public Policy Program, UM Ford School of Public Policy (2011-2016).
 Associate Director Social Science & Policy, Mich. Memorial Phoenix Energy Institute (2008-2011).
 Selection Committee, Michigan Journalism Fellows (2007-date).
 External Advisory Board, UM Transportation Research Institute (2005-2011).
 Executive Committee, UM Institute for Complex Adaptive Matter (2006-2014).
 Co-Director UM Interdisciplinary Program on Infectious Diseases (2002-2014).
 Science and Technology Policy Program Committee (2003-2020).
 Executive Committee, Center for Russia and East European Studies (2002-2003).
 Advisory Board, Organizational Studies Program(2002-2020).
 Executive Committee, G.R. Ford School of Public Policy (2000-2002).
 Executive Board, Financial Engineering Program (2000-2004).
 Director, Center for the Study of Complex Systems (1999-2009).
 Executive Board, Rackham Graduate School (1996-1999).
 Steering Committee, R.W.Johnson Health Policy Scholars Program (1995-1997)
 Executive Committee, School of Public Policy (1995-97)
 Executive Board, Institute for Social Research (1995-2001)
 Executive Committee, Program for the Study of Complex Systems (1994-date)
 Associate Director, Program for the Study of Complex Systems (1994-95)
 Task Force on LS&A Quantitative Reasoning Requirement (1992-94)
 Student Code Judicial Board (1993-94)
 University Faculty Awards Committee (1987-1989; chair, 1989)
 Rackham Dissertation Fellowship Committee (1986)
 LS&A College Academic Judiciary (1984-1986)
 At-large member, University of Michigan Senate Assembly (1982-1985)

Professional:

Reviewer for Math Reviews (1974-date)
 Frequent referee for journals in pure and applied mathematics and economics
 Frequent referee for NSF applications
 National Academy of Sciences Board on Mathematical Sciences and Applications, 2012-2016.

Teaching Experience

Advanced Mathematics Courses:

Symplectic geometry*
Singularities of smooth maps*
Differentiable dynamical systems*
Differential geometry
Celestial mechanics*
Algebraic topology
Ordinary differential equations
Mathematical bioeconomics*
Mathematical modeling*
Linear programming
Matrix algebra
Probability
Operations Research
Complex adaptive systems*.

Advanced Economics Courses:

Intermediate microeconomics
Mathematical techniques in economics
Topics in microeconomics*
Economics of the environment
Intermediate macroeconomics.
Social systems and Energy*

(* = new course developed)

Professional Societies

American Academy of Mechanics
American Association for the Advancement of Science
American Mathematical Society
Econometric Society
Mathematical Association of America
Sigma Xi
Society for Industrial and Applied Mathematics
Society for Mathematical Biology.

Talks at Conferences and Colloquia

- 2025: Talk on multi-level CoVid dynamics to UC Irvine Conference on
"Solving mysteries: from voting to the universe," honoring Don Saari's 85th birthday.
- 2024: Talk on multi-level CoVid dynamics to UM Complex Systems Seminar.
- 2021: Talk on CoVid dynamics to UM Complex Systems Seminar.
Talk on CoVid dynamics to U-M COVID-19 Modeling Symposium.
- 2020: Talk on salmon life history to UM Complex Systems Seminar.
- 2019: Talk to Gruter Institute Annual Conference, Squaw Valley, CA.
Talk on fitness functions to Hamilton Symposium at New College, Oxford University.
- 2018: Opening talk to the Jacobs Foundation Marbach Conference in Switzerland on
Reconciling Genes and Contexts: Exploring the Genomic and Environmental Headwaters
of Early Brain Development. My talk: "Complex Systems Approaches to Brain Modeling,"
Talk to Gruter Institute Annual Conference, Squaw Valley, CA.
Talk to Life History Symposium, University of Michigan, on "Sex and the semelparous salmon."
- 2017: Two talks to the Institute for Mathematical Behavioral Sciences, UC Irvine.
Talks on crime to UM-FSPP Faculty Unplugged and to UM Criminal Justice lunch.
Talk on crime to Complexity and Law Workshop.
Keynote talk for the Annual Meeting of the Metropolitan New York Section of the MAA.
Talk on crime to Gruter Institute on Law and Behavior, Squaw Valley, CA.
Talk on salmon life history to the Institute for Mathematical Behavioral Sciences, UC Irvine.
- 2016: Two talks to Gruter Institute on Law and Behavior, Squaw Valley, CA.
Talk to UM Sustainability Fellows on "Systems."
Two talks to the Brigham Young University math department.
- 2015: Talk to "Emerging Properties in Biology" Conference at The University of Michigan.
Talk to Conference on Model Validation, Univ. of California Irvine.
Colloquium to Northwestern University Institute on Complex Systems on "Model Using Musings."
Talk to NAS Mathematics Board (BMSA) on "Model validation."
Talk on "Salmon Life History" to DIMACS Math for Planet Earth Workshop at Howard University.
Talk on "Model Musings" to UM Biointerfaces Policy Symposium.
- 2014: Talk to Conference on Complex Systems, Health Disparities & Population Health, Bethesda, MD.
Talk to UM Conference on the Science and Practice of Computational Modeling.
- 2013: Talk to Faculty of Health Sciences at Simon Fraser University on "Complex Systems and HIV."
Talk to Math Biology Institute, Ohio State University, on "Tipping Points."
- 2012: Talk to Gruter Institute on "Systems Thinking," Palo Alto, CA.
Talk to UM-SFI Workshop on "Tipping Points."
- 2011: Talk to UCal Irvine Conference on "Mathematical Modeling of Infectious Diseases."

