

role of (previous) dispersal limitation. I find Hubbell's avoidance of recent niche-based theory and its possible alternative explanations for diversity and species abundance patterns understandable, but it is also unfortunate. When predictions from these contrasting perspectives are compared, new insights are likely to be found, but this is not in the book. Finally, the neutrality assumption creates linear Markovian systems which may make the theory simpler, but omits non-linearity in real ecosystems.

Like all good scientific books, this one made me think harder—in this case about some of the conceptual underpinnings of recent community ecology and conservation biology—although I don't believe half of it. I would recommend the book to community ecologists and those interested in basic theory on biodiversity. However, because of the large uncertainties that lie behind the theory, and no explicit relation to management problems, it has less to say to readers of *Ecological Economics*. The lesson can be said succinctly in one sentence: Because local diversity depends on the diversity and dynamics of species on regional (landscape) scales to a much larger extent than we usually like to think it does, management of biodiversity in local communities can only be made in the context of larger scales.

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### **Institutions, Ecosystems and Sustainability**

Edited by R. Costanza, B.S. Low, E. Ostrom, J. Wilson, Lewis Publishers, 2001. 270 pp.; ISBN 1-56670-389-1

A significant proportion of the work on institutions and the environment has relied on optimal control techniques or game theory. These approaches require very restrictive assumptions about the nature of economic agents, ecological systems, and social systems. The editors of *Institutions, Ecosystems, and Sustainability* argue that richer representations of ecological and social systems (that preclude the use of these traditional techniques) are required to address environmental problems. The trade-off between less realistic models with powerful analytical techniques and more realistic models with very weak analytical techniques is in the power and depth of the insights they can provide. Somewhere in between there is a domain of models that are realistic enough to capture fundamental drivers, yet simple enough to produce valuable insights. *Institutions, Ecosystems, and Sustainability* is an attempt to provide a framework to explore this middle ground. Its stated aim is to provide a framework—a common language—to link human and ecological systems.

The book has four sections. Section I (chapters 1 and 2) outlines the proposed framework. Section II (chapters 3–6) presents several example models intended to illustrate the application of the framework. Section III (chapters 7–9) links models to empirical examples in the real world, and Section IV (chapter 10) consolidates the findings of the book and points to future work. In chapter 1, it is asserted that models of ecosystems and social systems must be more tightly linked than in existing work where it is usually the case that one of the two is 'suppressed' (dramatically oversimplified). For example, the failure of analytical techniques to recognize multiscale phenomena has led to persistent resource management problems and points to the need for a richer set of models from both ecology and economics. To establish the linkage between these models the authors propose a stocks/flows/controls/attributes framework. These four elements characterize three subsystems: the ecological, human, and interaction subsystems.

Stocks and flows are straightforward concepts, but it is worth commenting on the term 'controls'. The authors use this term in a much wider sense than in the environmental/resource economics literature where it is associated with an optimal program of resource extraction, transfer payments, or direct regulation. The authors use the rule-based framework from [Ostrom et al. \(1994\)](#) in which seven clusters of rule sets are used to give a systematic description of system boundaries, allowable actions, how aggregation takes place, what information is available to whom, and how payoffs are distributed.

The models in Section II highlight the importance of a proper match between institutions and ecosystems. The main theme that emerges is that institutions (human rule sets) must match the relevant scales at which ecosystems operate, and must address transfers between ecological subsystems and across different ecological scales. Most of the models in Section II are only mildly more complex than their analytically tractable counterparts. The need for and benefit from this complexification, in terms of the overall theme of the book of better understanding the linkages between human and ecological systems, is fairly clear. However, the models become progressively more complex in later chapters. In chapter 7, a simulation model of the market for Maine lobster is presented as an alternative to statistical methods for understanding market behavior and forecasting. Although simulation of the lobster market is clearly related to resource management and quite interesting, I found it more difficult to link this chapter to the main theme of the book. I found the watershed model presented in chapter 9 even more difficult in this respect. The model is extremely detailed and leans heavily toward ecology and hydrology. The model is used to explore several scenarios of land use patterns and management very much like a traditional decision support tool. Although aspects of institutions are included indirectly in the model through scenarios, the linkages between human and ecological systems does not emerge as a key focus. As such, the contribution of the chapter to the theme of the book is unclear to me.

Three chapters not yet mentioned are 2, 8, and 10. The first two present taxonomies based on the purpose of models and provide some context for the other chapters. In chapter 10, the authors consolidate the main findings. They reiterate the central issue that plagues social ecological systems: mismatches between ecological conditions and decision making (institutions). Here the reader is reminded of the importance, particularly in the models presented in Section II, of the transfer of resources between different spatial units (subpopulations, upstream and downstream, etc.). The management of such systems requires local and higher level-rules, i.e. there must be multiple institutional scales to match multiple ecological scales.

Overall, the book is a step forward in a very ambitious and important research program. However, I felt that the potential value added was diminished due to a key problem with the way the material was presented. The importance and utility of the framework is not emphasized as much as it could be. Although it is referred to in various places, the framework is not used consistently throughout to illustrate how and why the models were constructed or to facilitate comparisons between them. As a result, the utility of the framework is not convincingly supported by the models. In all fairness, this problem may not necessarily reflect a shortcoming of the book, but rather the tremendous challenge faced in moving research in this area forward.

## References

Ostrom, E., Gardner, R., Walker, J. Rules, Games, and Common-Pool Resources. The University of Michigan Press, Ann Arbor, MI 1994.

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PII: S0921-8009(02)00132-5

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