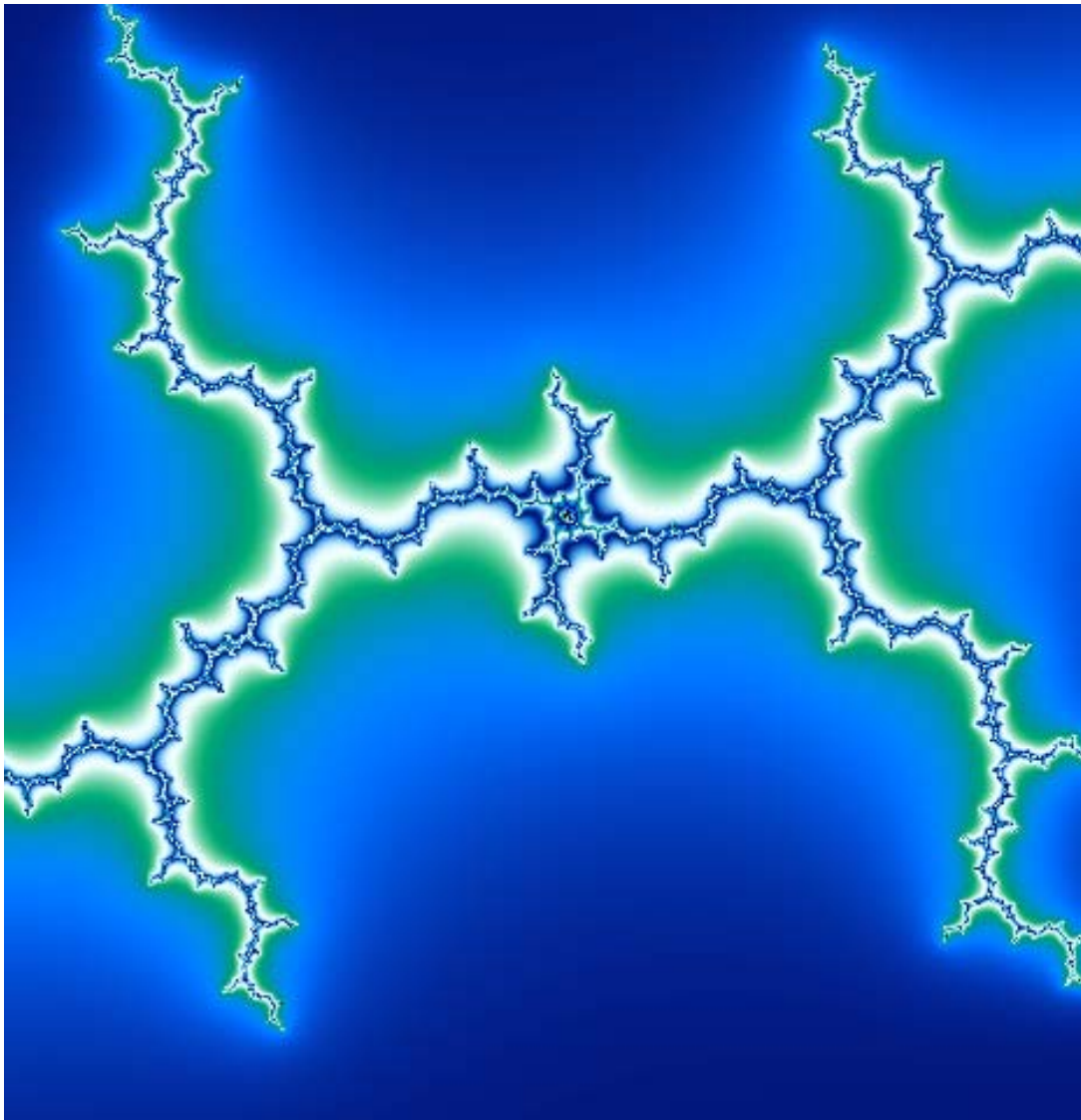


FORUM ON  
COMPLEXITY AND TRANSPORTATION POLICY



Catalyst Institute for Applied Policy

JUNE 15, 2006



This Forum is sponsored by the  
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*Solutions for Complex Systems*

