THE PENYCUIK EXPERIMENTS.[1]

THE well-devised breeding experiments now in progress at Penycuik under the direction of Prof. J. Cossar Ewart, are, it need scarcely be said, of the highest interest both theoretical and practical. To the general biologist the subject of hybridisation affords a wide field for the investigation of laws of heredity, and especially of such subsidiary factors, whether real or only imaginary, as reversion, prepotency, saturation and telegony; while the question of the sterility of hybrids has important bearings on the general theory of evolution. But besides the purely scientific aspects of the problems which are now being attacked by Prof. Ewart, there is also their practical application, which appeals with much force to the interests of the breeder of stock. It is of course true that the whole history of animals and plants under domestication may be said to provide a body of experiments in these and similar subjects on a very large scale; and it is undoubtedly the case that many of the questions referred to have been already answered, at least provisionally. The experience of many generations of breeders has led to the emergence of certain practical rules, which are seldom if ever disregarded by those whose interests are concerned in the rearing of animals with a definite object. But it still remains doubtful how far the widely-accepted doctrines of fanciers and other breeders rest upon any firm scientific basis; and it is certainly most desirable that precise experiments should be undertaken with the sole object of arriving at the truth in such matters as prepotency, telegony and the effects of inbreeding. It cannot but be to the advantage of breeders if empiric methods founded on vague conjecture and imperfect generalisation can be made to give place to a rational system derived from exact knowledge of facts. Prof. Ewart's design ought therefore to meet with a warm welcome in scientific and practical quarters alike.

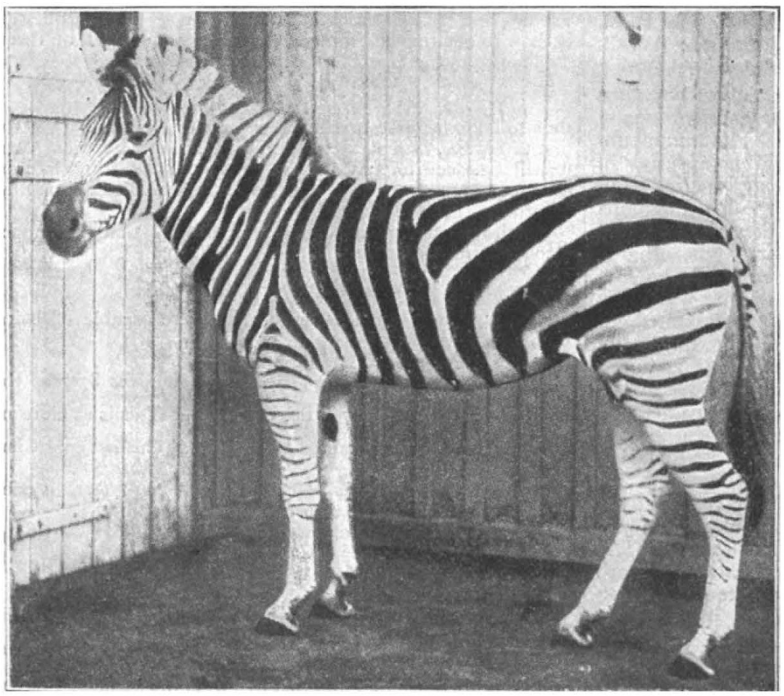

FIG. 1.—Matopo.

The volume before us contains an account of such results of the author's experiments as are now sufficiently mature for publication. It is not so much a book as a re-issue in book form of three papers that have already seen the light, together with a general introduction which, to some extent, summarises and supplements the information subsequently given. Prof. Ewart remarks that "as the problems under consideration are not of a kind that can be settled off-hand, and as one inquiry has begotten others, some years must elapse before a complete and systematic account is possible." Meantime, he thinks, the publication of his results in their present form "will indicate the lines along which the inquiries are proceeding, and also the kind of answers likely eventually to be made to some of the questions." Regarded in this way as an instalment, the volume well fulfils its purpose.

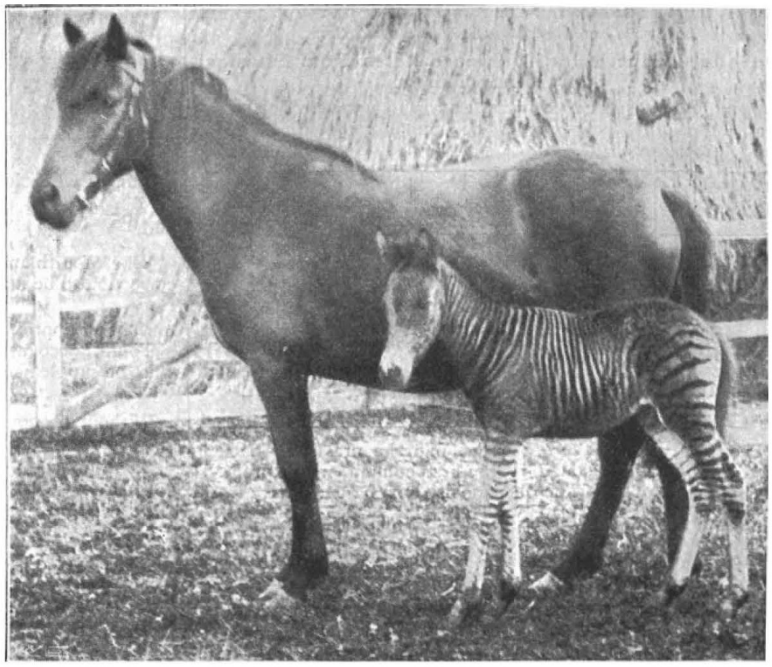

FIG. 2.—Romulus (seven days old) and his dam, Mulatto.

