Revue des livres


Are ecosystems complex systems? Most ecologists would answer yes without hesitation but there will a bit of silence when asked about the exact meaning of the words “complex systems”. Here is when a book as the one edited by Bossomair and Green may be of great help. The field of complex systems has grown explosively during the last two decades encompassing topics such as self-organisation, chaos, fractals and criticality among others. This is a science that successfully marries physics, biology, chemistry, physiology, computing, mathematics, economics, and whose aim is to explain similar dynamical behaviour and processes found in a diversity of systems no matter of their particular material basis and details. Examples range from similar information processing capabilities found in the human brain, in digital computers and in ant colonies, to similarities found among the behaviour of the earth’s plate tectonics and the free market economy.

Being a rapidly expanding topic, one is confronted with the fact that nowadays there are many books, perhaps too many, covering the subject. These ranges from the very basic to those addressing very specific topics aimed to the specialist. So why a new book with such a broad title? The first time I spotted the book edited by Bossomair and Green was at the bookshelves of Cambridge University Press bookstore. Something about it immediately caught my attention: it was for display in the Life Sciences section rather than in the Mathematics or Physics section. When browsing it, I realised why it was placed there and why it may be very welcomed by biologists and, specially, by ecologists interested in this new field.

The book is about exploring complexity and is well endowed with a range of biological problems such as ecology, brain dynamics, evolution and artificial life. Ecosystems and neural dynamics are particularly well treated at length and there are two chapters entirely devoted to discuss them. Other applied areas such as parallel computation and control systems are very well covered too. From the point of view of the tools and methodologies, the book will discuss in deep many biological inspired formalisms and ideas such as cellular automata, genetic algorithms and neural networks. All the authors have written their chapters seriously and with an excellent degree of expertise.

The editors have done a tremendous good job in bringing together the work of the many participating authors in a coherent and comprehensive way and without diminishing the overall editorial quality. However, I must warn the potential reader about some problems with this book. First, there are two chapters in particular, that are very difficult to follow for those who are not mathematicians by training. I mean the chapters on “Deterministic and random fractals” and on “Non-linear dynamics”, that have pages and pages plagued with theorems and proofs in the most pure mathematician style of writing. My opinion is that this way of presenting the topics was, perhaps, unnecessary and that the rigor may even end in having the undestraining effect of scaring the general public the book is intended to. More frustrating was to find out that after reading these chapters, the authors did not bother in presenting real-world examples in order to illustrate all their technicalities. The positive side, on the other hand, is that the authors of these chapters have provided a very good and complete list of entry-level references.

A second problem is that, if you are interested in a precise definition of complex systems, you will not find it here. The editors already stated that no attempt has been done in bringing forwards such a definition so that the reader is left pretty at its own to figure it alone. The editors nevertheless have overcome this problem in an elegant way by admitting that it is unlikely that a complete book on complexity could be written this century.

Book Review

They hope to give the readers some tools to go ahead and contribute to the development of this fascinating field and I have no doubt they have done it successfully. In summary this book is a complete well-written overview of the current state of the science of complex systems, rich in biological-inspired topics that is very worth reading.

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Insect Predator-Prey Dynamics: Ladybird Beetles and Biological Control by A. F. G. Dixon is a book that anyone studying coccinellids or biological control should get and read. It has value on several levels. For a new graduate student studying coccinellids, this book will build broad knowledge of the family’s biology and point the student to important unresolved questions. For the student, the book’s chapters on basic biology and structure (Ch. 2) and foraging behavior (Ch. 5) will be especially useful, providing a great deal of basic information about coccinellids, and placing this information in a broader framework from the ecological literature to make it readily understandable. The book, for example, includes a dendrogram of the phylogenetic relationships of the subfamilies of ladybirds and how these correlate to diet. Oritalinae coccinellids, for example, eat only whiteflies, psyllids and scales, while the Coccinellinae mostly eat aphids and the Chilocorinae eat mostly scales. Such perspective immediately broadens most non-taxonomists’ appreciation of the degree of diet specialization within subgroups of ladybirds, a topic of interest to biological control practitioners and ecologists alike. Other topics covered in a broad way that will benefit the student include cannibalism, intraguild predation, life history patterns, and determinants of body size and population growth rates among species of ladybirds adapted to different prey types.

For biological control scientists the book contributes interesting information and perspective in several areas, including host specificity, impacts of coccinellid introductions on other coccinellids, and efficacy of aphid-eating versus scale-eating coccinellids. Within Ch. 2 on foraging, the author addresses the determinants of host specificity. This is a very important area for biological control scientists because only the more specialized ladybirds will, in the future, be likely to be judged suitable for introduction to new locations. So, the question of how to judge the relative degree of selectivity exercised by both the larvae and adults will be an essential area of knowledge for practical use of this group of predators.

In Ch. 9 (Biological Control) the author explores several very interesting topics, one being whether introductions of ladybirds to new regions have suppressed or displaced local ladybird species. The author does a nice job of summarizing what we know about this topic. Also, this chapter summarizes the literature on the use of ladybirds for biological control, comparing success rates (in suppressing the target host) for ladybirds feeding on