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# Book reviews

**Drosophila genetics: a practical course**. Ulrich Graf, Nancy van Schaik and Friedrich E. Wurgler. Springer-Verlag, Berlin. 1992. Pp. 239. Price £24.50, softback. ISBN 3 540 54327 9.

That which distinguishes a good scientific training from mere erudition is the amount of 'hands on' practical experience in the laboratory. In these days of expanding student numbers, and a diminishing resource base, in U.K. universities at least, a compendium of ideas which 'includes all experiments that can be carried out without expensive equipment' is welcome indeed. This is what the authors set out to provide.

*Drosophila melanogaster* serves as the classic model for demonstrating the basic phenomena of eukaryote genetics but, apart from its evident versatility in this respect, it can also provide an excellent link organism, catering for those with interests focusing on molecular and developmental phenomena, and those with a more evolutionary bias centred on both whole organism behaviour and the population.

The book covers a good and concise introduction to the biology and culturing of *Drosophila*, with explanation of key symbols and a handy stocklist. This is followed by chapters on morphology, transmission genetics, phenogenetics, mutation, population genetics, cytology and cytogenetics, and molecular genetics. There is a helpful final section giving results and answers to questions, and the work is comprehensively indexed.

The strength of this practical book is in the chapters dealing with formal genetics, mutation, phenogenetics and cytology, which are well and carefully presented with detailed protocols for some interesting work.

The population genetics section is weak, amounting to a paper and not a practical exercise on Hardy–Weinberg equilibrium. This is followed by a suggestion for a short selection experiment while offering only superficial treatment of population modelling. Unfortunately, mating behaviour is treated in a perfunctory way which will do little to foster awareness of the links between behaviour genetics, ecology and ethology. The final chapter on molecular genetics is not experimental and consists entirely of an overview. It is difficult to see this as genuine practical work, although the approach may be useful at an introductory level or where resources are limited. Simple and relatively inexpensive practical work in this area can be carried out using useful protocols in D. B. Roberts' excellent '*Drosophila: A Practical Approach*'.

A useful guide to literature accompanies each excercise and references are given to major works on the biology and bibliography of *Drosophila*. An unfortunate omission, however, is any mention of B. Shorrock's book *Drosophila* with its indispensible and beautifully illustrated short key to common European species, useful for projects involving field work.

What makes the study of mutant genes exciting is what they can tell you about how organisms work. This can be approached using this book by linking practical exercises into a theme. For example, experiments with eye pigments can be used to explore gene interaction and steps in intermediary metabolism leading to synthesis of normal eye colour. An obvious extension, which the authors might have suggested, is to explore the consequences for effective vision in mutants lacking the ommochrome or pteridine pathways by making simple trials for phototaxis in a light gradient, or tests for visual activity using the optomotor response. Such experiments are simple and easy to perform. Brown pigment synthesis in white-eyed *vermilion brown* mutants in which both pigment pathways are blocked can be restored when the larvae are fed a missing intermediate (kynuranine) in the diet. This leads to recovery of normal visual activity which is otherwise severely impaired in phenotypically white-eyed flies. An analogy here can be made with environmental correction of metabolic disorders, as in phenylketonuria. The integration of a theme, from gene to behaviour, can be taken further by looking at the consequences for fitness and making a link with population genetics. Competitive mating tests will show that phenotypically white-eyed males are at a severe disadvantage relative to males in which either the brown or red biosynthetic pathways are intact.

This book is attractive, easy to use, and overall a valuable and worthwhile investment for anyone intending to use *Drosophila* for practical class teaching.

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**Evolution and the Recognition Concept of Species (Collected Writings of Hugh E. H. Paterson)**. Shane F. McEvey (ed.). The Johns Hopkins University Press, Baltimore. 1993. Pp. 234. Price £24.50, hardback. ISBN 0 8018 4409 6.

After more than 40 years of active research on species problems and speciation Ernst Mayr concluded that 'there is probably no concept in biology that has remained so consistently controversial as the species concept' (1982, *The Growth of Biological Thought*, Bellknap Press, Harvard). Paradoxically, Mayr himself certainly came closest to establishing a universally acceptable species concept, at least for biparental organisms, in the biological species of the evolutionary synthesis of the 1940s and 50s.

Hugh Paterson spent his early professional years in the 1950s and 60s as a medical entomologist, mainly working in southern Africa on groups of biting flies and other vectors of disease. He enthusiastically embraced the biological species and applied it to the identification of complex groups of siblings species. In the present volume a series of published, and indeed also some unpublished, papers are reprinted from the period 1973 to 1991. In these he developed his growing doubts about the biological species. Paterson's thinking has now been incorporated somewhat belatedly into the more general evolutionary literature and he is now widely cited. However, most of his more philosophical publications are difficult to obtain and were originally published in rather obscure journals and edited volumes. This book therefore provides a useful compendium now easily available to evolutionary biologists, systematists, geneticists and indeed general biologists.

In a series of papers, mostly in the *South African Journal of Science*, Paterson developed his major critique of the notion that isolating mechanisms are devices by which biological species develop and maintain their reproductive isolation. Rather, he argued that the individuals of species populations share a distinct and species-specific fertilization system, an important subset of which, at least in animals, is the specific mate recognition system (SMRS). These systems of interacting signals and tuned receptors ensure efficient syngamy of gametes and resulting fertilization. This is the core of Paterson's recognition concept of species which he contrasts strongly with the traditional biological species, or what he prefers to term the isolation species concept.

It is now widely agreed that the category of 'isolating mechanisms' is indeed a mixed bag of disparate species characteristics. No so-called post-mating isolating mechanism can logically be a product of selection for isolation *per se*, but is likely to result rather from incidental genetic divergence. Pre-mating isolation mechanisms on the other hand seem, at least to this reviewer, to be more or less synonymous with Paterson's SMRSs. Paterson is probably right in stating that specific mate recognition is the key feature that characterizes different species. However, it is equally incontrovertible that such SMRSs result in the reproductive isolation observed between groups of related sympatric species. The possibility of the evolution of reproductive isolation directly by natural selection, associated particularly with the writings of major authors, most notably Wallace and Dobzhansky, is still an area of active research and controversy. The existence of reproductively isolated species does not prejudice the final conclusions of those controversies.

The ideas developed in this series of reprinted papers are very important ones that deserve to be widely read. However, as so often with an innovative idea, the original author may appear, at least to some others, to go too far in pressing it to the exclusion of all other possibilities. For example, it is certainly too extreme a view to suggest that the recognition concept alone allows us to understand the nature of sibling species (Chap. 17). Living organisms, and even animals alone, are so diverse that it is highly unlikely that one model of speciation, or even one narrowly defined species concept, will describe and account completely for that diversity.

This book is well-produced and its value is enhanced by the introductory Preface and notes to each of the chapters provided by Hugh Paterson himself. The Johns Hopkins University Press announce on the fly sheet of this book the publication late in 1993 of a further volume of essays contributed by many of Paterson's past students and colleagues on the occasion of his retirement from the Chair of Entomology at the University of Brisbane. We shall wait to see how Hugh's ideas have been used and interpreted. It is to be hoped that he will himself now produce a new book-length treatment of his ideas as was his stated intention in 1985.

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