

FISHER'S GENETICAL THEORY ILLUSTRATED

Ecological Genetics

By Prof. E. B. Ford. Pp. xv + 335 + 16 plates. (London: Methuen and Co., Ltd.; New York: John Wiley and Sons, Inc., 1964.) 42s. net.

ECOLOGY is concerned with the circumstances regulating the quantities of organisms; genetics with the determination and transmission of their qualities. Prof. Ford's *Ecological Genetics* might reasonably be expected to provide a synthesis of these two specialist fields, since his work has spanned both, but he has defined his subject-matter more narrowly as "the adjustments and adaptations of wild populations to their environment". The reason for this restriction is that the book is the amplification of an outline written in 1928, on the basis of ideas deriving from Fisher's theories on mimicry and on dominance. This sketch has provided the guide-posts to his researches ever since. Consequently, *Ecological Genetics* is primarily an up-to-date report of the work of the Oxford group of geneticists whose bible has been R. A. Fisher's *The Genetical Theory of Natural Selection*, and it is dedicated to his memory. The book is intended for advanced students, but it is so clearly written that it will be understood by anyone who knows the elements of genetics.

The task Prof. Ford set himself was nothing less than the demonstration of the working of evolution and of natural selection in the field. This seemed a less than hopeful exercise to Darwin, and Ford's success depended on the development of field techniques (which he enumerates), and especially on the choice of critical situations where genetic change could be expected to be sufficiently rapid to be measured in a reasonable period. The book starts with chapters about three such circumstances.

The first situation, which cannot be anticipated, arises when the numbers of an isolated community fluctuate widely. It can be exemplified by Ford and Ford's early work on the marsh fritillary, which showed a change of typical form once the population recovered from a period of decline. Unfortunately this type of study has not been followed up as it deserves. Ecologists should now take the point, and add the extra dimension of genetics to some of their studies of changing populations.

Polygenically determined characters are readily, and rapidly, adjusted to ecological change; almost by definition, as we would now say. Measuring such characters of a species in different isolates, or throughout the ecological range of the species, provides the second situation studied. Here Prof. Ford's study centres around the meadow brown butterfly (*Maniola jurtina*), and of the effects isolation (in the Scillies) and stabilization (of mainland populations) have on an apparently trivial character, the number of spots on the underside of the hind-wing. These chapters are written in an anecdotal style which conveys some of the excitement of population sampling in the field. The work ends with the discovery of the very narrow belt, 160 yards wide, which separates the East Cornish and Southern English sympatric forms of this species. The ecological causes of selection of the two types are not yet clear, but it is claimed that "selection strongly eliminates intermediates between the sympatric races". Further data on the ecology and genetics of this species will be awaited with interest.

The third, and most important, situation is genetic polymorphism; the co-existence of discontinuous forms in such proportions that the rarest cannot be accounted for only by mutation. As recently as 15 years ago, polymorphism of, say, human blood group genes was considered as suggesting their "neutrality", whereas to-day polymorphism is automatically taken to indicate active selection. Many polymorphisms in domesticated, as well as wild, forms are being examined to see if this is truly so.

Prof. Ford records the well-documented cases of the scarlet tiger moth, of the snail *Cepea nemoralis*, of the homostyly-heterostyly in the primrose, of chromosome polymorphism in *Drosophila pseudo-obscura* and related cases, all of which have contributed to this change of attitude to polymorphism and which illuminate its causes.

The balance of advantage and disadvantage which results in superiority of the heterozygote is the most frequently assumed explanation of genetic polymorphism. That is, the opposite of the selection situation described for the meadow brown. Prof. Ford accepts Sheppard's postulated genetic mechanism for this hybrid advantage, without making it clear that this mechanism still awaits experimental proof and has only the weight of circumstantial evidence in its favour. Briefly, Sheppard states that some of the many effects of a single gene mutation may be advantageous and others disadvantageous. Natural selection will make the advantageous effects dominant (and the disadvantageous recessive, should they not already be so) if dominance evolves *à la* Fisher. The heterozygote will then have only advantageous characters, and the two homozygotes will each have some disadvantageous ones. This is a variant of the dominance theory of hybrid vigour and is subject to the limitations already noted by Crow. Further, it would also imply either that the modifying genes which lead to dominance become dominants themselves, or the population becomes homozygous for them, since they have to function in heterozygotes. Attempts to select for hybrid advantage have not been notably successful, so that this problem of mechanism must still be considered an open one, of great theoretical and economic importance.

The book concludes with chapters on mimicry, on industrial melanism, and on isolation and adaptation. It is a reflexion of the success of Prof. Ford's original project that these topics are now well documented and understood.

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OVER-NUTRITION IN MAN

Occurrence, Causes and Prevention of Over-nutrition (Symposia of the Swedish Nutrition Foundation 11, Falsterbo, August 1963. Edited by G. Blix. Pp. 152. (Uppsala, Sweden: Almqvist and Wiksells, 1964.) 35 Sw. kr.

THAT over-nutrition should be such a problem as to warrant a three-day symposium is perhaps surprising to the majority of people whose only awareness of malnutrition is under-nutrition. The *Proceedings* of a symposium held on this topic in Sweden in 1963 are now published and contain papers from workers in the United States and Great Britain as well as from Scandinavia. Calorie over-nutrition was the main type considered, and only scant mention was made of vitamin over-nutrition; and despite the title of the symposium little was said about prevention.

If these *Proceedings* are considered as the report of a symposium on obesity, then they make excellent reading, and anyone who has ever considered the subject of obesity will find some interesting new slants on the problem. The omission of the word 'treatment' from the title of the symposium was obviously very sensible, because it became apparent on reading the contents that no single method of management was applicable and it was emphasized that each person must be given advice specific to the individual. This book will be of little help to the obese in providing an 'easy-cure'; but it could give the overweight person insight into his or her condition.

Attempts at distinguishing a different biochemical state in the over-weight individual have met with little success, and, though some differences appear in obese persons compared with the normal, these differences do not appear in all. This, and other considerations, led to a discussion