

## CURRICULUM VITAE

Dr. Joshua M. Epstein

Senior Fellow  
Economic Studies Program  
Director, Center on Social and Economic Dynamics  
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**PRIMARY RESEARCH INTEREST:** Modeling complex social, economic, and biological systems using agent-based computational models and nonlinear dynamical systems.

### **PROFESSIONAL EXPERIENCE**

- Director, Center on Social and Economic Dynamics, The Brookings Institution
- Senior Fellow, The Brookings Institution, Economic Studies Program, 1996-present; Foreign Policy Studies Program, 1987-1996
- Visiting Professor, School of Public Health, University of Pittsburgh
- External Professor, The Santa Fe Institute
- External Research Professor, The Krasnow Institute for Advanced Study, George Mason University
- Member, National Academy of Sciences Institute of Medicine Committee on Advances in Technology and the Prevention of their Applications to Next Generation Biowarfare Threats
- Member, National Academy of Sciences Committee on Network Science
- Member, The New York Academy of Sciences
- Member, The MacArthur Foundation Research Network on Economic Inequality and Social Interactions
- Founding Book Series Editor, The Princeton Studies in Complexity, Princeton University Press, 1993-2003
- Editorial Board, *Disaster Medicine and Public Health Preparedness*

- Editorial Board, *Complexity*
- Associate Editor, *Artificial Life and Robotics*, Springer-Verlag
- Faculty Member, Santa Fe Institute 1992 Complex Systems Summer School
- Visiting Lecturer, the Woodrow Wilson School, Princeton University (1983-93)
- Adjunct Professor of Security Studies, Georgetown University (1989-90)
- Research Associate, Brookings (1985-87)
- Rockefeller Foundation International Relations Fellow in residence as a Guest Scholar at The Brookings Institution (10/83- 1/85)
- Council on Foreign Relations International Affairs Fellow (10/82-10/83)
- Post-Doctoral Fellow, Center for International Affairs, Department of Government, Harvard University (9/81-10/82)
- Post-Doctoral Research Fellow, Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University (9/80-9/81)
- Consultant, The RAND Corporation (3/80-9/81)

### **AWARDS AND PROFESSIONAL SOCIETIES**

- 2008 NIH Director's Pioneer Award
- Member, The Mathematical Association of America (1991 - Present).
- Member, The American Political Science Association (1991 - Present).
- 1989 Elected Member, The Council on Foreign Relations.
- 1983-1984 Rockefeller Foundation International Relations Fellowship.
- 1982-1983 Council on Foreign Relations International Affairs Fellowship.
- 1981, Elected Term Member, The Council on Foreign Relations.
- 1980-1981 Ford Foundation Dual Expertise Fellowship in Soviet/East European Area Studies and International Security/Arms Control.
- 1980-1981 Institute for the Study of World Politics Fellowship.

- Ford Foundation Arms Control Fellowships (through the Arms Control Project, Center for International Studies, Massachusetts Institute of Technology, 2/77-12/79).
- Amherst College Memorial Fellowships (successive academic years, 1976-1977 and 1977-1978).

## **EDUCATION**

### MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Cambridge, Massachusetts  
September 1976-February 1981

Ph.D. Department of Political Science, Fields of Specialization: Security Studies, Communist Studies, and Economics (in the MIT Economics Department).

### AMHERST COLLEGE

Amherst, Massachusetts  
February 1973-June 1976

Awarded B.A. in June 1976. Major: Independent Scholar with Thesis in Political Economy--Bank Control of Industrial Corporations in the U.S. Economy. Before assuming Independent Scholar status, was Mathematics major.

### UNIVERSITY OF MASSACHUSETTS

Amherst, Massachusetts  
September 1969-February 1973

Major: Music Composition and Theory. Principal Instrument: piano, with training in voice and orchestral conducting. (Transferred to Amherst College, February 1973).

## **PUBLICATIONS**

### **Books**

*Generative Social Science: Studies in Agent-Based Computational Modeling* (Princeton University Press, 2006).

*Growing Artificial Societies: Social Science From the Bottom Up*, with Robert L. Axtell (MIT Press / Brookings Institution, 1996). Recently translated into Japanese and Swedish

*Nonlinear Dynamics, Mathematical Biology, and Social Science* (The Santa Fe Institute / Addison-Wesley, 1997).

*Conventional Force Reductions: A Dynamic Assessment* (Brookings, 1990).

*Strategy and Force Planning: The Case of the Persian Gulf* (Brookings, 1987).  
*Measuring Military Power* (Princeton University Press, 1984).

