

BEN NEVIS AND GLEN COE.¹

SHEET 53 of the map of Scotland comprises the especially interesting area around Ben Nevis, Glen Coe, and Loch Linnhe. This district includes the highest summit in the British Isles; it presents geological problems, both tectonic and petrologic, of unusual variety, and it has a most instructive and diversified physiography. It is described in a memoir which is a most valuable contribution to Scottish geology. This work has been mainly written by Mr. E. B. Bailey, and is characterised by its high literary quality, its originality of view, its happy expressions and apt comparisons, and its sympathetic summary of previous work on the district, beginning with

being pre-glacial, cannot be due to the glacial enlargement of the main valleys.

Mr. Bailey adopts the view that the main north-west to south-east valleys are due to a pre-glacial river system, and that they were broken by cross valleys into segments separated by secondary watersheds. In the development of these river valleys he admits that earth movements played an important part, though he considers that the fractures which determined the valleys remained latent until opened by river action. He compares the valleys to the Zambesi gorge, which, though admittedly guided by fractures in the rocks, lacks the features indicative of the structural origin of these Highland valleys. Mr. Bailey attributes many of the valleys to erosion



FIG. 1.—Ben Nevis and Glen Nevis Gorge. By permission of the Controller of H.M. Stationery Office.

Macknight and Macculloch at the beginning of the last century. The problems in the Ben Nevis district of most general interest are those connected with the physiography of the Scottish Highlands. The Highland glens have been often attributed to glacial erosion, and some of their most conspicuous features to the glacial deepening of the valleys. Mr. Bailey, however, submits ample evidence that the valleys were pre-glacial, that Glen Nevis, for example, has not been glacially deepened, that some of the gorges have escaped any serious glacial modification, and that the much-quoted hanging valleys of the district,

along shatter-belts, which were attributed by Dr. Marr, the author of the term, to the crushing of a band of rocks along an oscillatory fault that may produce no final displacement of the rocks beside it. The description of shatter-belts in the memoir (pp. 215-16) gives no clear evidence as to their origin. Some are bands of broken rock along ordinary faults; some are later than the last of the Cainozoic dykes, and are therefore geologically modern. So far as can be judged from the scanty evidence given in the memoir, these formations may be bands of rocks shattered between parallel ruptures due to tension during the elevation of the country into broad, low upfolds. Mr. Bailey remarks that if many of the Highland valleys had been originated along tension clefts some of them

¹ Memoir Geol. Surv. Scotland. "The Geology of Ben Nevis and Glen Coe, and the Surrounding Country." (Explanation of Sheet 53.) By E. B. Bailey and H. B. Mauffe. Pp. x+247+plates xi.

would be found filled by gravel; but this difficulty is inherent in all theories which assign the valleys a pre-glacial age. However the glens were formed, they must once have contained river gravels, and the fundamental difficulty in the pre-glacial history of Scotland is due to the removal of the earlier gravels during the glaciation. The author objects that by a mistake the view that the Central Valley of Scotland was a rift valley due to trough faulting has been attributed to him; but he stated so in the East Lothian memoir (1910, p. 10), referring to the time "when the Central Valley was originated as a structural feature directly influencing the scenery, a true rift valley, in fact, recalling that which at the present day includes the Great Lakes of Africa."

Within the area of this memoir are many interesting igneous rocks and structures, notably the cauldron of Glen Coe. The survey of the area by Mr. Bailey and his colleagues has shown that this formation



FIG. 2.—An Steall, the waterfall from a hanging valley, tributary to Glen Nevis. Water-worn crags on left due to stream tumbling down marginal crevasse. By permission of the Controller of H.M. Stationery Office.

was due to the subsidence of a block of ground along a circular fault, up which welled a ring of igneous rocks.

The memoir also contains an important contribution to the correlation of the Dalradian rocks of this area. Mr. Bailey explains the difficulties by assuming great recumbent overfolds. His colleague, Mr. Carruthers, on the other hand, adopts a simpler explanation based on a different classification of the rocks. Mr. Bailey recognises that Mr. Carruthers's interpretation is of equal standing with his own, which is advanced tentatively. It is difficult to judge the arguments without the map, the issue of which is delayed by the war. The discussion as to which of this series of schists is the oldest and which the youngest, and of their true succession, will probably be settled in areas further east, where the problem is simpler, as the rocks have been less disturbed by the complex earth movements and prolonged igneous activity to which the Ben Nevis district owes so much of its interest and beauty.

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THE GENETICS OF SILKWORMS.¹

FEW animals lend themselves more readily to breeding work than the silkworm moth, and many valuable contributions to our knowledge of their genetics have been made by Japanese workers, among whom Dr. Tanaka has been one of the most successful. The present memoir deals with the inheritance of a number of characters. It is in part an amplification of data previously published by the same author, and in part a collection of new material. Tanaka has dealt for the most part with larval characters. He has worked out in detail the heredity of the patterns peculiar to the various races where his analysis has led him to the detection of seven Mendelian factors. Certain of these are inherited independently, but there are others forming one of those little groups about which there is at present such keen discussion in connection with multiple allelomorphs. In the present case there are four characters belong-

ing to the group, viz. striped, moricaud, normal, and plain (or, in the absence of the P factor, striped quail, moricaud quail, quail, and pale quail). As in the other cases of similar nature, either the hypothesis of multiple allelomorphs or that of complete coupling covers the facts equally well.

One of the most interesting of Tanaka's earlier publications dealt with the peculiar relation existing between the factor for yellow cocoon and certain factors for larval pattern. In the present paper this relation has been worked out in great detail, and has involved the breeding of more than 100,000 individuals. Briefly, the results are as follows: The factor for yellow shows linkage with any one of the group of four characters mentioned

above. In the female, linkage is complete, e.g. a female *ex* yellow striped × white normal forms yellow striped and white normal ova only, while a female *ex* white striped × yellow normal forms only white striped and yellow normal ova. In the male, however, the linkage is partial. The majority of the sperms are of the two parental types, but about one-quarter belong to the two other possible combinations. Thus a male *ex* moricaud yellow × striped white forms the four types of gamete, moricaud yellow, moricaud white, striped yellow, and striped white, nearly in the proportion 3:1:1:3.

In *Drosophila*, as is well known, a similar relation exists between sex and certain characters, but here it is always the male which shows complete, and the female partial, linkage. The significance of the parallel is brought out when it is remembered that in

¹ "Genetic Studies on the Silkworm." By Yoshimaro Tanaka. Journal of the College of Agriculture, Tohoku Imperial University, Sapporo, Japan, vol. vii., part 3, June, 1916. Pp. 122-256+plates i-vi.