- Keynote Talk to American Association of Artificial Intelligence in Arlington, VA.
- 2010: Talk to Eastern Michigan University Faculty Development Center.
Talk to UM Public Policy Alumni Association in Washington, DC.
Talk to University of North Carolina Charlotte Complex Systems Institute.
- 2009: Talk to Conference on “Adaptation, Order and Emergence,” Nanyang University, Singapore.
Talk to NSF-AIR Workshop on Dynamics in the the Human Sciences, Reims, France.
Talk to Ohio State University Initiative on Complex Systems Analysis and Population Health.
- 2008: Talks on energy to UM President’s Advisory Group and LSA Dean’s Advisory Group.
- 2007: Talk to Gruter Institute Conference on Law, Behavior and the Brain, Squaw Valley, CA.
Talk to UC Irvine Human Societies and Complexity Seminar, Irvine, CA.
Talk to INCOSE Systems Engineering Conference, Mackinac Island.
- 2006: Talk to UM Journalism Fellows.
Talk to Notre Dame Workshop on Stochastic Modeling.
Talk to Kalamazoo College Complex Systems Seminar.
Talk to Catalyst Workshop on Complex Systems and Transportation, DC.
Talk to The Santa Fe Institute.
- 2005: Talk to International Conference on Mathematical Economics and Celestial Mechanics, CIMAT, Guanajuato, Mexico.
Seminar to Biology Department, University of Trondheim, Norway.
Talk to Business Insight Forum, Central Michigan Univ. Research Corp.
Talk to Complex Systems Seminar at Wayne State Univeristy.
Two talks to S.I.A.M. Conference on Mathematics for Industry, Detroit.
- 2004: Talk to Gruter Institute Conference on Law, Behavior and the Brain, Squaw Valley, CA.
Talk to Indiana University Workshop on Political Theory & Policy Analysis.
Keynote speaker, S.I.A.M. Conference on Mathematics for Industry, UM Dearborn.
- 2003: Luce Foundation Workshop on “Evolutionary Models of Economic and Social Behavior,” at Penn State Univ.
Talk to Workshop on “Robustness of Coupled Natural & Human Systems,” Santa Fe Institute.
Keynote speaker, S.I.A.M. Conference on Mathematics for Industry, Toronto.
I.M.A. Workshop on “Networks in Epidemiological Models,” Univ. of Minnesota.
- 2002: Talk to DIMACS Working Group on Math Models of Bioterrorism, Rutgers University.
Talk to Workshop on Network Contagion and Failure, Columbia University.
Talk to DIMACS Tutorial on Mathematical Epidemiology, Rutgers University.
Workshop on “Dynamics of Interactive Decision Making,” UCal Irvine.
- 2001: Hosmer Lecture to The University of Michigan Business School.
Talk to UM Population Studies Center.
Talk to SFI/Carnegie Mellon Complexity in Social Science Conference.
Talk to University of Illinois Symposium on “Understanding Complex Systems.”
Biocomplexity Workshop on human/animal interactions at White Oak Plantation, Florida.

- NSF/NAS Biocomplexity workshop on primate evolution in Cambridge, MA.
- NSF Panel on encouraging theory/data analysis in political science.
- Workshop on monogamy at Max Planck Institute, Leipzig, Germany.
- NCEAS Workshop on Ecology and Conservation, Santa Barbara, CA.
- Workshop on Threat Anticipation, Defense Intelligence Agency, Alexandria, VA.
- Talk to International Symposium on Compartmental Models in Epidemiology, UM.
- Talk to UM Orthopaedic Research Lab.