The first paper is chiefly devoted to a detailed descrip-

[1] "The Penycuik Experiments." By J. C. Ewart M.D., F.R.S., Regius Professor of Natural History, University of Edinburgh. Pp. xciii + 177. (London: Adam and Charles Black, 1899.)

tion of "Romulus," a hybrid colt whose sire "Matopo" is a Burchell's zebra of the *Chapmani* form, and whose dam "Mulatto" is an Island of Rum pony. "Mulatto" was afterwards crossed with a grey Arab stallion "Benazrek," and a description of her second foal, which unfortunately only lived for a little over five months, is given in the last paper under the head of "Telegony and Reversion." The foal in question was naturally a centre of great interest, inasmuch as from its parental history it afforded an opportunity for the operation of the alleged principle of telegony. The answer returned by nature to this particular interrogation was, as is so often the case, ambiguous. The colt was certainly striped, but the stripes were not like those of Mulatto's first mate; nor, on the other hand, did they entirely resemble those stripes often obscurely visible in ordinary foals. The evidence so far, though in no way conclusive, seemed to be capable of interpretation in accordance

FIG. 3.—Matopo.

with the theory of telegony. However, in the general introduction, after giving the results of a fresh comparison with pure-bred foals, and adding an account of three additional experiments of the same kind, the author concludes that in no one of these cases is it possible to maintain that infection, saturation, or telegony has taken place. The results of further trials with rabbits, dogs and pigeons have also at present been uniformly negative.

In the second paper, particulars are given of a further batch of hybrids sired by the same zebra stallion "Matopo"; the dams being respectively a Shetland and an Iceland pony, an Irish mare and a cross-bred Clydesdale mare. All presented points of interest, and the extent to which they resembled their sire or respective dams varied much, but it was found that even those which in several characters most distinctly suggested the zebra sire differed entirely from him in markings. According to Prof. Ewart, the markings of his hybrids accord fairly with those of the Somali zebra, which he regards as being the most ancestral in its colour-pattern of all recent Equidæ.

If this is really the case—and it is difficult to find any weak spot in the author's cautious yet cogent line of argument—the hybrids in question supply one more good illustration of Darwin's principle that the crossing of distinct species frequently leads to reversion. It may here be remarked that precisely the same conclusion seems to follow from the elaborate experiments in the hybridisation of insects recently conducted at Zürich by Dr. M. Standfuss. The latter investigator, it is true, speaks only of the "prepotency of the phylogenetically older" of the two parent species; but, while he refrains from actually using the term "reversion" with regard to his hybrids, he records the fact that some of them exhibit characters which must have belonged to an

FIG. 4.—Romulus.

ancestor of one of the parent species, though absent from the parents themselves.

With regard to the zebra hybrids now under discussion, the most striking point of difference in marking between "Romulus" and the other cross-bred foals on the one hand, and their common sire "Matopo" on the other, is the multiplication of stripes in the former, and the tendency to the production of a gridiron pattern over the rump. The last-named of these characters resembles the condition seen in the mountain zebra, an earlier form, according to Prof. Ewart, than the Burchell group, while the former point recalls the still more ancestral pattern of the Somali zebra. In the Shetland pony's hybrid, "Norette," the pattern over the hindquarters from the first resembled that of the Somali zebra; in the other hybrids, the markings of the same region, indeterminate at first, finally settled down into a form suggestive rather of the less remote stage marked

by the mountain zebra. The difference in the general system of striping between "Matopo" and his offspring is well brought out in the figures here reproduced, by the courtesy of the publishers, from Prof. Ewart's work. A more special point, but one of great interest, is that exemplified in the accompanying figures of the brow-stripes in "Matopo," in "Romulus," and in a Somali zebra. The numerous rounded arches shown on the forehead of "Romulus" are very different from the four or five acutely pointed arches of "Matopo," and clearly bear a much greater resemblance to the corresponding pattern of the Somali zebra. It should, however, be mentioned that a system of brow-striping not unlike that of "Romulus" occurs in Crawshay's zebra, a member of the Burchell group.

On one point of special importance the experiments have so far given results that, however interesting scientifically, are from the practical side disappointing. Following a suggestion of Captain Lugard, that zebra mules might possibly turn out to be immune to the disease communicated by the tsetse fly, and might thus help in solving some of the difficulties of African transport, Prof. Ewart, with great liberality, inoculated three of his hybrids with some of the tsetse organism at that time under investigation by Messrs. Blandford and Durham. The result of this experiment is not given in the present volume, but in the recently published *Proceedings* of the International Congress of Zoology at Cambridge it is stated that the inoculated animals, though apparently somewhat more resistant than horses, all died in about eight weeks.

