

Island Environments in a Changing World

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the generic patterns of phase changes in complex systems, in my opinion they have limited explanatory power and fail to capture the rich diversity of patterns and processes in real-world systems.

The field of complex systems has evolved beyond such simple caricatures derived from physics. Recent research in ecological complexity, socioecological systems, and computational social science is leading to the development of whole-systems, agent-based models that incorporate diverse, interacting components, cross-scale interactions, hierarchy, uncertainty, memory, and adaptation. In my view, such models, which simulate emergence from the bottom up, will have considerably more practical applications in understanding and interpreting the complexity of integrated social, economic, and biophysical systems.

The real test of the field of complex systems studies will be in its ability to provide insight beyond simple models. As a multidisciplinary science, complex systems studies is well poised to deal with a number of pressing issues related to the environment, sustainability, and systemic risk in an increasingly interconnected and complex world.

Mean-field approaches constitute an elegant and considerable contribution to complex systems studies, and I commend Solé for his rigorous presentation. Given his mastery of the subject, however, I regret that he did not provide us with that final chapter to put these important theoretical contributions in the perspective of the challenges we face in understanding and describing the structure and dynamics of complex systems.

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ENVIRONMENTAL TRANSFORMATION: ISLANDS BEYOND THE ILLUSION OF PARADISE

Island Environments in a Changing World. Lawrence R. Walker and Peter Bellingham. Cambridge University Press, 2011. 338 pp., illus. \$49.00 (ISBN 9780521732475 paper).

The idea that islands are vulnerable ecological systems in which anthropogenic impacts can be catalogued in a compressed time frame is well established in the scientific literature (Fosberg 1963, Vitousek 1995, Kirch 1997). Island fragility is primarily associated with both isolation and small size, which limit resource availability, ecosystem resiliency, and the long-term provision of ecosystem services under increasing pressure from the human population. In *Island Environments in a Changing World*, authors Lawrence R. Walker and Peter Bellingham reinforce these facts in their sweeping and generally engaging account of environmental degradation on nine island groups. Despite this affirmation, they were also compelled to add a somewhat optimistic note in the concluding chapter of the book that describes the environmental degradation on these islands as not entirely irreversible. They draw attention to successful restoration efforts that have slowed deforestation, biodiversity loss, and soil erosion on several of the islands that they studied. Still, the authors caution that appropriate resource-management strategies need to be deployed on populated islands in order to raise any hope for the sustainability of island societies into the twenty-first century.

In this collaboration, Walker (a professor of biology at the University of Nevada) and Bellingham (an ecologist with New Zealand Landcare Trust) chose to write about the degradation of resources pertaining to the following islands, which vary in size and stretch across multiple climate zones: Tonga, Jamaica, and Puerto Rico in the tropics;

Hawaii and the Canary Islands in the subtropics; New Zealand, Japan, the British Isles, and Iceland in temperate and subarctic latitudes. Although the selection of these particular islands seems to have been influenced more by the authors' desire to summarize their collective experience than by their desire to elucidate specific new theoretical perspectives, the evidence of threats to the sustainability of life on these islands, as well as on all of the Earth, is well worth reiterating. As renowned physicist Stephen Hawking suggested (Solar 2010), unless human societies can find additional planets to inhabit, the knowledge and values that drive the depletion of finite natural resources and undermine ecosystem stability must be reassessed, and alterations must be made.



The first four chapters of *Island Environments in a Changing World* are devoted to the natural settings and natural disturbances of the islands. Although the accounts are choppy and frustratingly minimal, they do provide synopses of key physical features within each group of islands (i.e., geology, topography, climate, and soils), describe the character of these highly evolved native ecosystems, and include a discussion of a local natural-disturbance regimen. Natural phenomena like typhoons, tsunamis, and hurricanes can wreak havoc on coastal marine and terrestrial island landscapes, and these forces lead to disastrous scenarios when they intersect with human settlements. In addition, the general absence of wise land-use planning and

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resource management exacerbate environmental insecurities on islands.