- 2000: Talk to Conference on Mathematical Immunology at Duke University.
- Talk to UM Society of Fellows.
- Talk to Ford Motor Co. Research Division.
- Talk to Intrntnl. Assoc. for the Study of Common Property Conference at Indiana Univ.
- Talk to RAND Conference on Complex Systems and Public Policy, Washington, DC.

- 1999: Talk to the University of Michigan Health Policy Research Seminar.
- Talk to Social Capital Interest Group Visiting Scholars Series, Michigan State University.
- Talk to I.M.A. Workshop on “Mathematical Approaches for Emerging Infectious Diseases”, Univ. of Minnesota.
- Three talks to Los Alamos Immunology Group on “Modeling the Spread of Influenza.”
- Talk to I.M.A. Workshop on “Modeling Animal Grouping”, Univ. of Minnesota.
- Talk to University of Warwick Symposium on Compartmental Modeling and Pharmacokinetic Analysis.
- Talk to University of Maine Darling Marine Center.
- Talk to University of Maine Economics Department.
- Talk to Indiana University Workshop in Political Theory & Policy Analysis.
- Talk to International Conference on Celestial Mechanics, Northwestern University.

- 1998: Invited 1-Hour talk to the Annual A.A.A.S. Meeting in Philadelphia.
- Talk to I.M.A. Workshop on “Dynamics and Control of AIDS”, Univ. of Minnesota.

- 1996: Mathematics Dept Colloquium, Case Western Reserve University.
- Workshop Leader for Conference on Mathematical Analysis in the Undergraduate Economics Curriculum, Miami University, Ohio.

- 1995: Talk to Seminar on the Applications of Mathematics to Biology, University of Texas.
- Mathematics Department Seminar, University of Arizona.
- Lecture to Midwest Dynamical Systems Conference, University of Cincinnati.
- Lecture to Economic Science Association, Tucson, AZ.
- Lecture to the University of Michigan/Santa Fe Institute Workshop, Ann Arbor.

- 1994: Talk to International Conference on Differential Equations with Applications to Biology and Industry, Claremont, CA.

- 1993: NATO Workshop on Epidemic Models, Newton Institute, University of Cambridge.
- Math Department Colloquium, University of Vilnius, Lithuania.
- Newton Institute Workshop on Infectious Human Diseases, Cambridge University.
- Lecture to University of Michigan School of Management Conference on Search for New Strategy Paradigms.
- Lecture to Midwest Dynamical Systems Conference/Moe Hirsch Symposium, UC Berkeley.

- 1992: Dynamical Systems Seminar, Northwestern University.
 Lecture to Conference on Computational Economics, University of Texas.
 Workshop on Operations Research and Complex Adaptive Systems
 at the Santa Fe Institute.
 Talk to NSF Workshop on Coordination Theory and Collaboration Technology
 in Washington, DC.
 Lecture to Symposium on Mathematical Epidemiology,
 S.I.A.M. Conference on Dynamical Systems, Snowbird, UT.
- 1991: Mathematics Dept. Colloquium, Michigan State University.
 Physics Dept. Seminar, University of Texas.
 Mathematics Dept. Colloquium, University of Texas.
 Talk to Campus Theory Seminar, Michigan State University.
 Lecture to Session on Mathematical Economics, American Math. Society
 Meeting, South Bend, IN.
 Talk to NSF Workshop on Coordination Theory and Collaboration Technology
 in Washington, DC.
 Talk to Workshop on Stochastic Modeling for Infectious Diseases, Luminy, France.
 Workshop on Epidemiological Modeling, Pittsburgh Supercomputing Center.
 Talk to School of Urban and Public Affairs Faculty Research Seminar,
 Carnegie Mellon University.
- 1990: Mathematical Biology Colloquium, University of Iowa.
 Mathematics Department Colloquium, Carleton College.
 Lecture to Minisymposium on Mathematical Biology,
 S.I.A.M./A.M.S. Meeting, Albuquerque, NM.
 Workshop on AIDS Modeling, Los Alamos National Laboratory, NM.
 Lecture to Symposium on Mathematical Epidemiology,
 S.I.A.M. Conference on Dynamical Systems, Orlando, FL.
 Lectures to the Differential Geometry Seminar and to the I.M.A.
 at the University of Minnesota.
 Charles Phelps Taft Lecture, University of Cincinnati.
- 1989: Lecture to Workshop on Mathematical Models for Infectious Diseases,
 Oberwolfach, Germany.
 Workshop on Evolutionary Economics, Santa Fe Institute.
 Economics Department Colloquium, S.U.N.Y. Stonybrook.
 Lecture to Midwest Dynamical Systems Conference, Northwestern University.
 Lecture to Symposium on Mathematical Modeling of AIDS, S.I.A.M. National
 Meeting, San Diego, CA.
 Mathematics Department Colloquium, Bowling Green State University.
- 1988: Workshop on Coordination Theory, M.I.T.
 Address at 1988 I.P.P.S. Graduation Ceremony.
 Lecture to Economic Theory Colloquium at Purdue University.
 Invited organizer and lecturer, Minisymposium on Mathematical Epidemiology,
 S.I.A.M. National Meeting, Minneapolis.