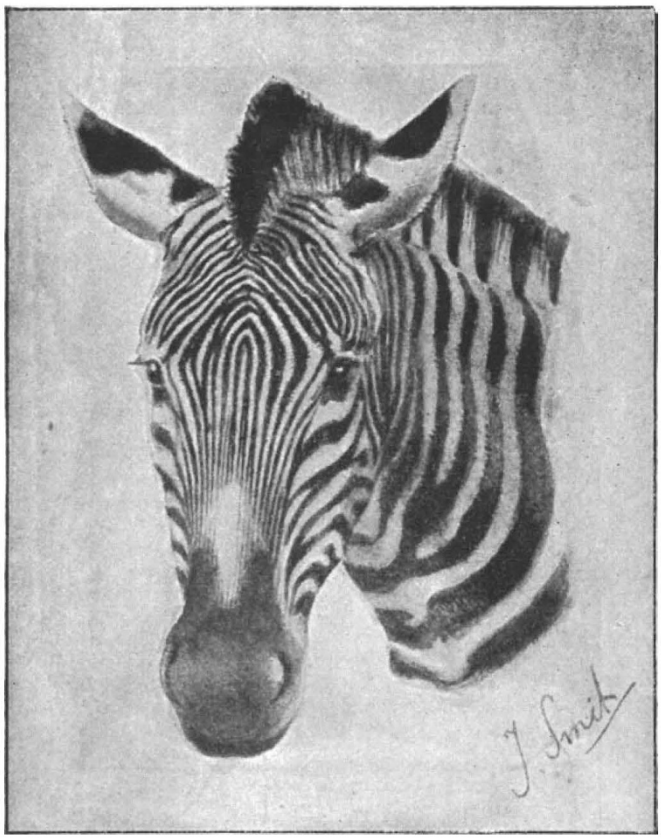

FIG. 5.—Somali Zebra.

The above-mentioned are a few only of the points of interest brought out by the remarkable series of experiments dealt with in the present volume, but enough has probably been said to show the importance of the problems which Prof. Ewart has set himself to solve, and the prospects of advance in knowledge which these researches hold out. It only remains to say a word in commendation of the general get-up of the book, and of the character and accuracy of the illustrations, which in many cases are reproduced from actual photographs. The absence of an index or detailed table of contents is a drawback, but this, like the frequent repetition of the same facts, is perhaps inseparable from the method of publication adopted. A tabular list of the hybrids, giving their parentage and the more important features of their aspect, might be a useful addition, as the reader finds it a little difficult at present to piece together the various details, scattered through many parts of the work, under their proper headings. But any small defects of this kind will, no doubt, be completely remedied in the connected and systematic account of the fruit of his researches which Prof. Ewart leads us to hope for at some future time. Meanwhile, the course of his experiments will be watched with keen interest by all those who realise the importance, both scientific and practical, of a right conception of the laws of heredity. F. A. D.

PIONEER CLIMBERS.[1]

NOTWITHSTANDING what has been done by Coolidge and Freshfield, by C. E. Mathews and F. Pollock, for the pioneers in mountain climbing, there is still room for a book so comprehensive as that before us. Mr. Gribble has collected a quantity of interesting information, and prints at the end of his work several rare and curious documents. It is, moreover, not wholly restricted to the Alps, for it touches on early ascents in the Pyrenees and the Apennines. These, however, are distinctly subordinate; the interest, as is only natural, centres on the mountain backbone of Europe. This is many-sided, but on the present occasion we must restrict ourselves to aspects more or less scientific. A wide question is suggested at the outset: What caused that horror of mountains which was evidently so genuine among the chief nations of Europe till a period comparatively late in history? It was not felt by the Hebrew, as Mr. Gribble shows, but the Greek seems to have cared little for them, and the Roman detested them. Perhaps the practical nature of this people viewed them as an impediment to "imperial expansion," a sentiment hinted at in Napoleon's question, "When will the Simplon be practicable for cannon?" Moreover, in Rome's more luxurious days the rough roads, hard fare, and bad lodging of a journey across the Alps would naturally be objectionable. Classical influences, with a certain sympathetic similarity, may have caused the dislike once so general among our own countrymen, which has only been changed during the last thirty or forty years. These have witnessed a revulsion of sentiment which, whatever be its cause, is certainly one of the remarkable features in the later part of the nineteenth century.

But to pass from a general question to more particular topics, we can incidentally gather from this volume no bad idea of how some parts of scientific knowledge have advanced during the last four centuries. Prior to this epoch men knew little of science, and less of the mountains; pioneers were few, and the history of climbing—except when there was no help for it—was almost

[1] "The Early Mountaineers." By Francis Gribble. Illustrated. (London: T. Fisher Unwin, 1899.)