

LETTERS TO THE EDITOR.

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Mendelian Characters among Shorthorns.

I HAVE just come upon a phenomenon which, although it may be interesting to naturalists, may be alarming to breeders of Shorthorn cattle. It is that the roan Shorthorn is a hybrid, and must remain so for ever.

The data on which this statement is based are to be found in a paper on the inheritance of coat-colour in cattle, by Miss A. Barrington and Prof. Karl Pearson, published in *Biometrika* for March, 1906.

For the purposes of their paper these authors, having examined in the Shorthorn Herd-book the pedigrees of more than 2000 calves, noted the colours of these and their parents, and analysed and tabulated the figures found. They divided the sires and dams according to the colours under which they are registered, and then made an analysis of the colours of the calves produced. There are five different colours registered, viz. red, red and little white, red and white, roan, and white. A sire of any one of these colours may be bred with a dam of any one of them. Miss Barrington and Prof. Pearson made an analysis of the colours of the calves produced by bulls of all the five colours when bred with cows of every one of the same five colours. For instance, they found that by mating 514 roan bulls with 514 roan cows there had been produced eighty-six red calves, thirty-one red with little white calves, thirty-five red and white calves, 278 roan calves, and eighty-four white calves.

These cases at a first glance give rise to no Mendelian suggestion. No more does the full collection of cases. Miss Barrington and Prof. Pearson failed to find in them any Mendelian indications.

But if we consider the nature and history of the Shorthorn breed the Mendelian characters come out. The Shorthorn is a composite breed. A hundred and fifty years ago it consisted of at least three, and possibly four, different strains. The chief ancestry came from the Low Countries. They were red-and-white flecked cattle—*fleckvieh*. In Durham and Yorkshire they wedged themselves in between the original British black cattle in the north and the Anglo-Saxon red cattle in the south. They also possibly reached westwards to the Longhorns. The Anglo-Saxon red cattle were probably the purest. The northern black cattle and the western Longhorns were not pure. They were intermixed with white cattle—cattle which had been introduced originally by the Romans. It was impossible for the recently introduced flecked cattle not to become mixed with black blood in the north, with white blood in the north and west, and with red blood in the south. Breeders, however, did not like the black blood, and it was soon bred out. The white was retained, but, so far as I know, it is difficult to say how much Anglo-Saxon red blood was retained. It is on that ground any uncertainty arises. But, if red blood was retained, it was nearly related to the red and white blood introduced from the Continent.

If we look upon the Anglo-Saxon red cattle and the Low Country red-and-white cattle as being of one race, then, since the black blood was bred out, the Shorthorn is a combination of two races. If we look upon these red and red-and-white cattle as different races, then the Shorthorn is a combination of three.

I tried to find Mendelian characters among the cases collected by Miss Barrington and Prof. Pearson by assuming the Shorthorn to be a three-fold combination, but unsuccessfully. Then Prof. Arthur Thomson's account of the blue Andalusian fowl in his newly published "Heredity" suggested the idea that the red, red and little white, and red-and-white Shorthorns might be taken as one race. Are not these Shorthorns splashed reds just as one of the blue Andalusian parents is "splashed white"? The Shorthorn, then, becomes a composite breed with one parent white and the other splashed red.

Assuming this to be so, then the Mendelian characters of the Shorthorn come out. There are one or two small discrepancies, but they can be explained. It is sometimes difficult to say whether a calf is red-and-white or roan. Thus all that are labelled red and white may not be really red and white, and all that are labelled roan may not be really roan. Among Shorthorn breeders white calves are not desirable. Cases of false registration and the substitution of another calf for a white—that is, giving a red or a roan calf a white calf's pedigree—have not been unknown. Thus some red or roan calves may not be the progeny of the parents attributed to them. For the same reason that white calves are undesirable, a good many white calves are not registered at all. Thus the real numbers of white calves born are greater than the numbers registered, and the number of matings recorded is less than it ought to be through matings that produced white calves being unrecorded. For the reason that white calves are not wanted, a white bull and a white cow are very seldom mated. Thus very few such matings are registered.

Assuming the horthorn to be a combination of two races, a red and white, then, according to the Mendelian formulæ as exemplified by the blue Andalusian fowl, we ought to get the following results:—

- (1) Red crossed by red should give red calves.
- (2) White crossed by white should give white calves.
- (3) Red crossed by white should give roans.
- (4) Roans inbred should give reds, whites, and roans in the proportion of 1, 1, 2.
- (5) Roans crossed by reds should give roans and reds in equal proportions.
- (6) Roans crossed by whites should give roans and whites in equal proportions.

This, giving heed to the expected exceptions as indicated above, is what we find, viz. :—

	Red	Roan	White
438 Reds crossed by reds give ...	413	25	0
3 Whites crossed by whites give ...	0	0	3
71 Reds crossed by white give... ..	3	68	0
514 Roans crossed by roans give ...	152	278	84
456 Roans crossed by reds give ...	226	230	0
23 Roans crossed by whites give... ..	0	14	9

For the breeder of Shorthorns this means that, if he wishes to avoid white calves, he is limited to three crosses, viz. red with red, red with roan, and red with white. He gets whites when whites are bred together, when whites are bred with roans, or when roans are bred together.

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The Nature of γ and X-Rays.

IN a letter to NATURE of January 23 (p. 270) Prof. Bragg mentions the results of some experiments on γ rays from which he concludes that the ether pulse theory of γ rays is not tenable, but which support his theory that the γ rays consist of neutral pairs revolving in a plane containing their direction of translation. From the close resemblance of X-rays to γ rays he assumes that they also consist of neutral pairs. His reasoning seems to be that if the γ rays are ether pulses only, they should produce in any substance which they strike secondary kathode rays which come off equally in all directions, and if they do not the ether pulse theory cannot be correct.

Prof. Bragg's experiments show that the secondary kathode rays coming from the side of a substance on which the γ rays fall differ in the amount of ionisation they produce from those coming from the side from which the γ rays emerge. Also that the "emergence" kathode rays from a substance of low atomic weight are greater than those from a substance of higher atomic weight, while with the "incidence" kathode rays the substance of high atomic weight gives off more than the substance of lower.

I have been working for some time upon the secondary kathode rays produced by X-rays with a form of apparatus which can be easily adapted for a repetition, with X-rays, of Prof. Bragg's experiments with γ rays (see *Amer. Jour. Sci.*, October, 1907, p. 285). I have therefore tried to