

and genetically manipulated crop plants. Both fit relatively easily into the organizational and distributional framework of agrochemical companies, and both are more easily patentable than other modes of biological pest management. It is a supreme irony that these technologies, designed to be environmentally friendly, often attract stronger criticism from press and public than traditional pesticides. One of the best parts of the book is Winston's treatment of this conflict. He lambastes the more extreme environmental pressure groups who produce ludicrous press releases ('gypsy moth pheromone may cause breast cancer') and scandal-hunting journalists who are unwilling, or too lazy, to distinguish between mainstream environmental concerns and the lunatic fringe.

His discussion of genetically manipulated crops seems very fair to me – he does not minimize the environmental dangers of herbicide-tolerant plants (which lead to more herbicide application) nor the problems of insect resistance to plant-expressed Bt toxins and other insecticidal compounds, but he also stresses the great benefits of the potential reductions in chemical application to the environment and human health. He is a little fonder of Bt than I am – it's not that specific though much better than most alternatives – and very interesting about the politics of spraying downtown Vancouver with Bt to eliminate gypsy moth (to avoid the US imposing non-tariff barriers on Canadian lumber).

Biological control and the new biotechnologies raise many areas of legitimate concern for environmentalists and ecologists, but I share Winston's dismay that so much of the criticism of these approaches, including that by some academic ecologists, fails to look at the costs of sticking with the status quo. It is as if we have grown so used to the massive chemical input into the environment that we don't realize what we've lost. This only came home to me visiting southern Poland just after the fall of the Iron Curtain. Living in the agricultural deserts of southern England, I didn't realize that pastureland without high pesticide input could be that full of wildflowers and butterflies. The purple descriptive passages in 19th century bucolic English novels aren't just hyperbole, but true testament to what has gone.

Winston writes in a relaxed, clear and informal manner. His style can be rather stereotypical scientific journalism with little vignettes when he introduces a new character: 'Elliot is fiftyish and rumped, and affects a professorial air of distracted befuddlement'. The book is not aimed primarily at biologists, so I missed not having the scientific names of pests, and the references are not informative. However, these are minor quibbles – Winston has thought hard about pest management, and believes passionately that it can be improved. This is an excellent book and should be very widely read.

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A lively bustle

Host–Parasite Evolution: General Principles and Avian Models

edited by D.H. Clayton and J. Moore

Oxford University Press, 1997.
£25.00 hbk (xiii + 473 pages)
ISBN 0 198 54892 3

One of the peculiar things about attempts to view host–parasite interactions through the lens of modern evolutionary biology is that the number of reviews often matches, or even outstrips, the number of empirical studies directly testing the ideas. Witness, for example, the body of literature surrounding Darwinian Medicine, the evolution of virulence and parasite life history evolution. And here we go again. Six years after Loye and Zuk's edited volume *Bird–Parasite Interactions*¹ (which modestly began: 'With this volume a paradigm is born...'), we have a new edited volume focusing on a subsection of the last (this one starts: 'Host–parasite evolution is a hot topic'). Have studies of bird–parasite evolution flowered in intervening years? Apparently not.

With one exception (about which more shortly), the chapters on avian models are actually primers on bird parasitology (as are the comprehensive appendices on techniques). Of the eleven chapters billed as covering general principles, four are wholly concerned with community ecology. Two others are excellent primers on immunity and on parasite-mediated natural selection – material one ought to know before getting down to evolutionary studies. This leaves less than 25% of the book discussing host–parasite evolutionary research.

Sexual selection, an area well represented in the Loye and Zuk book, is (perhaps mercifully) represented in this volume by a single chapter. Here, Hillgarth and Wingfield make a persuasive case that very careful thinking will be needed to extract parasite models from the empirical quagmire of immunocompetence handicaps. Hart reminds us that behavioural alterations provide the first line of defence against pathogens and gives a shopping list of material for David

Attenborough (my favourite: eastern screech owls apparently transport blind snakes to their nests to remove ectoparasites). Quantitative cost–benefit analyses, so illuminating in other areas of behavioural ecology, are noticeably absent in studies of behavioural defences but eminently feasible.

Two areas of advancing research are usefully overviewed in this book. The first is the study of cospeciation. This is the attempt to reconstruct the macroevolutionary history of host–parasite interactions. For most of this century, there has been heated debate about how to recognize congruent phylogenies, but record temperatures are currently being recorded. In part, these are fuelled by the overblown hyperbole and self-aggrandizement of some of the key players. But a number of more serious issues are also involved. Increased computer power has made tests of ever more complex null models possible, and molecular techniques generate data on branch lengths that demand more detailed analyses. There is also the growing realization that this is not just an arcane branch of parasitology: the same techniques should be useful in biogeography (the congruence of geological and biological evolution) as well as molecular evolution (have genes in the same genome radiated together?). Furthermore, major contributions to our understanding of macroevolution may be in the offing. If cospeciation events can be identified, it is possible to investigate rates of evolution in taxa with very different life histories and population sizes. It may also be possible to identify factors promoting parasite cladogenesis and host switching, currently of concern in the context of emerging diseases. So there is some potentially very serious science in here if the controversies can be resolved. Accessible introductions to the views of two of the main protagonists in the current debate – the Brooks school and what might be called the New Zealand school – appear in this volume. The controversy contains ghosts of bitter disputes past; as Paterson and Gray show, identifying appropriate null models is the problem.

