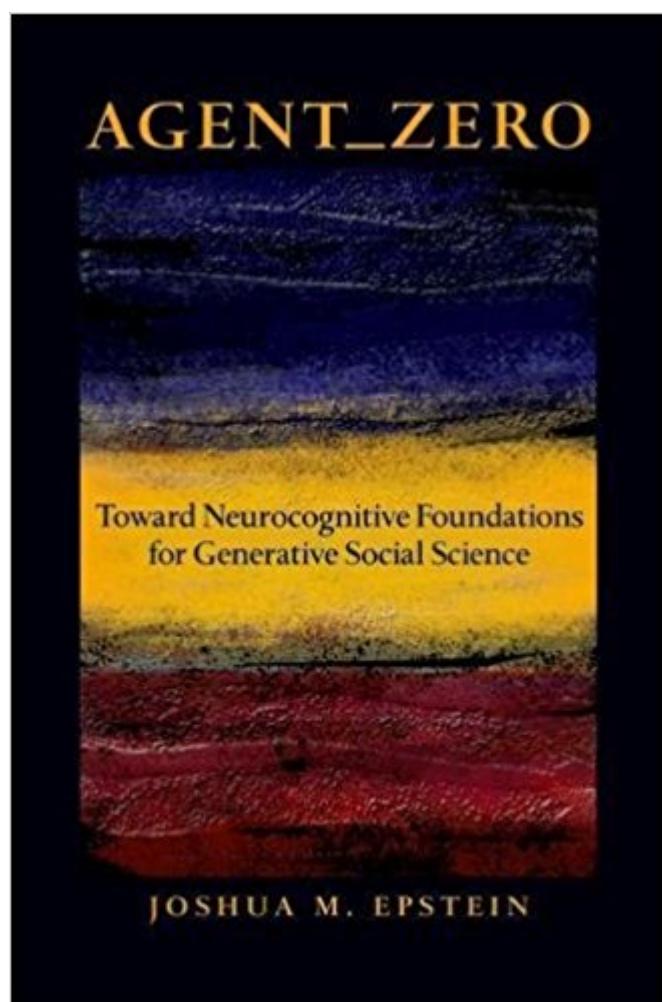


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# **Agent\_Zero: Toward Neurocognitive Foundations For Generative Social Science (Princeton Studies In Complexity)**



## Synopsis

The Final Volume of the Groundbreaking Trilogy on Agent-Based ModelingIn this pioneering synthesis, Joshua Epstein introduces a new theoretical entity: Agent\_Zero. This software individual, or "agent," is endowed with distinct emotional/affective, cognitive/deliberative, and social modules. Grounded in contemporary neuroscience, these internal components interact to generate observed, often far-from-rational, individual behavior. When multiple agents of this new type move and interact spatially, they collectively generate an astonishing range of dynamics spanning the fields of social conflict, psychology, public health, law, network science, and economics. Epstein weaves a computational tapestry with threads from Plato, Hume, Darwin, Pavlov, Smith, Tolstoy, Marx, James, and Dostoevsky, among others. This transformative synthesis of social philosophy, cognitive neuroscience, and agent-based modeling will fascinate scholars and students of every stripe. Epstein's computer programs are provided in the book or on its Princeton University Press website, along with movies of his "computational parables." Agent\_Zero is a signal departure in what it includes (e.g., a new synthesis of neurally grounded internal modules), what it eschews (e.g., standard behavioral imitation), the phenomena it generates (from genocide to financial panic), and the modeling arsenal it offers the scientific community. For generative social science, Agent\_Zero presents a groundbreaking vision and the tools to realize it.

