

Predator-prey interaction in arthropods

A. F. G. Dixon

The Dynamics of Arthropod Predator-Prey Systems. By M. P. Hassell. Pp. 237. (Princeton University Press: Princeton, New Jersey, and Guildford, UK, 1978.) Hardback \$20; £10.70; paperback \$8.75; £4.40.

DR HASSELL has given us a lucid, clearly illustrated and eminently readable account of the development of analytical models of parasite-host interactions. This book is a most welcome exposition and summary of the current position in a rapidly developing aspect of ecology to which the author himself has been a major contributor.

Starting with the Nicholson and Bailey model the author develops step by step elegant analytical models framed in difference equations. This is achieved by the incorporation of more biologically significant parameters into the model. First, it is shown that stability can be predicted if an expression for density dependence is incorporated. A consideration of the functional responses of predators to prey density reveals the difficulties of extending relationships derived from studying mainly parasitoids. In true predators the search rate and handling time vary with stage of development of the predator and size of the prey, and this complexity poses difficulties in modelling this set of interactions. Consideration is given to the consequences of non-random search by a predator as opposed to the random search assumed by Nicholson and Bailey. More realistic prey and predator distributions tend to make the interaction very complex and difficult to explore analytically. However, the author shows that descriptive models have been useful in this context.

Next is revealed the powerful stabilising effect of mutual interference among searching parasites on parasite-host interactions, the constant area of discovery assumed by Nicholson and Bailey being a special case. However, although a widespread phenomenon in laboratory studies of parasite searching, it should be stressed that the extent to which mutual interference occurs in the field and the significance thereof still needs to be resolved. Many of the laboratory studies on mutual interference have been done at unrealistic densities. In considering the predator

rate of increase the author reveals another difference between predators and parasitoids. Prey density influences development, survival and fecundity in predators. If these factors are to be incorporated then the author suggests that we may have to abandon simple time dependent difference equations in favour of mathematically less tractable models.

Switching by predators from eating one prey species, to eating predominantly another species, as the proportion of the alternative prey increases, is shown to stabilise prey populations providing the predator population remains constant. Likewise, if switching is shown by the top predator in a community it can enable competing prey species to coexist. This is followed by a consideration of how it is possible for competing predators and hyperparasitoids to coexist.

The book ends with a most useful chapter on the theoretical basis for biological control which builds on the previous chapters. This reveals that an ideal parasitoid for use in biological control programme, all other things being equal, is one that has a high search rate and a marked ability to aggregate in areas of high host density; and it is argued that these are more likely to be attributes of specific rather than generalist parasitoids. However,

the case of the biological control of winter moth in Canada is used to show that when 'things are not equal' then predicting the outcome is difficult. Multiple introductions of parasitoids are shown now to be justified, as additional species will either coexist with the first species or replace it, and, whatever, the outcome, the equilibrium density of the host will fall.

The author justifies the book's title by regarding parasitoids as simple predators. He stresses that "true predator-prey models need to recover from the neglect at the hands of essentially parasitoid models". Only further study will reveal just how much of a special case the parasitoid-host interaction is and whether it can be usefully applied to the arthropod predator-prey system.

This book will undoubtedly be the standard text for both students and research workers in this field for some time to come. It is also a tribute to Nicholson and Bailey who, although unable to model the stability they observed in insect populations in the field, nevertheless produced a model which has been developed by the author and others to further our understanding greatly. At £4.40 the paperback version, is excellent value. □

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Creative personality

Macdonald Critchley

Chase, Chance and Creativity: The Lucky Art of Novelty. By J. H. Austin. Pp. 237. (Columbia University Press: New York, and Guildford, UK, 1978.) \$16.20.

NOT for a long time have I enjoyed a technical apologia so much. Disjointed it may be, but the book is none the worse for that. Obviously the author is not only a biochemist of conspicuous ability, but he is something much greater, a thinker who writes well, and who is versed in the humanities. The book opens in a naive, autobiographical but intensely interesting fashion. We learn how as a junior hospital officer his interest was captured by a fascinating and argumentative case-conference between two of America's outstanding neurologists. His stint in the pathological laboratory was highlighted by the opportunity to study that rare and deadly disorder, **metachromatic leuco-**

dystrophy. He became intrigued by the presence of highly coloured urinary deposits which in an odd fashion changed in hue from reddish-purple to a vivid golden brown. What was their nature and what was the meaning of their metamorphosis? Patiently over the ensuing years Dr Austin pursued his quest, following one clue after another, communicating with other workers far and wide. Eventually he narrowed down the responsible factor to a deficiency in the enzyme sulphatase A. This accomplishment led the author to investigate the nature of the Lafora deposits within the neurons in cases of myoclonus epilepsy. They proved to be comprised essentially of a glucose polymer. Important findings such as these inspired Dr Austin to extend his investigations into the chemistry of Alzheimer's disease and then the ageing of the brain.

