



Panarchy: Understanding Transformations in Human and Natural Systems

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Creating institutions to meet the challenge of sustainability is arguably the most important task confronting society; it is also dauntingly complex. Ecological, economic, and social elements all play a role, but despite ongoing efforts, researchers have yet to succeed in integrating the various disciplines in a way that gives adequate representation to the insights of each. Panarchy, a term devised to describe evolving hierarchical systems with multiple interrelated elements, offers an important new framework for understanding and resolving this dilemma. Panarchy is the structure in which systems, including those of nature (e.g., forests) and of humans (e.g., capitalism), as well as combined human-natural systems (e.g., institutions that govern natural resource use such as the Forest Service), are interlinked in continual adaptive cycles of growth, accumulation, restructuring, and renewal. These transformational cycles take place at scales ranging from a drop of water to the biosphere, over periods from days to geologic epochs. By understanding these cycles and their scales, researchers can identify the points at which a system is capable of accepting positive change, and can use those leverage points to foster resilience and sustainability within the system. This volume brings together leading thinkers on the subject -- including Fikret Berkes, Buz Brock, Steve Carpenter, Carl Folke, Lance Gunderson, C.S. Holling, Don Ludwig, Karl-Goran Maler, Charles Perrings, Marten Scheffer, Brian Walker, and Frances Westley -- to develop and examine the concept of panarchy and to consider how it can be applied to human, natural, and human-natural systems. Throughout, contributors seek to identify adaptive approaches to management that recognize uncertainty and encourage innovation while fostering resilience. The book is a fundamental new development in a widely acclaimed line of inquiry. It represents the first step in integrating disciplinary knowledge for the adaptive management of human-natural systems across widely divergent scales, and offers an important base of knowledge from which institutions for adaptive management can be developed. It will be an invaluable source of ideas and understanding for students, researchers, and professionals involved with ecology, conservation biology, ecological economics, environmental policy, or related fields.

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Editorial Review

Review

"A wonderful and stimulating blend of theoretical and empirical perspectives on multiscale dynamic systems of humans and nature. This book brings together the diverse insights of some of the most creative and original thinkers on resilience and adaptive change in ecological and social systems, yet it is seamlessly integrated through coherent underlying principles. A triumph for Holling's seminal concepts, and for the Resilience Alliance."

(Simon Levin *Princeton University, author of Fragile Dominion*)

"We denizens of the early twenty-first century have urgent need for an integrative theory that links changes in our global environment to underlying causes. *Panarchy* is the best presentation I've seen of the elements of such a theory, considering everything from ecosystems to political action. Anyone desiring a serious understanding of our global environment—and that should be all of us—will find no better starting point for their quest."

(John Holland *Professor of computer science and engineering and Professor of psychology, University of Michigan*)

"Resilience, timing, adaptation—these are the three pillars upon which the emergent properties of interacting systems rest. When the systems are the economy and the environment, understanding of the relationships among these concepts is crucial. This volume does a better job of explaining how to manage both money and nature to ensure humanity's long-term future than any other work I know of. Read and reflect."

(John L. Casti *Santa Fe Institute, United States, and Technical University of Vienna, Austria*)

About the Author

Gunderson is professor in the Department of Environmental Studies at Emory University in Atlanta, Georgia.

C. S. Holling has worked at the Institute of Resource Ecology, University of British Columbia, the International Institute for Applied Systems Analysis in Vienna, and the University of Florida. He is a coeditor of Columbia's *Barriers and Bridges to the Renewal of Regional Ecosystems*.

Lance H. Gunderson is associate professor and chair in the Department of Environmental Studies at Emory University in Atlanta, Georgia.

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