Resilience, Biocomplexity, and Industrial Ecology: Insights for Future Energy and Mobility Systems

March 2 and 3, 2006

Dreese Laboratories
College of Engineering
The Ohio State University
Columbus, Ohio

Organized by the Center for Resilience
The Ohio State University

Resilience
The capacity for a system to survive, adapt and grow in the face of turbulent change.
Symposium Objectives

Bring together researchers and practitioners working on industrial-ecological systems.

Identify key research priorities for improving resilience in complex, adaptive systems.

Provide insights for pursuing sustainable development of energy and mobility systems.

Thursday, March 2, 9:00 to 10:30 AM

Opening Keynote Session

Welcoming remarks by Joseph Fiksel, Co-Director, Center for Resilience.

Keynote presentations from noted sustainability pioneers on the current status of sustainable systems research, development, and practice:

Michael Bertolucci
President, Interface Research
(a division of Interface)

Interface’s journey toward sustainability began with the Natural Step System Conditions, and led to a model of the prototypical company in the 20th Century and its transformation to a sustainable enterprise in the 21st Century. The speaker will give examples of Interface’s progress in developing more sustainable products using more sustainable process technologies.

Jim Davis
President, Chevron Energy Solutions
(a subsidiary of Chevron)

Chevron Energy Solutions provides energy-efficient facility upgrades that are funded by their energy savings and can be “bundled” with alternative power (e.g., solar, fuel cells). The speaker will give case studies of projects that are saving taxpayer money while benefiting the environment and communities, and will discuss Chevron’s overall corporate social responsibility commitment.

Paul Anastas
Director, Green Chemistry Institute
American Chemical Society

By understanding the resilience of a system, whether it is the human body or an ecosystem, chemists can begin to define how “benign” a chemical or material is by relating its toxicity to the system’s ability to respond or adapt without adverse consequences. The speaker will explore the relationship of green chemistry, toxicity dose-response curves, and the resilience framework.

John Ehrenfeld
Executive Director, International Society for Industrial Ecology
Former Director, MIT Program in Technology, Policy and Society

The industrial ecology model has spawned methodologies and practices related to understanding and intervening in societal material and energy flows. However, that model is limited by the equilibrium basis of the underlying ecological theory. The speaker will explore the possibility of extending the biological metaphor of industrial ecology to incorporate complex systems theory.
Thursday, March 2, 11:00 AM to noon
Panel Discussion

How can we endow complex industrial systems with the capacity to achieve business continuity and economic growth while protecting the ecosystem services upon which they depend?

A multidisciplinary panel of invited experts will discuss their views of key issues, challenges, and research opportunities in the field of sustainable systems and resilience.

Alan Hecht
Director for Sustainable Development
Office of Research and Development
U.S. Environmental Protection Agency

Giorgio Rizzoni
Director, Center for Automotive Research
Professor of Mechanical and Electrical Engineering
The Ohio State University

Kevin Leahy
General Manager
Cinergy Corp

Adrian Roberts
Battelle Memorial Institute
Former Deputy Director, Pacific Northwest National Laboratory
Department of Energy

Thursday, March 2, Noon to 1:00PM
Buffet Lunch

Thursday, March 2, 1:00 to 4:30 PM
Working Session 1: Economic and Ecological Systems Modeling

What are promising methods for dynamic modeling of complex economic-ecological systems?

March 2, 1:00 to 4:30 PM
Working Session 1: Economic and Ecological Systems Modeling

Alan Randall, Chair
Elena Irwin
Associate Professor, Department of Agricultural, Environmental, & Developmental Economics
The Ohio State University

William Mitsch
Director, Ohio Center for Wetland and River Restoration
School of Environment and Natural Resources
The Ohio State University

Matthias Ruth
Professor of Environmental Economics and Policy
Co-Director of Engineering and Public Policy Program
University of Maryland

Jed Shilling
Trustee,
The Millennium Institute
(formerly of the World Bank)

Garry Peterson
Professor of Geography, McGill University
(Coordinating Lead Author, Millennium Ecosystem Assessment – MEA)

The MEA assessed the contribution of ecosystem services to human well-being. The speaker will outline four future global scenarios developed by the MEA: Global Orchestration, TechnoGarden, Adapting Mosaic, and Order from Strength.

Thursday, March 2, 5:00 to 7:00PM
Reception at the Blackwell Inn
March 3, 8:30 to 11:30 AM

Working Session 2: Applications to Energy and Mobility Systems

Brief presentations followed by break-out groups.

What are the critical business, technical, and policy challenges for meeting energy and mobility needs?

**Terry Cullum**
Director, Corporate Responsibility, Environment & Energy
General Motors

The GM Public Policy Center deals with government relations, energy and environmental, economics, and community relations functions. The speaker will give examples of GM innovations aimed at improving the sustainability of automotive systems.

**Michael Wang**
Center for Transportation Research
Argonne National Laboratory

New fuels such as hydrogen and biofuels are being promoted for use in advanced hybrid electric and fuel cell vehicles. Argonne has developed a fuel-cycle model called GREET for “well-to-wheels” analysis of life cycle energy and emission benefits.

**Tom Gladwin**
Professor of Sustainable Enterprise
Director, Erb Environmental Management Institute
University of Michigan

The Sustainable Mobility and Accessibility Research and Transformation (SMART) Project unites two dozen “complexity science” scholars and practitioners in the search for systemic, robust solutions for transportation and urban development.

**Bhavik Bakshi**
Professor of Chemical & Biomolecular Engineering
Co-Director, Center for Resilience
The Ohio State University

Use of thermodynamic methods for analysis of industrial and ecological systems, including the contribution of natural capital to economic activity, life cycle assessment for existing and emerging technologies, and understanding of resilience.

March 3, 11:30 AM to 12:15 PM

Buffet Lunch

March 3, 12:30 to 1:30 PM

Culminating Distinguished Lecture

Sponsored by Battelle Memorial Institute

Design for Resilience: Complexity and Urban Systems

**Professor Braden Allenby**
Lincoln Professor of Engineering and Ethics
Professor of Civil and Environmental Engineering
Professor of Law
Arizona State University
(formerly Vice President at AT&T)

Several U.S. cities have recently been subject to unusual weather events and deliberate attacks in ways that increase our concern about urban vulnerability. The resulting demands for greater resilience have in many cases failed to draw from the historical record and systems analysis, and have therefore tended to seriously underestimate the difficulty of enhancing the resilience of complex, adaptive systems such as cities. Nonetheless, it is possible to begin sketching key policy principles that can provide enhanced resilience. It is particularly important to develop and implement such policies now, since current trends suggest that future urban systems will be far more complex than those in which many Americans now live. We must design for resilience!

Open to the public

Knowlton School of Architecture
Auditorium – Room 250

March 3, 1:45 to 3:00 PM

Concluding Session: What Have We Learned?

**Facilitated roundtable discussion:** What helpful insights were gained during the symposium? What are the implications for future research priorities and business or government initiatives?

What follow-up actions or communications are needed to capture and disseminate the important findings of this symposium? Can we achieve a genuine positive impact?