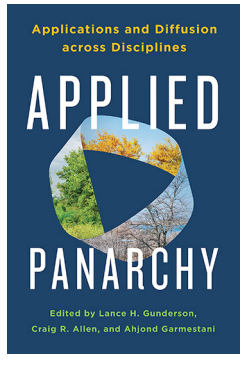
OTHER

Applied Panarchy: Applications and Diffusion across Disciplines

Edited by Lance H. Gunderson, Craig R. Allen, and Ahjond Garmestani. 2022. Island Press. 344 pages and 34 illustrations, 49.00 USD, Paper. Also available as an E-book.



The concept of panarchy is rooted in the original and creative theories of C.S. Holling, a Canadian scientist whose name and work may be familiar to you. Holling moved ecological theory away from traditionally simple, linear climax models to more complex "non-linear, cyclical, ecosystem dynamics" (p. xiii). Building on Holling's models of natural systems, panarchy takes the next step towards "coupled, multiscale, socio-ecological systems that generate abrupt, episodic and non-linear system changes [a.k.a. panarchies]" (p. 13). Interestingly, the word panarchy was created "by combining *Pan*, the mischievous Greek god of nature who scattered discord and chaos in mythology, with the Greek word *arkos*, 'rules'" (p. xi), suggesting that even chaos must follow the rules of science.

In simple terms, panarchy is kind of a 'theory of everything', with the COVID-19 pandemic being the perfect example that fits very nicely into the complex definition noted above. First, it is a coupled human-natural environmental event (i.e., socio-ecological system). It began with a small-scale event when the COVID-19 virus jumped species (likely bats to civets to humans). Then, as viral variants travelled across the globe, this led to an impact that was abrupt, multiscale, episodic, and non-linear—the global pandemic we know all too well. Climate change is another example of panarchy. It has coupled, multiscale, socio-ecological systems leading to abrupt, episodic, and non-linear system changes.

I work in international development, and I had hoped that *Applied Panarchy* would offer practical, useable, real-time models to help guide *Homo sapiens* out of the socio-ecological disaster we have created for ourselves. My hope quickly vanished as I became bogged down in dense descriptions laced with terminology and Möbius strip diagrams labelled with Greek symbols of rho, alpha, kappa, and omega in reference to the four phases observed in socio-ecological systems: exploitation, reorganization, conservation, and release, respectively. While the book devotes over 100 pages to Applications of Panarchy Theory (Part 2, Chapters 2 to 7), each of the six chapters in this section focusses more on theory than application, reiterating the non-linear, multiscale, coupled nature of the socio-ecological world we live in. Actual applications are sorely lacking, although there are some ideas worth noting. One such example is "coerced panarchy" in Chapter 4, where societal changes that reduce greenhouse gas emissions have the capacity to "coerce" the complex system of climate change away from catastrophe. Chapter 6, An Engineering Perspective on Managing for Resilience and Panarchy, recommends nature-based solutions as a resilience management strategy. Nature-based solutions are currently promoted by Global Affairs Canada, Canada's international development agency, which provides funding to development initiatives that conserve, restore, and sustainably use biodiversity and ecosystems to enhance human livelihood security.

Ultimately, *Applied Panarchy* is a book written by theoretical scientists for theoretical scientists working in this field. It is well-written, presents many complex graphs and diagrams, and the work is well-referenced. While it is useful to understand the evolving science of panarchy theory, the book provides little practical advice on how to address the chaos driving non-linear, multiscale, and often abrupt changes associated with climate change, which is testing the resilience of all species (including humans) and their ecosystems globally.

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