## Articles and Chapters

“Controlling Pandemic Influenza: The Role of International Travel Restrictions.”

Epstein, Joshua M.; Michael Goedecke; Feng Yu, J. Morris, Diane Wagener, Georgiy Bobashev. *Public Library of Science One*. May 12, 2007

“Individual-based Computational Modeling of Smallpox Epidemic Control Strategies”

Burke, Donald S., Joshua M. Epstein; Cummings, DAT, Parker, Jon I., Cline, Kenneth C., Singa, Ramesh, and Chakravarty, Shubha. *Academic Emergency Medicine* Vol. 13, No. 11, 1142-1149.

“Containing a Large Bioterrorist Smallpox Attack: A Computer Simulation.” Longini, I

M, Halloran, ME, Nizam, A, Yang, Y, Xu, S, Burke, DS, Cummings, and J.M. Epstein  
*International Journal of Infectious Diseases*. IJID.2006.03.002.

“Remarks on the Foundations of Agent-Based Generative Social Science” in *Handbook of Computational Economics II: Agent-Based Computational Economics*. Kenneth Arrow (Series Editor). North-Holland; 2006.

“Modeling Civil Violence: An Agent-Based Computational Approach,” *Proceedings of the National Academy of Sciences* 99(3):7243-7250. (Summer, 2002).

“Population Growth and Collapse in a Multi-Agent Model of the Kayenta Anasazi in Long House Valley,” with Robert Axtell, Jeffrey Dean, George Gumerman, Alan Swedlund, Shubha Chakravarty, Jason Harburger, Ross Hammond, Jon Parker, Miles Parker in *Proceedings of the National Academy of Sciences* 99(3):7275-7279 (Summer, 2002).

“The Evolution of Social Behavior in the Prehistoric American Southwest,” *Artificial Life* 9 (2003), with George J. Gumerman, Alan C Swedlund and Jeffrey S. Dean.

“Agent-Based Computational Models and Generative Social Science,” *Complexity* 4:5 (1999).

“The Emergence of Economic Classes in an Agent-Based Bargaining Model,” with Robert Axtell and Peyton Young,” in Steven Durlauf and Peyton Young, (eds.) *Social Dynamics* (Brookings Press / MIT Press, 2001).

"Learning to be Thoughtless: Social Norms and Individual Computation," *Computational Economics* Vol. 18 (2001).

“Understanding Anasazi Culture Change Through Agent-Based Modeling,” with Jeffrey S. Dean, George J. Gumerman, and Robert Axtell,” in George J. Gumerman and Timothy Kohler, *Dynamics in Human and Primate Societies: Agent-Based Modeling of Social and Spatial Processes* (Oxford University Press / Santa Fe Institute, 2000).

“Coordination in Transient Social Networks: An Agent-Based Computational Model of the Timing of Retirement,” with Robert Axtell, in Henry Aaron, editor, *Behavioral Dimensions of Retirement Economics* (Russell Sage / Brookings Press, 1999).

“Zones of Cooperation in Demographic Prisoner’s Dilemma,” *Complexity* 4:2, (November/December 1998).

"Aligning Simulation Models: A Case Study and Results", with Robert Axtell, Robert Axelrod, and Michael D. Cohen, *Computational and Mathematical Organization Theory* 1:2 (1996).

"Artificial Societies and Generative Social Science," with Robert Axtell, *Proceedings of the First International Symposium on Artificial Life And Robotics (AROB)*, (February 1996, Oita Japan).

"Agent-Based Modeling: Understanding Our Creations", with Robert Axtell, *The Bulletin of The Santa Fe Institute*, (Winter, 1994).

"On the Mathematical Biology of Arms Races, Wars, and Revolutions," in L. Nadel and D. Stein, (eds.) *1992 Lectures in Complex Systems*, Vol. 5 in Santa Fe Studies in the Sciences of Complexity. (Reading, Mass.: Addison-Wesley, 1994).

"The Adaptive Dynamic Model of War," in Nadel and Stein, (eds.) *1992 Lectures in Complex Systems*, Vol. 5 in Santa Fe Studies in the Sciences of Complexity. (Reading, Mass.: Addison-Wesley, 1994).

"War With Iraq: What Price Victory?" *Brookings Discussion Papers* ( January 1991).

"The 3:1 Rule, The Adaptive Dynamic Model, and the Future of Security Studies," *International Security* (Spring 1989).

"Dynamic Analysis and The Conventional Balance in Europe," *International Security*, (Spring 1988).

"Assessing the Military Balance: Defense Analysis and the Defense Debate," *The Brookings Review*, (Spring 1985).