## Book Information

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## Customer Reviews

"Agent Zero offers a solution to some of social science's great puzzles. Its behavioral basis is the interplay of emotion, cognition, and network contagion effects. It elegantly explains why so many human actions are so manifestly dysfunctional, and why some are downright evil."--George Akerlof, Nobel Laureate in Economics"Rarely has a book stimulated me intellectually as much as this one. Particularly exciting is the incorporation of agents who feel (affect) and deliberate, as well as influence one another through social interaction. Epstein is a brilliantly creative scholar and the range of applications showcased here is stunning. In sum, this is a pathbreaking book."--Paul Slovic, University of Oregon"Joshua Epstein proposes a parsimonious but powerful model of individual behavior that can generate an extraordinary range of group behaviors, including mob violence, manias and financial panics, rebellions, network dynamics, and a host of other complex social phenomena. This is a highly original, beautifully conceived, and important book."--Peyton Young, University of Oxford"In social science generally and most notably in economics, the rational actor model has long been the benchmark for policy analysis and institutional design. Epstein now offers a worthy alternative: Agent\_Zero, a mathematically and computationally tractable agent whose inner workings are grounded in neuroscience. Much like you and me, Agent\_Zero is influenced by emotion, reason, and social pressures. Epstein demonstrates that collections of Agent Zeros perform amazingly like real groups, teams, and societies and can therefore serve as the fundamental building blocks for what he calls Generative Social Science. The rational actor now has a true competitor. Agent\_Zero is a major advance."--Scott Page, University of Michigan"This is social science based on how our brains actually work. Epstein's computerized 'agents' can feel passion and fear, and can influence each other emotionally. And when they interact, we see many of the realities of social life, from the dynamics of juries to racist violence to Arab springs. A remarkable and original piece of work."--W. Brian Arthur, Santa Fe Institute

Joshua M. Epstein directs the Center for Advanced Modeling at The Johns Hopkins University, where he is a professor in the Department of Emergency Medicine with joint appointments in the Departments of Applied Mathematics, Economics, International Health, Environmental Health Sciences, Biostatistics, Civil Engineering, and the Institute for Computational Medicine. He is also an external professor at the Santa Fe Institute. This volume forms a trilogy on agent-based modeling, with *Growing Artificial Societies: Social Science from the Bottom Up* (MIT), with coauthor Robert Axtell, and *Generative Social Science: Studies in Agent-Based Computational Modeling* (Princeton).

Technical and thoughtful, good introduction to the field, but lacks the greater meaning I was hoping for. Lots of information, not really an underlying reason. Like a long results section without the discussion or conclusion

Gave excellent insight into the basic building blocks for modeling human behavior.

I was lucky enough to get an advance copy of this book. Epstein is a pioneer in using agent-based models -- computerized artificial societies -- to elaborate and conceptualize complex processes of social organization and evolution. Here, he focuses on simple agents that nonetheless have properties essential to human actors: (1) information gleaned from the world, subject to biases of local availability, (2) emotional responses that take time to subside, and (3) social influence from their fellow agents. This book unfolds in a manner very much like Epstein's previous book with Robert Axtell, *Growing Artificial Societies* (1996). That is, a basic modeling idea is described and explored, and throughout the book more detail is gradually added so that new interesting questions can be asked. In the modeling of human behavior, individual-level models of cognition are often overly complex, and do not lend themselves to studying social behaviors. At the same time, population-level models often use drastically oversimplistic models of cognition and behavior, such as the rational actor model from economics or simple game theoretic strategies like Tit-For-Tat. This book presents a halfway point -- far more cognitively realistic than most population models, far more tractable than most cognitive models. The second half of the book proceeds through a series of examples and uses the model to draw analogies toward many important social behaviors, from jury deliberation to lynch mobs to the Arab Spring. There is math, but it's mostly fairly simple algebra. This is definitely an academic book, but the writing is far from dry. I really enjoyed it, and I think it will end up being highly useful to both students and experts from any field in the social, and behavioral sciences. I recommend this book for anyone interested in modeling or otherwise better understanding social behavior.

I went to Princeton. Einstein taught at Princeton. L'Princeton c'est moi. Q.E.D. Read my book *Away from neurocognitive anti-foundations for an anti-generative antisocial science* for an opposing view.

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