standing of these topics is rapidly reinforced by an appropriate examination of the operation of the thermoregulatory and blood pressure control systems.

The quantitative description of a biological process is likely to require mathematics a little more complex than the simple algebraic equations associated with the canonical form. This is particularly true when considering the dynamic response of a biological system. Behaviour of this type is often investigated by methods such as Bode and Nyquist analysis, both of which are clearly described in the text. However, immediately after this section of the text there is a brief introduction to the Fourier transform and its use in systems analysis. In an introductory work of this type a two-page summary on the Fourier transform would seem inadequate, or indeed even inappropriate.

Having described a repertoire of techniques, the author introduces the reader to their application in the analysis of human physiological systems. Such a discussion inevitably results in the consideration of more advanced topics, such as the analysis of nonlinear and oscillatory systems. These topics together with biochemical control form the material for the last two chapters. Clearly, these are areas of great scientific importance; hence they should either be discussed in detail or omitted completely. In view of the nature of this book, the latter course might be more appropriate.

In summary, then, the aim of Richard Jones to write a book on the quantitative description of biological systems is entirely laudable. In writing such a text the author is faced with the problem of steering a middle course between introducing mathematics which are beyond the scope of the reader but describe the biological situation accurately, or reducing the mathematical complexity to the point where the description is no longer realistic. Nevertheless, in spite of the reservations noted, the result is a well balanced text which is certainly worth reading.

R. I. KITNEY

# Population Ecology

*Populations in Seasonal Environment.* By S. D. Fretwell. Pp. xxiii+217. (Princeton University: Princeton, New Jersey, January 1973.) £5.75.

THE first part of the preface and section 2 of this book are excellent. The first part of the preface is a concise summary of the philosophy of science which is most welcome in a book of this sort. Section 2, which is based largely on the author's own work with birds, provides an elegant example of scientific method, and would be worth reading for this alone. The author has a flair for deduction, so elaboration of hypothesis into prediction is prominent in his work, and most elegantly done. His explanations seem both original and profound as, for example, when his analysis of habitat selection in a territorial species suggests with simple inevitability that there must be selective advantage in the behaviour of both the winner and the loser in the territorial encounter. This and other of Dr Fretwell's conclusions in this part of the book certainly have the generality that he himself modestly wished for them.

Not so with section 1. The models are exclusively about populations in which there is no secular trend in density. On page 5 the equation $d=\frac{b}{1+b}$ (which is fundamental to all the models) depends on the condition that $N=N(1+b)(1-d)$. And see page 3: "On the average the declines equal the gains . . . so the population shows only random (*sic*) changes in size." This statement embodies a philosophical error that has long prevailed among a certain school of ecologists but it is disappointing to find it in one so perspicacious in philosophy as Dr Fretwell. It is a philosophical error because it ignores time. It is palpably false on a geological time-scale on which any population may flower and most populations become extinct. It is palpably false on the historical time-scale: during the last 150 years in Australia many populations have flowered and many others have greatly declined. On the unrealistically short time-scale of the working life of an ecologist some populations seem to remain steady, but how can one test such a hypothesis without writing into the prediction some arbitrary short period of time, which makes the whole exercise trivial? Of course, Dr Fretwell is not interested in lack of secular trend *per se* but only as evidence for density dependence. But stability on a short time-scale is poor evidence for density dependence as the work of Den Boer and Reddingius has shown. If Dr Fretwell had considered their work he may not have missed the obvious third contingency in discussing summer $K$ and winter $K$.

The logistic theory had a great vogue some five or six decades ago; but there were also some classical criticisms of it in the decades immediately following. It was wrong to revive the theory without refuting the criticism of it. To explain *Thrips imaginis* in terms of the logistic theory is nonsense because none of the assumptions is fulfilled.

Section 1 may not be worth reading because it is trivial but section 2 is a must for all population ecologists especially those interested in birds.

H. G. ANDREWARTHA

# Colour Constancy

*Surface Color Perception.* By Jacob Beck. Pp. xiv+206. (Cornell University: Ithaca and London, February 1973.) $11.50; £5.20.

THIS book is concerned with the enormous gap that exists between the approach to colour by the physicist and by the artist. The physicist or the physiologist starts with what is clear to him—the nature of the light coming to the eye from various objects, and the way that nerve signals are generated and modified, as can be recorded from the eye and the brain. The artist or the psychologist starts from the other end with what is clear to him—perceptions of the colour and the lightness of the objects themselves.

The author evidently sees that the psychological complexity with which he has to deal is well beyond the reach of today's electrophysiology, and therefore ignores the known way that nerve signals are generated and processed and received in various parts of the brain. Instead, his treatment is to speculate upon the way that one aspect of perception may interact with others to account for what subjects say they see, in a very large variety of experimental situations.

The central problem is the famous and ancient question of colour constancy—how we manage to name the colour and lightness of objects around us "correctly" even when the colour and brightness of the illumination are changed so that the light entering the eye becomes quite different.

This is exceedingly hard to explain, especially since what is perceived is strongly influenced by what is expected. One kind of organization considered is expressed as follows: "Whether the stimulus is seen as a white in reduced illumination, or as a grey, depends upon whether the stimulus cues and an observer's attitude induce the perceptual system to assimilate the sensory signals to a schema of a white plus a correction for the reduced illumination, or a schema for a grey surface normally illuminated". This and alternative formulations may help psychologists to form some idea of what goes on in the mind to correct (or misrepresent) the primary sensation in a wide range of carefully examined conditions.

Indeed the importance and value of the book lie in the thorough way in which the very many aspects of surface colour are treated, the great number of classified experiments that are briefly described (with references), and the enumeration with contrast of interpretations advanced by various authorities.

The book is beautifully produced, and colour-plate 1 is a fascinating illustration of the variety seen in object colours.

W. A. H. RUSHTON