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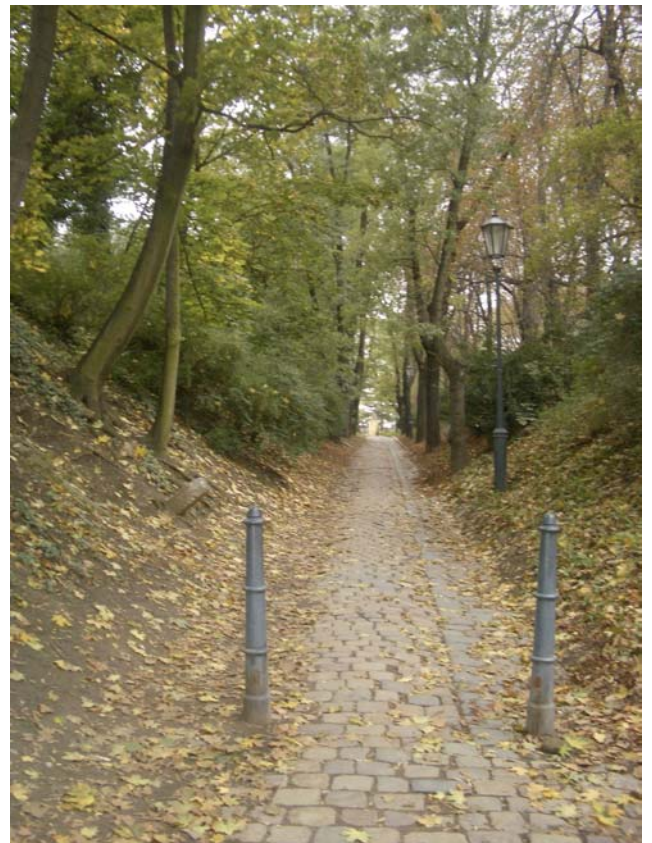
# Welcome

to the [Catalyst Forum on Complexity and Transportation Policy](#), our second Forum of a four part series exploring the nexus between complexity and public policy.

Policy instruments of the industrialized era are inadequate to the challenges we face in the globalized, 21<sup>st</sup>-century information age. New ways of defining problems and structuring solutions, as well as new forms of leadership are needed. An analytical framework uniquely suited to the highly-integrated nature of the modern world is offered by complexity science. The purpose of this Forum is to promote and assist in the migration of the concepts and techniques of this new science to the social sciences in general and to the analysis and formulation of public policy in particular.

Current rigorous applications of complexity science to social systems are, at best, embryonic. There are even those who question the legitimacy of the pursuit. Catalyst has assembled the leading thinkers in this field to examine the assumptions, and to engage in dialogue with you about the possibilities that might be unleashed by this new way of thinking. Complexity science is inherently collaborative, and our hope is to engender an ongoing, mutually beneficial exchange between you, the policy experts, and these and other complexity scientists so that we can cooperatively discern the way forward. Note that it is not our objective to create analogies or mine the romanced metaphors offered by complexity science (e.g. the butterfly effect); rather our objective is to enable the rigorous migration of the concepts and techniques offered by complexity science to the analysis of social systems.

We hope you enjoy the Forum, and use it as an opportunity to share you best thinking on your most difficult challenges.



# Vision

The 21st Century is driven by complex systems. In particular, our social, economic, and political systems are highly complex. Complexity occurs when the mix of human activity becomes dense, and lines of causal interaction intersect at random, unpredicted, and/or uncontrolled points. From any given point, it is possible to determine in retrospect what has happened and why, but it is not possible to predict or control in advance what will happen because there are interactive dynamics in the system which are not explicitly defined, often not even seen.

The value of the complexity perspective is that it enables the analyst, protagonist, or change agent to view the system in terms of its component parts, and to assess possibilities in terms of the behavior of these parts. There is potentially infinite variety, and therefore significant creativity, involved in identifying the key system components that will make change possible. Artfully identifying and defining these components with vision and insight can release untold power and potential that did not previously exist. The objective of this process is to allow for the recombination of component parts in a manner that will support innovation. The best way to generate change is to build on what is. These system parts are the building blocks of what is. Combining them in new ways, forging new relationships, adding new perspectives or lines of communication, can allow resources to be used more effectively, and make cooperation possible that was heretofore not imagined. This is the role of Catalyst. Catalyst is a 21st Century solution to the challenges we face in this rapidly changing global milieu. It is the missing ingredient needed to trigger important changes in complex systems. As agents of change we bring to the table vision, established relationships, experience and expertise.

