REVIEWS

THE EVOLUTION OF MELANISM. Bernard Kettlewell. Clarendon Press, Oxford, 1973. Pp. xxiv + 423. £10.25.

The phenomenon of industrial melanism is a classic example of the interaction between observation and experiment in field biology. Its analysis stands as a cornerstone of ecological genetics; the first fully documented example of the power of natural selection to change gene-frequencies in wild populations. The names of Bernard Kettlewell and *Biston betularia* will for ever be associated in the annals of evolutionary biology. It is right that Kettlewell has taken the opportunity to review at length the phenomenon of melanism in moths.

It is therefore particularly unfortunate that his work is littered with irritating errors. Authorities are mis-spelled and dates are given wrongly. The statistical results frequently have > and < confused, and the frequent absence of degrees of freedom makes it difficult to understand which is correct. The plates are numbered in a curious sequence depending upon the chapter of reference. At least one seems to be out of order, and whole blocks of them are inserted in the wrong place.

The best parts of the book are undoubtedly those describing the field studies of melanism with which Kettlewell himself has been concerned. The review of industrial melanism in *Biston betularia* is excellent. The descriptions of phenotype distributions, their change with time, and the experimental proof that visually discriminating avian predators were responsible for these changes are gathered together and discussed at length for the first time. The section dealing with the influence of atmospheric pollutants upon the epiphytic flora of industrial and rural Britain explain why melanics are frequently found far from industrial centres. The report on the genetic effects of the legislation in the 1960's against smoke pollution brings the subject right up to date.

Kettlewell also describes the ecological genetics of *Lasiocampa quercus*. This species has a melanic form which is unusual in being recessive. It is found commonly in the north-east of Scotland, and on heather moors it is subjected to differential predation. The melanic seems to be more cryptic than the non-melanic on the peat moor environment. The same holds for *Amathes glaneosa*, though the melanic here is dominant. *Amathes* shows a cline down the Shetland Islands which is particularly steep in the area where the northern heath moor ends, and the southern arable land begins. Once more Kettlewell and his colleagues have shown that differential predation is an important force to be reckoned with in the analysis of genetic variation in this species.

It seems that melanism in moths can occur almost anywhere. Kettlewell clouds the subject by dividing melanism into a series of subgroups (*e.g.* geographical, relict, and even "miscellaneous" melanisms), but there is a simple generalisation. Many species of moth rest upon exposed surfaces during the day when they depend upon their personal crypsis for survival. In an area where the background is locally darker, populations of these moths may contain alleles that confer a darker pigment upon their bearers.

The best known example is from industrial areas. However, some species have melanic forms that live on peat bogs, in dark shady pine forests, or even, perhaps, in areas where the trees are blackened by frequent burning. The great contribution of Kettlewell and his colleagues has been to show that, in many of these situations, predators discriminate between the phenotypes favouring and simultaneously improving crypsis. Such polymorphisms have probably been in existence for a very long time, and it would be of interest to know whether any of these alleles has migrated into industrial areas.

Little is known about the interaction between melanism genes and the remainder of the genome. Lepidoptera are poikilothermic, and the colour of a moth must have major effects upon its thermal balance. Behavioural differences between phenotypes have been found in the selection of habitats and mates. The dominance relationships seem to depend upon the genetic background of the individual. Studies have been made of all of these situations in non-Lepidopteran species, and it would have been valuable if this work had been reported in the text and related to the problem of melanism.

A weakness in the book is its superficial treatment of the theoretical aspects of population genetics. The author takes a gratuitous sideswipe at "armchair biometricians". They could be forgiven for replying in kind about "moth-trap statisticians" who suggest experiments using artificial populations of melanic *Panaxia dominula* to study differences in behaviour between melanics and typicals, and to investigate the responses of insectivores (*sic*) to them.

Despite its limitations, this book is essential reading for all who profess an interest in field biology. The price is high, and one cannot imagine undergraduates buying it, but they ought to read it. Kettlewell comments that many students cannot think of suitable research projects for themselves. This book indicates many avenues of research that should be explored, even despite the recent tendency of some (who should know better) to jeer at the middle-class English interest in butterflies and snails. One chooses the organism to fit the problem, and melanism is a case in point.

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THE BIOCHEMISTRY OF CYTODIFFERENTIATION. D. E. S. Truman. First Edition, Blackwell Scientific Publications, Oxford. Pp. 116+51 text-figures, 13 text-tables, 2 plate-figures. £2.00 paperback and £3.50 cloth back.

The stated aim of the author of this slim volume has been to provide an introductory review of differentiation and development for the biochemist and of the biochemistry of gene expression in its broadest sense for zoologists and genetecists. In 105 pages of text he has set out, in what is for the most part clear readable form, the features of development and the currently accepted mechanisms for the regulation of gene expression at the molecular level.

The early chapters dealing with the morphological and physiological variation characteristic of differentiation will assist the biochemist to grasp