This introduction leads on to sections 2 and 3, in which we are introduced to such fascinating topics as the nature of scientific discovery; the role played by mere lucky chance; the factor of intellectual preparedness; and the place occupied in research by serendipity. Concerning the latter, Dr Austin submits an allied but deviant conception which he calls "altamirage". This term was named after the "discovery"

of the prehistoric art within the caves at Altamira by Don Marcelino—more particularly by his dog, and especially by Maria, his 9-year-old daughter. It was this little girl who was the first to direct her gaze upwards, and thus become the discoverer of the glories of the "Sistine Chapel of prehistory". Altamira is defined as "the facility for encountering unexpected good luck as the result of highly individualised action". It transcends the boundaries of serendipity in its role of personal action in chance.

The erudite and stimulating chapters which make up the final sections are psychological and philosophical in nature, and deal with such subjects as, for example, the creative personality. In an interesting fashion the author reviews the considerable literature concerning the anatomy of creativity. He emphasises, in a manner which merits the attention of all senior academics who dispense power and patronage, Dragstedt's essay "Who Killed Cock Robin" in which is described the gradual death of creativity in a researcher who becomes enmeshed in too many committees. In Dragstedt's words, "the early days in the laboratory are the golden years for many scientists. After he becomes known, the volume of mail, telephone calls, number of visitors, organisational activities, including committees by the dozen, and demands for lectures, reviews and community activities grow insidiously and will destroy the creativity of the scientist if unopposed".

Throughout his book Dr Austin recurrently mentions the part which the arts may have contributed to his scientific career. Music is there, and more particularly an almost obsessive, lifelong preoccupation with colour. It is tempting to believe that the author is, or was, a synaesthetic thinker, though he nowhere explicitly says so. Likewise he speaks of a reality familiar to some who have closely studied the phenomena of the body-image, and which the reviewer has never before seen expressed in print. According to Austin, "Even now, writing these lines, I retain a clear visual image of the scene at the desk where these ideas burst forth. This time, in a kind of mental double vision, I am both a participant in the process and a spectator hovering over a point about five feet up and ten feet directly to the rear." (My italics.)

The reviewer has nothing but admiration for Chase, *Chance and Creativity*, and confesses that Dr Austin is a man he would very much like to congratulate in person. □

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Major flowering plant families

Peter D. Moore

Flowering Plants of the World. Edited by V. H. Heywood. Pp. 335. (Oxford University Press: Oxford and London, 1978.) £7.95.

It is an unusual experience to come across a book which demands unrestrained praise; this one does. In both concept and execution this work is eminently laudable. It aims at providing a simple introduction to the major flowering plant families of the world; over 300 are described, so it approaches a comprehensive coverage.

The book commences with a brief introduction to the structure and biology of the angiosperms together with an outline of their evolutionary history and the criteria which are used in their classification. As the book is likely to attract a wide market outside the circles of academic botany, this is a very necessary section. Even within such circles it will prove a useful summary for students. It includes Stebbins' diagrammatic portrayal of evolutionary relationships within the flowering plants.

There follows a synopsis of classification in which families are arranged into their ten Orders. On the whole the Stebbins system is used, except where some small families are fused with closely related ones.

Technical terminology in plant morphology is, according to Heywood, one of the major obstacles for the amateur, which keeps him from the appreciation of much taxonomic botany. Undoubtedly he is right in this, and the provision of an illustrated glossary should go a long way towards demolishing this obstacle, especially as the attractiveness and clarity of the illustrations make it quite the most explicit glossary of its kind currently available.

The bulk of the text (300 pages) consists of a systematic treatment of the plant families. The description of each family includes an assessment of its distribution, both verbally and cartographically. The distribution maps are a unique feature of the book, which will prove particularly interesting to those interested in phytogeography. The verbal descriptions are necessary supplements; for example, although the family Magnoliaceae is

found in southeast Asia and in North, Central and South America, 80% of the genera come from the former region. A map on its own could be misleading.

The diagnostic features of each family are then described, and here the use of technical terms for the sake of brevity will necessitate frequent use of the glossary. Major subdivisions within the family are then described and finally its economic value is considered. The latter is a source of much interesting information and includes medicinal, timber and horticultural uses.

Quite the most striking features of the book are the illustrations. Each family has a few characteristic members illustrated both by habit drawings and flower sections. Many of the illustrations are reproduced in a sepia monotone with certain parts, often the flower or fruit, picked out in full colour. It is impossible to convey in words how aesthetically pleasing and technically informative this form of representation has proved. It combines the clarity of a line diagram with the naturalness of a well-composed painting. Victoria Goaman, Judith Dunkley and Christabel King, together with the publishers, must be congratulated on a set of illustrations which are unsurpassed in current popular botanical literature.

It would be petty to dwell upon errors in the text; they are present, but fortunately scarce. For example, the primrose is referred to as *Primula veris* rather than *P. vulgaris*.

There are no comparable books which could compete with this one, either in quality of production or in price (at under £8 it must be rated a bargain). Older books, such as G. H. W. Lawrence's *Taxonomy of Vascular Plants* (Macmillan, New York, 1951), which have served generations of students, lack the fine illustrations and the distribution maps of Heywood's book. These features will also appeal to the very considerable amateur market in both Europe and North America.

This book is more than a textbook of taxonomy, it is a publication which will stimulate an interest in plants within any who open its covers. It is an item which all biologists should have on their bookshelves. Oxford University Press are to be congratulated on the production of a book which will be of great service to botany and which is a credit to British publishing. □

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