

May 13 to 16 there fell 106 mm. rain, about *one-ninth* of our total yearly quantity; on the 13th, 26 mm.; 14th, 27·6; 15th, 22·4; 16th, 30. These heavy rains were undoubtedly due to the northern storm, although they came two days later.

Caracas, June 29

A. ERNST

The Indivisibility of Certain Whole Numbers

ANOTHER exception has been found to Fermat's assertion regarding the indivisibility of whole numbers of the form $2^{2^m} + 1$ (see several notices in NATURE, vols. xviii. and xix.). The matter now stands as follows:—

$$\begin{array}{ll} 2^5 + 1 & \text{divisible by } 5 \cdot 2^7 + 1 \text{ (Euler)} \\ 2^6 + 1 & \text{,, } 1071 \cdot 2^8 + 1 \text{ (Landry)} \\ 2^{12} + 1 & \text{,, } 7 \cdot 2^{14} + 1 \text{ (Pervouchine)} \\ 2^{23} + 1 & \text{,, } 5 \cdot 2^{25} + 1 \text{ (Pervouchine)} \\ 2^{36} + 1 & \text{,, } 5 \cdot 2^{39} + 1 \text{ (Seelhoff).} \end{array}$$

M.

A Quadrupe Duck

IT may interest some readers of NATURE to hear that there is at present living in Bardsea a duck which has four feet. The two abnormal feet, which are webbed like the others, and of the same shape and size, spring from one leg, which is about the same length as the normal legs, but rather thicker. This leg grows from a point just beneath the tail. Its bone does not seem to be directly connected with the other bones of the bird, as it can be freely moved in any direction. This duck is more than a month old, and is healthy. EDWARD GEOGHEGAN
Bardsea, August 3

PHYSIOLOGICAL SELECTION: AN ADDITIONAL SUGGESTION ON THE ORIGIN OF SPECIES¹

I.

THERE are three cardinal difficulties in the way of natural selection, considered as a theory of the origin of species.

(1) The difference between species and varieties in respect of mutual fertility. Many of our domesticated varieties differ from one another to an extent greater than that which distinguishes many natural species: yet they continue perfectly fertile *inter se*, while the natural species are nearly always more or less sterile. The difficulty is not met by pointing to the fact that sterility between natural species is neither absolutely constant nor constantly absolute; for the question still remains, Why are the modifications of organic types supposed to have been produced by natural selection, so generally attended with some more or less pronounced degree of mutual sterility, when even greater modifications of such types produced by artificial selection so generally continue mutually fertile? That this question does not admit of any answer by the theory of natural selection Mr. Darwin himself acknowledges, and therefore suggests a wholly independent hypothesis by which to explain the fact. This hypothesis is, that varieties occurring under nature "will have been exposed during long periods of time to more uniform conditions than have domesticated varieties, and this may well make a wide difference in the result." Now, whatever we may think of this hypothesis, it is certainly quite distinct from the theory of natural selection; and, therefore, any one who adopts the supplementary hypothesis is, so far, confessing the inadequacy of that theory, considered as a theory of the origin of species. For my own part, I deem the hypothesis wholly insufficient to meet the facts. When we remember the incalculable number of species, living and extinct, we immediately feel the necessity for

¹ Abstract of a Paper read before the Linnean Society on May 6, by George J. Romanes, M.A., LL.D., F.R.S. &c.

some much more general explanation of their existence than is furnished by supposing that their mutual sterility, which constitutes their most general or constant distinction as species, was in every case due to some incidental effect produced on the generative system by uniform conditions of life. To say nothing of the antecedent improbability that in all these millions and millions of cases the reproductive system should happen to have been affected in this peculiar way by the merely negative condition of uniformity, there remains what seems to me the overwhelming consideration that, at the time when a variety is first forming, the condition of prolonged exposure must necessarily be absent as regards that variety: yet this is just the time when we must suppose that the infertility with its parent form arose. Because, if not, the incipient variety would have been reabsorbed into its parent form by intercrossing.

(2) For the swamping effects of free intercrossing upon an individual variation constitutes the next, and perhaps the most formidable, difficulty with which the theory of natural selection is beset. The only answer which Mr. Darwin has to make in this case is that a number of individuals inhabiting the same area may vary in the same way at the same time. Of course, if this assumption were granted, there would be an end of the present difficulty; for if a sufficient number of individuals were thus similarly and simultaneously modified, there need no longer be any danger of the variety being swamped by intercrossing. But the force of the difficulty consists in the very fact of this assumption being required to meet it. The theory of natural selection trusts to the chapter of accidents in the matter of variation; and in this chapter we read of no reasons why the same beneficial variation should arise in a number of individuals simultaneously. Moreover, if it does so, the fact of its doing so cannot be attributed to natural selection, which thus again fails as a theory of the origin of species. Lastly, as will immediately be shown, a very large proportion, if not the majority, of features which serve to distinguish species from species, are features presenting no utilitarian significance; and, therefore, even if it be conceded that they each arose in a number of individuals simultaneously, their reabsorption by intercrossing could not have been in any degree hindered by natural selection.

(3) The difficulty just alluded to of the inutility to species of so large a proportion of specific distinctions, is one which Mr. Darwin frankly acknowledges in the later editions of his works. In other words, he allows that a large proportion of these distinctions resemble the more general distinction of sterility in not admitting of any explanation by the theory of natural selection. They consist of small and trivial differences of form and colour, or of meaningless details of structure, which, being of no service to the plants or animals presenting them, cannot have arisen through the agency of natural selection. If it be suggested that all such distinctions are of disguised utility, the answer is that to offer this suggestion is to reason in a circle. For the only evidence we have of natural selection as an operating cause in any case is derived from the utility of the observed results: therefore, in cases where utility is apparently absent, we may not assume that it must be present only because, if it were not present, the results must be due to some cause other than natural selection. Observe, the case would be different if the great majority of specific distinctions—like the great majority of higher distinctions—were of obvious utilitarian significance; for in this case we might reasonably set down the exceptions as proof of the rule, or hold that they appear to be exceptions only on account of our ignorance. But it is certainly too large a demand on our faith in natural selection to appeal to the argument from ignorance when the facts require that the appeal should be made over so very large a proportion of instances. But it is needless further to insist upon this