man'' sounds a cautionary note. Misunderstandings about such issues are bound to arise until we understand the epigenetics of such traits as aggressive behaviour and the points in development at which they are accessible to environmental modification. As Barnett indicates, the interaction of nature and nurture is a central problem in biology and those trained in the ethological tradition are especially well placed to deal with it. An historic opportunity will be missed if current enthusiasm for behavioural ecology diverts all young ethologists from what has to be the most challenging and momentous issue ethology has yet faced. Only when we understand how genes impose adaptive limits on behavioural plasticity will we fully appreciate the pervasiveness of genetic influences on the development of behaviour, whether animal or human. □

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Sixty years on?

Michael B. Usher

Elementary Mathematical Ecology. By John Vandermeer. Pp.294. ISBN 0-471-08131-0. (Wiley: 1981.) £24.05, $43.25. *Population Systems: A General Introduction.* By Alan A. Berryman. Pp.222. ISBN 0-306-40589-X. (Plenum: 1981.) $16.95, £10.71. *Population Ecology: A Unified Study of Animals and Plants.* By Michael Begon and Martin Mortimer. Pp.200. Hbk ISBN 0-632-00812-1; pbk ISBN 0-632-00667-6. (Blackwell Scientific/Sinauer: 1981.) Hbk £15, $33; pbk £7.90, $16.95.

MANY origins of the subject of population dynamics can be traced to the 1920s, when A.J. Lotka, R. Pearl, P.F. Verhulst, V. Volterra and others were publishing relatively simple mathematical models of population growth and interaction. During the following half-decade the subject grew slowly, but in the 1970s there was an explosion of research interest. It is inevitable that this would eventually manifest itself in teaching and writing textbooks to fill the students' need. Three recent examples are considered here.

John Vandermeer teaches population dynamics with a programmed text of ten lessons, each of which is designed to take 5 ± 2 hours. The explanatory sections of *Elementary Mathematical Ecology* are kept short, and the exercises, for which relatively sketchy but adequate answers are given, are both numerous and essential for understanding the lesson. I am reasonably certain that most undergraduates would take considerably longer than the designed time, and in the exercises I found the lack of consistency of rounding intermediate results most confusing (for example, in the first chapter one has ln (2.25) = 0.81093 and exp (0.83) = 2.3).

In *Population Systems,* Alan Berryman has written a more traditional textbook, setting the subject out in only six chapters which contain few exercises and only brief solutions. The text itself does not make reference to the ecological literature: a series of notes, listed in rather small type at the end of each chapter, provides reviews of a few references and also gives some of the more technical material. I found the shuffling between text and notes a rather frustrating aspect of the book's subject presentation.

A slight departure from the usual progression from single-species to two-species interactions to communities is a characteristic of Michael Begon and Martin Mortimer's *Population Ecology.* Although the first five chapters follow the first two steps in this sequence, the authors conclude the book with three chapters — on life-history strategies, population regulation and community structure — in a section called "Synthesis". Although this makes for interesting, if unexpected, reading, since one is asked to think about migration, costs of reproduction, r- and K-selection, and so on, after reading about interspecific competition and predator–prey relationships, the attempt at synthesis really fails.

It is interesting to compare the subject matter of these books. All of them include introductions to population growth, interspecific competition, predator–prey relationships, spatial patterns (rather briefly dealt with in *Population Ecology*) and community structure (only sketchily introduced at the end of *Elementary Mathematical Ecology*). A consideration of life tables is the most surprising omission from *Population Systems,* which also lacks an account of matrix models of age-structured populations. These, then, are the core topics, but what are the specialities? *Elementary Mathematical Ecology* contains data on island biogeography and species–area relationships, but I wish that the author had not used the ambiguous term "species number" (implying ranking) for the unambiguous "number of species". *Population Systems* takes a systems analysis approach, introduces much of the jargon such as "feedback", which then leads to an extensive consideration of density-dependent effects. *Population Ecology* includes chapters dealing with life-history phenomena, key factors and harvesting. None of the books contains detailed discussions of genetical aspects of population regulation.

The theoretical foundation of 60 years ago is still strongly evident. *Population Systems* perhaps diverges most in taking a systems theory point of view. But, for teaching, I would certainly recommend the excellent blend of example and theory in *Population Ecology,* and possibly support some areas by the greater theoretical and practical development coming from the 291 exercises in *Elementary Mathematical Ecology.* □

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Search for a science

Graham Hoyle

Neuroethology: An Introduction to the Neurophysiological Fundamentals of Behavior. By Jorg-Peter Ewert. Pp.342. ISBN 0-387-09790-2. (Springer-Verlag: 1981.) DM 49, $29. *Neuroethology: An Introduction.* By D.M. Guthrie. Pp.221. Pbk ISBN UK 0-632-00303-0; ISBN US 0-471-26993-6. (Blackwell Scientific/Halsted: 1981.) £8.75, $27.95.

THESE two introductory texts, appearing independently at about the same time, offer an insight into viewpoint as well as subject matter. Ewert does his research on a backboned animal, the toad; Guthrie on invertebrates. Each goes out of his way to offer a fair balance, with extensive examples from the other's group. Many of the same studies are reported by both authors, showing that they agree as to what constitutes neuroethology. It is remarkable to find such concurrence, since others who consider themselves to be neuroethologists have quite different notions as to what should be included. Guthrie has chapters on evolutionary trends and human neuroethology, with illustrations taken directly from textbooks on neuroanatomy, psychology and animal behaviour. Ewert avoids such a nebulous search for principles, sticking to observations and hypotheses — although he does manage to squeeze in a section termed "Stress in Human Society".

The Nobel prize-worthy finding of Lorenz and Tinbergen in the name of ethology was a simple generalization: complex behavioural acts of animals as different as insects, birds and human beings are handled genetically — and therefore evolutionarily — as wholes. This applies especially to acts of territoriality, home-building, prey-capture and courtship. They introduced key concepts and clear descriptive terms, notably "fixed action pattern", "releaser", "drive" and "consummatory act". Each of these offers a major challenge to neurobiologists, because each implies a specific kind of underlying neural circuitry and properties. Working them out offers a splendid and significant intellectual/laboratory pursuit,