"Horizontal Escalation: Sour Notes of a Recurrent Theme," chapter in Robert J. Art and Kenneth N. Waltz, (eds.), *The Use of Force* (Lanham, Maryland: University Press of America, 1983). Slightly revised, the same chapter appears in *International Security*, Winter 1983/1984.

"On Conventional Deterrence in Europe: Questions of Soviet Confidence," *Orbis*, (Spring 1982).

"Soviet Vulnerabilities in Iran and the RDF Deterrent," *International Security*, (Fall 1981).

## Monographs

*Toward a Containment Strategy for Smallpox Bioterror: An Individual-Based Computational Approach*, Joshua M. Epstein, Derek Cummings, Shubha Chakravarty, Ramesh Singa, and Donald S. Burke Washington DC: The Brookings Institution Press; 2004.

*Controlling the Greenhouse Effect: Five Global Regimes Compared*, with Raj Gupta (Brookings, 1990).

*The Calculus of Conventional War: Dynamic Analysis Without Lanchester Theory*. Brookings Studies in Defense Policy ( Fall 1985).

*The 1987 Defense Budget*. Brookings Studies in Defense Policy, (Spring 1986).

*The 1988 Defense Budget*. Brookings Studies in Defense Policy, (Spring 1986).

*The Extended Calculus of Spencer Brown and Related Areas of Logic and Mathematics*, Center for International Studies Monograph C/79-8 (Cambridge, Massachusetts: Massachusetts Institute of Technology, 1979).

## WORKING PAPERS and ARTICLES UNDER REVIEW

*Coupled Contagion Dynamics of Fear and Disease: Mathematical and Computational Explorations*. Santa Fe Institute Working Paper 07-12-048. Joshua M. Epstein, Hammond, R.A., Cummings, D., Parker, J. Submitted to PLOS\_1

“Public Health Communication, Reactance, and Smoking Dynamics: An Agent-Based Model” (Report to the Legacy Foundation, with Hammond, R.A., and Parker, J.)

“Exploring Price-Independent Mechanisms in the Obesity Epidemic” (with Hammond, R.A.). Brookings Center on Social and Economic Dynamics Working Paper Number 50, 2007.

## RESEARCH GRANTS

Preparedness and Emergency Response Research Centers: 10/1/08-10/1/13  
A Public Health Systems Approach (P01)  
Role: Co-PI

2008 NIH Director's Pioneer Award 8/22/08-8/22/13  
Role: PI

SES-0729262 Epstein (PI) 10/01/07-3/30/10  
National Science Foundation  
Collaborative Research: Modeling Interaction Between Individual Behavior, Social



IRI-9725302 Epstein and Axtell (Co-PI)  
 National Science Foundation  
 Scale and Complexity in Computational Models of Social Interaction  
 Role: Co-PI

IRI-9820872 Epstein and Axtell (Co-PI)  
 National Science Foundation  
 Agent-Based Models of Social Interaction and the Emergence of Multi-Agent Institutions  
 Role: Co-PI

MacArthur Foundation Gell-Mann (PI)  
 Santa Fe Institute and World Resources Institute  
 2050 Project  
 Role: Investigator

### **MUSICAL COMPOSITIONS AND ACTIVITIES**

Quartet for Violin, Oboe, Clarinet and Bassoon, Op. 1.

Trio for Violin, Clarinet, and Cello, Op. 2.

Quartet for Flute, Viola, Trumpet, and Bass Clarinet, Op. 3.

Assistant Conductor, Amherst College - Mount Holyoke College Orchestra, 1973.

### **CONGRESSIONAL TESTIMONY**

Statement on the Fiscal Year 1985 Department of Defense Budget Request  
 Before the Senate Committee on the Budget, February 23, 1984.

Statement on NATO's Strategy for the 1990s  
 Before the Senate Committee on Foreign Relations, October 3, 1985.

Statement on the Fiscal Year 1988 Department of Defense Budget Request  
 Before the Senate Committee on the Budget, February 18, 1987.

Statement on Defense Budget Policy in a Constrained Environment  
 Before the House Committee on the Budget, September 14, 1987.

Statement on the European Conventional Balance  
 Before the Senate Committee on Armed Services, October 20, 1987.

Statement on the European Conventional Balance  
 Before the House Committee on Armed Services, April 13, 1988.

Statement on Defense Spending Priorities for the 1990s  
Before the U.S. Senate Budget Committee, March 8, 1990.

**MAJOR COMPUTER LANGUAGES AND SOFTWARES**

C++, C, Java (Ascape), NetLogo, and Mathematica.

**FOREIGN LANGUAGE TRAINING**

Russian and French