The chapter showing most persuasively that knowledge of host–parasite evolution is actually expanding concerns avian brood parasitism. Payne provides an impressive overview of the phenomenon, its fitness effects on host and parasite, the adaptations and counteradaptations involved, and reconstructions of the macroevolution involved. It draws on comparative and molecular data, elegant field experiments, lucid thinking and interesting theory. The general message is that microevolutionary coadaptation has not led inevitably to macroevolutionary cospeciation. Instead, recent and independent colonization followed by highly species-specific coadaptation explains both the macroevolutionary patterns and the presence or absence of particular host and parasite traits.

I have been teaching an advanced undergraduate course in host–parasite coevolution; Payne’s chapter was the only one that proved useful. Paradoxically, it illuminates what is missing from the rest of the book: data directed at well constructed, testable hypotheses. In the final chapter, Moore and Clayton provide a stimulating summary of what is not included in their book, and it makes good reading for graduate students casting around for a project. They end by welcoming the reader to ‘the lively bustle of a work in progress’. I agree there is a bustle, but the avian slant of this book means that much of it is missing. Phage–bacteria studies, insect–pathogen interactions and within-host evolution of mammalian parasites, such as HIV and trypanosomes, have generated major insights into the general principles of host–parasite evolution, and are surely going to keep doing so. Perhaps someone in those fields ought to pause to write a review.

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A model fish

Sex, Color and Mate Choice in Guppies

by *Anne E. Houde*

Princeton University Press,
Monographs in Behavior
and Ecology, 1997.

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(xii + 210 pages)
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As a particular field of research matures, studies of a few key taxa often contribute disproportionately to its data base. In sexual selection, the peacock might exemplify the primary quandary of the evolution of extremely sexually dimorphic traits¹ but, despite some excellent studies², the peacock is more of a mascot than a model. Of the few model systems in sexual selection, the guppy stands supreme.

In her new book, Houde reviews much of the relevant literature and combines it with some of her unpublished research to address the question of why males have evolved their spectacular color polymorphism. Houde builds on a wealth of information dating from the earlier studies by

Baerends, the Haskinses, Liley and Endler and culminating in the mate choice studies by herself, John Endler, and others.

The main focus of Houde’s analysis is the role of female mating preference in the evolution of male color, especially orange. This concern is complex because it not only involves documenting the female’s preference, but also addresses how the color pigments are acquired, how color is perceived by females and predators, the influence of the environment on color transmission, and some speculation as to what information about the male is conveyed by these colors. Houde’s analysis is characteristic of a new trend in studies of behavioral and evolutionary ecology towards an integration of frequently isolated levels of analysis. Many other guppy studies have also relied on the extensive population variation that has endowed guppies with the raw material required by researchers to document the correlates of color variation in nature (such as predation pressure and possibly geographic variation in female visual sensitivity); to conduct artificial selection experiments on the response of color to predation (there is a clear evolutionary response to selection); and to uncover genetic correlations between male trait and female preference (these results are less clear). This superb presentation by Houde will bring many readers up to speed on the current status of guppy studies.

Another refreshing aspect of Houde’s synthesis is how she addresses hypotheses about the evolution of female mating preferences. Gone is the overworked emphasis of ‘good genes’ versus runaway sexual selection. Instead, Houde acknowledges that these effects can act in concert, that the neural mechanisms underlying preference can be influenced by selection in a variety of other contexts and that preference can be influenced by the past evolutionary history of the species. However, it is interesting how difficult it is to abandon the intuitively seductive notion of good genes despite any evidence for its support in this system. Orange, and other carotenoid-based pigments, cannot be synthesized in guppies but must be acquired through the diet. The color of an individual, therefore, provides a window on its foraging behavior – the suggestion is not that carotenoids themselves are advantageous (apart from attracting females) but that only a healthy foraging male can acquire them. Several studies have investigated whether female guppies (and other animals, such as finches³) that mate with brighter males produce offspring of greater vigor. There are no compelling data to suggest this is true. This is clearly stated but it seems difficult for the author to let go of this notion.

My only serious complaint about this book might be more aptly directed to the publisher rather than the author. This is a

book about color, but on the cover (of the paperback version) there is not a single color illustration; if ever color was needed to make a point, the stunning variation in the color of male guppies is it.

In many biological disciplines, new researchers tend to gravitate towards model systems when embarking on their research careers. In various areas of ecology, evolution and behavior, however, the opposite often appears to be true. These are fields that attempt to explain diversity and, to understand diversity, a diversity of systems must be understood. Thus, there can be no single ‘lab rat’. However, students are often drawn to the bizarre rather than the manageable. But, if this new trend towards a more integrative biology is worthwhile, there must be some premium put on studying systems for which there is a wealth of information. Houde has clearly shown the advantage of the model-system approach. This book can serve both as an introduction in how to study sexual selection to the novice and as a welcome synthesis and update on guppy sexual selection.

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Space, time and statistics

Spatiotemporal Models of Population and Community Dynamics

by *T. Czárán*

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Community Biology Series, 1997.
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ISBN 0 412 57550 7

Recently, the effects of spatial configuration in population and evolutionary processes have been the subject of intensive research efforts. Most ecological interactions (e.g. competition over resources, disease transmission, cooperative interaction by attracting common pollinators and reproduction) occur within a spatial scale that is much smaller than the size of the whole