# Mission

Catalyst is a group of experts in the functional fields of education, housing and community development, economic strategy, and public policy with years of experience in the operational techniques of business, government, academia, and non-profit organizations. More importantly, we employ an approach to systems analysis, problem solving, and development which is based on the system's possibilities, not on its limitations or its past performance. Our commitment is to assist in identifying, and then in creating the conditions necessary to realize those possibilities. Our techniques involve generating new partnerships and new ways of thinking, while building on what is, with the intention that solutions will be taken to scale. Our focus is on large systems to which the resources of government, business, foundations, and community institutions can cooperatively be brought to bare. Our problem solving techniques are derived from complexity science with the objective of demonstrating the applicability of these techniques to a wide range of systems, issues, and opportunities.



# Methodology and Theory of Change

The overarching dynamic of modern complex systems is interaction. Today's problems are multi-dimensional and inter-disciplinary. They operate primarily in the interstitial spaces of organizational and institutional intent. Organizations sacrifice breadth and depth of influence for effectiveness and control. This often leads to silos of operations that exhibit a serious mismatch not only between the organization and the environment within which it must operate, but also between the organization and the true nature of the issue or problem it is designed to address. Further, such organizations and institutions find it difficult to adjust in a timely fashion to the new circumstances generated by the constant change typical of our fast paced, information- driven, technological society.

These circumstances are particularly challenging under the conditions of complexity created by today's global, open-architecture systems. Straight line, cause and effect methodologies fail to accommodate the externalities generated by the unimaginable maze of possibilities created by crossing, overlapping, intermingling and outright canceling out of causal lines put in motion by traditional intervention strategies. There is no question that focused straight line strategies have produced remarkable results for humanity in their time; however, leaving aside issues of political intent and resources availability, still our lack of understanding of the behavior of complex systems has ushered us into the 21st century with an antiquated system of public education, environmental pollution, increasing disparities along racial and economic divides, and a disintegrating commonweal. One of the reasons why traditional interventions are ineffective is that outcomes are more



a function of system interactions than of intervention design. Catalyst has evolved an agent-based applied policy strategy that allows the problem to speak for itself, is interactive and evolutionary, forms partnerships and engages stakeholders, and builds on what is.

Catalyst views society as a complex system with its many parts woven together in an intricate network of relationships, beliefs, behaviors, needs and resources that portend infinite possibilities. The particular present manifestation of its many possibilities is at once magnificent and problematic. Our intention is to so engage with its institutions as to shift it to a manifestation that is more magnificent than problematic and closer to the Pareto optimum that we all know is available to us, even within current resource constraints.

# Forum Program

**1:00** Claudia Pharis, Catalyst Chair and CEO  
*Welcome*

**1:15** Dr. Tom Downs  
*American Transportation: Chaos or Theory*

1- In the United States, in the year 2001, Americans drove 2,799,258,000,000 miles in 200,000,000 vehicles. Americans traveled this distance over 3,963,262 miles of roadway. With many roads reaching their capacity and large amounts of research funds being expended to better understand this system, are there better ways to understand the dynamics in play? Engineers have discovered that large traffic volumes have high degrees of predictability over time, and some have suggested that flow characteristics of fluids and gas are predictors of traffic behavior. The National Academy of Science has published a monograph "Traffic Flow Theory 2005" #01022818, suggesting that a number of models are in development. None of those models seem to be utilizing chaos theory to better understand this complex dynamic.

**2:15** Dr. Carl Simon  
*Sustainable Mobility*

2- The goal of the University of Michigan sustainable mobility and accessibility project is to ensure that future generations have access to adequate resources to meet their mobility needs and aspirations while maintaining the integrity and resilience of supporting environmental and social systems. This is not only a technological or a fuel-oriented problem. It also involves many social and environmental dilemmas and includes considerations of land use and city design. The challenge calls for an integrative and systematic approach, not the undirected incrementalist approach currently in place. Its core is to harness the emerging science of complex adaptive systems to address the challenges of meeting future mobility and accessibility needs in an ecologically and socially sustainable manner. In the process it hopefully will uncover a set of "tipping points" that guide the evolution of such systems toward or against sustainability.

**3:15** Q & A

**3:30** Adjourn

# Presenter Bios



TOM DOWNS is President and CEO of the Eno Transportation Foundation, an organization dedicated to improving all modes of transportation. Mr. Downs has led several highway, rail, and transit organizations during his distinguished 30-year public service career. His roles have included: Chairman and CEO of Amtrak, Commissioner of Transportation for New Jersey, Chairman of the New Jersey Transit Corporation and Director of Transportation for the District of Columbia. He is a White House Fellow, Fellow of the National Academy of Public Administration and 2004 recipient of the prestigious Turner Lecture Award.