The topics considered in the second half of the book are laid out in a more engaging manner, especially where the authors trace unique settlement histories and the sociopolitical and economic forces that have altered the natural processes on these islands. Their discussions of the settlements of Tonga, Hawaii, and New Zealand include a current and impressive set of facts about the peopling of those islands by the Polynesians and an explanation of the environmental impacts created by their canoe cargo of rats, pigs, dogs, and assorted food plants, as well as those created by their cultural practices. Overall, their treatment of the environmental consequences of rapid population growth and global capitalism, viewed over sequential time periods, is expertly evaluated.

Walker and Bellingham stop just short of a complete picture of the environmental transformation of islands as one of irreversible damage, in which readers conjure images of an Easter Island-type of outcome, where almost all of the island's native life is now extinct (Hunt and Lipo 2011). Instead, they call attention to the examples of Japan and Puerto Rico, where ecological restoration efforts are succeeding. They note that corrective responses to positive feedback are occurring in all of the island groups, with the possible exceptions of Tonga and Jamaica, where poverty and low average per capita income (below \$10,000, compared with over \$40,000 for Japan, Hawaii, the British Isles, and Iceland) may limit environmental restoration initiatives. The hope of improving the environmental security and the sustainability of resources on these two islands may be further compromised when the repercussions of poverty undermine a competitive advantage (e.g., the slow growth of tourism revenue in Jamaica as a result of real or perceived threats to the personal safety of tourists).

In general terms, the authors are successful in reinforcing awareness of the environmental and economic vulnerabilities of islands, especially in their

discussion that raises a red flag regarding the future sustainability of island resources. However, most of the photographs are of such poor quality that they detract from the weight of the book's intended message. I also found minor errors of fact, such as the statement that Iceland originated from the geologic process of subduction (p. 22), and, in my opinion, an example of stereotyping with regard to Hawaiians, who have migrated in large numbers to Las Vegas to seek employment. Hawaiians are not led to the city—or call the city their “ninth island”—because of a “high degree of self-assurance” among islanders.

Island Environments in a Changing World provides a handy summary of the natural history and environmental impacts of the development of each of the nine groups of islands discussed therein. Although the book does not present any new insights into scale-related environmental issues (e.g., the relative resilience to environmental degradation associated with size of landmass, topography, or climate), it does contain useful, descriptive comparisons and an impressive list of facts about these islands. Despite the social and environmental remedies spelled out in the final chapter, the sobering question remains whether islanders can shift their human–nature interactions onto a path of ecological sustainability.

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A FULL SPECTRUM OF BIOLOGY AS SEEN THROUGH THE LIGHT OF EVOLUTION

In the Light of Evolution: Essays from the Laboratory and Field. Jonathan B. Losos, ed. Roberts and Company, 336 pp., illus. \$30.00 (ISBN 9780981519494 cloth).

The book *In the Light of Evolution: Essays from the Laboratory and Field* takes its title from a famous line by the great evolutionary biologist Theodosius Dobzhansky: “Nothing in biology makes sense except in the light of evolution,” which was part of a speech given to the American Society of Zoologists in August 1964 and published three months later in *American Zoologist*. In 1973, Dobzhansky used this same line as the title of his article published in the journal *American Biology Teacher*. Dobzhansky was concerned that the impact of the discovery of the structure of DNA and the subsequent rapid growth of molecular biology was pushing the traditional focus on organismal biology, ecology, and evolutionary biology to the periphery. His concern was instantiated by the creation of new departments of molecular biology in universities and the fragmentation of the life sciences. His point was that sense could be made of what Ernst Mayr called “the biology of proximate causality” (relating to, e.g., biochemistry, physiology, and cell biology) only through the evolutionary context (termed the *ultimate causality* by Mayr) in which these fields arose. Dobzhansky called for a synthesis of the molecular and organismic or evolutionary approaches in order to synergistically gain a deeper understanding of life phenomena.

This collection of 16 essays seeks to achieve Dobzhansky's goals of synthesizing molecular and organismal

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