- 1987: Workshop on Organizational Science, M.I.T.
Lecture to the Midwest Dynamical Systems Conference at Boston University.
- 1986: Lecture to the Strategic Behavior and Competition Workshop, Northwestern U.
Workshop on Classifier Systems and Parallel Processing at Rowland Institute,
Cambridge, Mass.
Panel Discussant for “Frontiers of Chaos” Exhibit at U. of Michigan Art School.
- 1985: Lecture to Symposium on Mathematical Modeling at University of Michigan
at Dearborn.
Colloquium to Mathematics Department at S.U.N.Y. at Buffalo.
- 1984: Two lectures at mathematical economics conference at University of Indiana
and Purdue at Indianapolis.
Lecture at International Colloquium on Mathematical Economics in Luminy, France.
Workshop on Dynamical Systems, Oberwolfach, Germany.
Lecture to I.M.A. Symposium on Differential Equations and Dynamical Systems.
- 1983: Economics department seminar at University of Southern California.
Troubled Economy Lecture Series at USC.
Ten-minute live studio interview on Financial News Network.
Workshop on Price Adjustment, Quantity Adjustment, and Business Cycles at
the Institute for Mathematics and its Applications (I.M.A.).
Three lectures on Theory of Value and two lectures on dynamical systems at I.M.A.
- 1982: National Academy of Sciences Conference on Families and the Economy,
Washington, D.C.
Michigan Mathematical Association of America Meeting, Grand Rapids, MI.
Mathematics department colloquium, University of Toledo.
First Annual Michigan Conference on Industrial and Applied Mathematics,
Michigan State University.
Economic and Social Outlook Conference, University of Michigan.
- 1981: International Conference on Dynamical Systems II, University of Florida.
Mathematics department colloquium, University of Strasbourg, France.
- 1980: Mathematics department colloquium, Wayne State University.
- 1979: Special session on “Singularities, Catastrophes, and Dynamical Systems,”
Operations Research Society of America national meeting, New Orleans.
N.B.E.R. Conference of General Equilibrium Theory, Berkeley, CA.
International Symposium on Dynamical Systems, Northwestern University.
Special session on “Generic Nonlinear Programming,” Operations Research
Society of America national meeting, Milwaukee.
- 1977: Panelist on “Catastrophe Theory and Political Research,” International Studies
Association Meeting, St. Louis.
Colloquia to mathematics department and to economics department, University
of North Carolina at Chapel Hill.

- 1976: N.B.E.R. Conference on General Equilibrium Theory, Berkeley, CA.
International Conference on Dynamical Systems, University of Florida.
Mathematics department colloquium, Wayne State University.
- 1975: Midwest Mathematical Economics Conference at University of Illinois.
Mathematics department colloquium at University of Minnesota.
Economics department seminar at University of Minnesota.
Colloquium at IMPA, Rio de Janeiro, Brazil.
Midwest Mathematical Economics Conference at Northwestern University.
Special session on Global Analysis, American Mathematical Society Meeting, Chicago.
- 1974: Conference on Dynamical systems, University of California (Berkeley).
Industrial and Operations Engineering Department Colloquium at University
of Michigan.
Mathematics department Colloquium at University of Cincinnati.
Rencontre in Mathematical Economics at University of Warwick, England.
International conference on Dynamical Systems at University of Warwick, England.
International colloquium on Symplectic Geometry and Mathematical Physics at
University of Aix-en-Provence, France.
Mathematical Social Science Board Colloquium on Mathematical Economics at
University of California (Berkeley).
- 1973: Midwest Global Analysis Conference at Northwestern University.
Mathematics department colloquium at Michigan State University.
- 1971: International Symposium on Dynamical Systems, Bahia, Salvador, Brazil.