reviews

Longing for simplicity

P. D. Moore

Plant Strategies and Vegetation Processes. By J.P. Grime. Pp.222. (Wiley: Chichester, UK, and New York, 1979.) £11.50.

IF there is one straw for which all biologists grasp, it is a clear conceptual framework upon which to hang the varied observations which form the raw material of biological research. No biological mind has equalled that of Darwin when it comes to the discovery of common denominators within disparate facts, but many have used a similar approach with varying degrees of success. In a science in which laws are statistical and exceptions are often commoner than the rule, it takes a brave man to make firm statements concerning the way in which living organisms are structured or behave in relation to their environment. That such statements are readily latched on to by the academic masses is evidenced by the current popularity of such concepts as *r* and *K* selection, or island biogeographic theory. We all long for simplicity in nature and embrace it firmly when it is shown to us.

J.P. Grime of the University of Sheffield is one of those people who has actively sought simple statements which can be made about nature and in particular about the various strategies which have evolved within the Plant Kingdom and which confer certain advantages upon those species possessing them. He conceives of three basic strategists: competitors, stress tolerators, and ruderals. He defines competition as the tendency of neighbouring plants to make use of the same resources; the competitor strategist is thus a species which, as a consequence of robust stature, fast growth rate and optimal timing of canopy expansion, is well fitted to obtain at least its fair share of those resources. Stress is defined as the external constraint upon the growth of part or all of the plant; the stress tolerator is thus a species which can continue its growth in conditions which might be expected to curtail the growth of others. Ruderal species are characteristic of disturbed habitats, where disturbance is defined as an interruption to plant biomass accretion. On the basis of this view of plant species, Grime proposes that three selective forces, *C* selection, *S* selection and *R* selection, are operative which had led to the evolution of the observed strategies. In attempting to reconcile this system with the currently prevailing *r–K* selective spectrum, Grime proposes that *R* selection is equivalent to *r* selection, *S* selection to *K* selection and that *C* selection occupies the intermediate part of the continuum.

Having three, rather than two, defined endpoints in a classificatory scheme means that a simple one-dimensional ordination of species along a line is no longer appropriate and that, instead, one must think in triangular terms (an analogous model to the triangle of texture in pedology). In this way we can admit such bastard strategists as "stress-tolerant ruderals" and even "*C–S–R* strategists" which combine some features of all strategy types.

This system Grime regards as appropriate for any consideration of plants in their established phase. Upon it one must superimpose a further set of subdivisions based upon regenerative strategies, such as vegetative spread, soil seed banks, and so on. Having thus defined and explained his terms, the author then proceeds in the second part of the book to put them to the test, applying them to a consideration of various features and processes found in vegetation, such as dominance, coexistence and succession.

The real test of the value of this novel concept of vegetation is, of course, whether it assists in the explanation and understanding of observed phenomena. In this respect there are many pleasing features about Grime's model. One of its most successful applications, to my mind, is in the explanation of the high species density found in calcareous grassland, where low phosphorus and nitrogen availability can be regarded as a stress which limits the development of *C* strategists and permits the proliferation of *S* strategists and various non-competitive intermediate types.

Perhaps the least satisfactory aspect of the system is the loose definition of stress. The problem here is that what represents a stress for one species may be beneficial for another (take water-logging, for example). As most ecologists think of species as possessing bell shaped performance curves along environmental gradients, stress really has to be defined separately for each taxon, in terms of its optimum and performance limits. It cannot be defined in general terms.

Grime claims that his model is consistent with Odum's suggestion that the greatest diversity occurs in the middle range of a physical gradient, but this is not so. Odum considered that where conditions were least extreme, diversity would be highest. Grime claims that in such locations the *C* strategists would have a hey-day and plant species density would be low. Higher diversities would thus be achieved as one moves out from the centre towards physical extremes (there must be a better expression than "stress-gradient" for these axes). In this respect Grime's view seems to accord with reality more closely than Odum's.

This book is stimulating, refreshingly novel, controversial, perhaps a little oversimplified in places, but has one most valuable feature: it forces the reader's mind along new paths. He may not always completely agree with the author's views and conclusions, but he is sure to benefit from examining them. This freshness of approach, coupled with a concise and lucid style make this book a valuable tool for teachers of plant ecology. □

P.D. Moore is Senior Lecturer in Plant Ecology at King's College, University of London, UK.

Large scale magnetic fields

Cosmical Magnetic Fields. By E.N. Parker. Pp. 841. (Clarendon/Oxford University Press: Oxford, 1979.) £45.

ALTHOUGH the same basic physical principles apply to cosmical magnetised plasmas as to those produced in the laboratory, very significant differences arise in their application. Trapping of plasma in the laboratory is carried out with magnetic fields anchored to rigid conductors, and the aim is to produce equilibrium configurations. Astrophysical fields are trapped by gas, however, and gravitational forces give rise to magnetic buoyancy: dynamical activity seems to be the norm, rather than stable equilibrium, because of this absence of anchoring. These magnetic fields play important roles in determing conditions throughout the Universe, as they control the production and flow of the cosmic radiation, affect the accumulation of interstellar gas into clouds, and determine the radiation intensity of bremsstrahlung sources. It is clear that theoretical work would have been aimed entirely at understanding equilibrium configurations of magnetised plasmas in the cosmos if spatially unresolved sources had been the only ones