CARL P. SIMON is Professor of Mathematics, Economics, and Public Policy at the University of Michigan and Director of the UM Center for the Study of Complex Systems. His research interests center around mathematical models which involve natural dynamics or motion over time. He has applied dynamic modeling to the movements of an economy over time, the spread of AIDS, and the evolution of biological and economic systems. He is also co-author of the textbook *Mathematics for Economists*.



M. MITCHELL WALDROP earned a Ph.D. in Elementary Particle Physics at the University of Wisconsin in 1975, and a Master's in Journalism at Wisconsin in 1977. From 1977 to 1980 he was a writer and West Coast Bureau Chief for *Chemical and Engineering News*. From 1980 to 1991 he served as a senior writer at *Science* magazine, where he covered physics, space, astronomy, computer science, artificial intelligence, molecular biology, psychology, and neuroscience. He is the author of *Man-Made Minds* (1987), a book about artificial intelligence; *Complexity* (1992), a book about the Santa Fe Institute and the new sciences of complexity; and *The Dream Machine* (2001), a book about the history of computing.



CLAUDIA PHARIS is Founder and CEO of the Catalyst Institute for Applied Policy, a social systems intermediary that is engaged in problem solving in large complex systems. Her experience in public policy includes Chief of Staff and Senior Policy Advisor to Congressman Chaka Fattah; service at the Department of Housing and Urban Development, the Office of Management and Budget and on both the House and Senate Budget Committees. She earned a BS in Physics from Trinity College, an MBA from the Harvard University School of Business, and is currently pursuing a Ph.D in Public Policy at George Mason University.

# Organizations Engaged in Complexity-Related Research

Santa Fe Institute  
Krasnow Institute  
New England Complex Systems Institute  
Center for Interdisciplinary Research on Complex Systems at Northeastern University  
Plexus Institute  
IBM Almaden Research Center  
Center for Complex Systems Research, University of Illinois  
University of Michigan Center for the Study of Complex Systems  
Institute Para Limes of the European Union  
Centre for Policy Modeling - Manchester Metropolitan University (UK)  
Program on Social Complexity - George Mason University  
Complexity Research Programme - London School of Economics (UK)  
Computational and Experimental Economics Laboratory - University of Trento (Italy)  
Center for Computational Finance and Economic Agents - University of Essex (UK)  
Center for Interdisciplinary Research - University of Bielefeld (Italy)  
Cluster on Complex Agent-Based Dynamic Networks (CABDYN) - Oxford (UK)  
Center on Social and Economic Dynamics - The Brookings Institution  
Center for Complexity Studies - Bucharest, Romania  
The Center for the Study of Institutions, Population, and Environmental Change, Indiana U.  
The LABORatorio Riccardo Revelli, University of Torino  
The Center for Nonlinear Dynamics in Economics and Finance, University of Amsterdam  
MIT System Dynamics Group - Sloan School of Management  
Center for Complex System Studies - Kalamazoo College  
Complex Systems Research Center - University of New Hampshire  
Duke Center for Nonlinear and Complex Systems - Duke University  
Center for Human Complex Systems - UCLA  
Complex Adaptive Systems Group- Iowa State University  
Institute for Systems Biology - Seattle, Washington  
Institute for Advanced Interdisciplinary Research - Houston, Texas  
Complexity and Management Centre - University of Hertfordshire  
Center for Complex Systems and Visualization- University of Bremen  
Centre for Social Theory and Technology - Keele University  
The Centre for Complexity and Change - The Open University  
Max Planck Institute for the Physics of Complex Systems - Dresden, Germany  
Complex Systems Management Centre - Cranfield University  
Austrian Institute for Nonlinear Studies - Vienna, Austria  
Computational Analysis of Social and Organizational Systems- Carnegie Mellon University  
Complexity in Social Sciences- European Commission Network  
Chaos and Innovation Research Unit - Aristotle University of Thessaloniki, Greece  
Society for Organizational Learning - Cambridge, MA  
T-13 Complex Systems Group - Los Alamos National Laboratory  
Center Leo Apostel for Interdisciplinary Studies, Belgium  
Clemson Research Institute for the Study of Complex Social System  
NSF Center for Discrete Mathematics & Theoretical Computer Science  
The Rand Corporation Science and Technology Policy Institute

Save the date:  
September 14th

Part three of this four part  
series:

Forum on Complexity and  
Economic Policy

Pre-Register at:  
[catalystdc.org](http://catalystdc.org)

**“I think the next century will be the century of complexity.”**

Stephen Hawking  
San Jose Mercury News, 2000

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