

established by some form of agreement. But whatever the method there was no doubt about the ascendancy acquired by the Germans. The case of lead may be cited as an example. Before the war the Germans were, by means of the so-called Lead Convention, which they organised, placed in complete control of the lead trade of the world. Attempts were also being made to secure the control of all the free lead of the world. As regards zinc the position has already been described in the columns of NATURE (October 19, 1916). At the outbreak of war this control was a source of great embarrassment to the Government, and for quite two years afterwards the cause of this country and its Allies was severely handicapped because we were without the necessary metal supplies, and many trades were in jeopardy. Had not the U.S.A. come to the rescue in supplying these deficiencies, particularly as regards copper, zinc, and lead, it is very doubtful whether the Allies would have been able to avoid defeat.

In order to obtain the best expert advice on the problem of how to meet this difficulty in the future, the late President of the Board of Trade appointed a strong committee composed of representatives of this country, and to this Sir Albert Stanley, the present occupant of the position, added three members representing respectively Canada, Australia, and South Africa. According to the statement made by him in moving the second reading of the "Non-ferrous Metal Industry Bill" in the House of Commons on December 3, the Committee came to the conclusion that an essential preliminary condition of the successful organisation of any counter-measure was to secure, at all events for a period after the war, that all trace of German influence and association—direct or indirect—should be eliminated from any undertaking allowed to do business in this country. The Bill aims at achieving this object.

Clause 1 provides that it is unlawful to deal in certain metals and ores without a licence. The licences to be granted are renewable annually. Clause 2 gives the Board of Trade power to require certain information and to inspect the books and documents of persons or firms who apply for, or obtain, licences. Clause 3 provides for certain penalties for contravention of the Act. Clause 4 empowers the Board of Trade to make rules for carrying out the Act, and Clause 5 specifies the metals and ores to which the Act applies. The Act is intended to be in force during the war and for five years after its termination. The President of the Board of Trade stated that the measure is designed, not in the interest of "the trade," but in that of the nation, and that the control of metals which are so essential to the development of British industries must not be allowed to fall again into German hands after the war. He also claimed that the power of control given by the Bill will be a distinct step towards securing our economic freedom.

The discussion took a somewhat curious course. The rejection of the Bill was moved by Mr. J. M. Henderson, but his amendment was not seconded,

and, therefore, was not put from the chair. Later the rejection was moved by Sir F. Banbury, and this was seconded. Finally, the debate stood adjourned. The discussion was resumed on Tuesday, December 11, when, in a division on the amendment that the Bill be rejected, there voted against the rejection 182, and for it 79, giving a majority of 103 against rejection. The result was that the Bill was read a second time.

H. C. H. CARPENTER.

THE ROLE OF SELECTION IN EVOLUTION.¹

ABOUT the beginning of the twentieth century the current of doubt as to the evolutionary importance of processes of selection grew rapidly in strength, and swept not a few naturalists off their feet. Bateson and De Vries produced evidence of the frequent occurrence of discontinuous variations or mutations; De Vries began methodical testings of what selection could do in the course of years with maize, buttercups, striped flowers, and four-leaved clover—the general outcome being that it did not do very much; and Johannsen, working carefully on "pure lines" of beans, which are self-fertilising but show fluctuating variation in the size of the seed, proved that selection continued generation after generation in a particular direction may be without result, so far as any change in average seed size is concerned. These and other considerations led to a depreciation of the importance of selection processes. As Prof. W. E. Castle says in a very interesting pronouncement:—

In the minds of many biologists at the present time selection is an obsolete agency in evolution, and an adequate explanation of evolution is to be found only in mutation and pure lines. I believe this to be a mistaken view, not because mutation and pure lines are false, but because their applicability is very limited compared with the broad field of organic evolution. To universalise them is to hide the world by holding a small object close to the eye.

As De Vries has always insisted, mutations come we know not how, but selection determines which must go and which will stay. According to Darwin, new types are for the most part established gradually; according to De Vries, they arise abruptly. According to Darwin, new types are for the most part plastic; according to De Vries, new types are fully stable. According to Darwin, one evolutionary change follows upon, and is made possible by, another; according to De Vries, one evolutionary change has no necessary relation to another. According to Darwin, natural selection determines what classes of variations shall survive, and, in consequence, what shall be the variable material subjected to selection in the next generation; according to De Vries, natural selection determines only what classes of variations shall survive, and exercises no influence on the subsequent variability of the race. According to Darwin, the further evolution of our

¹ Journ. Washington Acad. Sci., vii. (1917), No. 12, pp. 369-87.

domestic animals and cultivated plants (and of man himself) is to some extent controllable, because we can by selection influence the variability of later generations; according to De Vries, evolution is beyond our control except as we discover and isolate variations. Thus does Prof. Castle contrast the two sets of views, which "remind us somewhat of the theological ideas of free-will and predestination respectively." But which view is right?

The evidence from palæontology, geographical distribution, and classification tends on the whole in favour of the Darwinian view that "evolution as an age-long process has been gradual and progressive, not abrupt and unguided," but the evidence from experimental breeding leans to either side. The mutationists hold that selection "can do nothing but isolate variations which may sporadically put in an appearance or which may by hybridisation be brought together into new combinations." The selectionists, with whom Prof. Castle ranks himself, maintain that selection "can accomplish more than the mere isolation of variations, because it can, by a series of selections, influence further variability." How is one to decide?

Prof. Castle considers carefully the attempts that have been made to generalise Johannsen's brilliant discovery of the principle of "pure lines," and shows that this is not warranted. In the case of certain characters in guinea-pigs he has himself found that a *ne plus ultra* is reached which cannot be changed by selection in an inbred race. "Thus a very dark form of Himalayan albino, after a certain amount of improvement by selection, could not be further darkened to any appreciable extent." On the other hand, certain characters of guinea-pigs, rabbits, and rats have been found to respond readily to selection in a particular direction. Prof. Castle's experiment with hooded rats "selected simultaneously in *plus* and *minus* directions has produced one race which is black all over except a white patch of variable size underneath, and another race which is white all over except for the top of the head and the back of the neck, which are black. The races do not overlap at all, and have not done so for many generations, though they still continue to diverge from each other as a result of continued selection."

It comes to this, that divergent conclusions are in part due to the data utilised.

"A study of albinism alone would lead one to believe in the fixity and constancy of Mendelian genes and the impossibility of modifying them by selection." But "in the case of such characters as white spotting in mammals, it is evident that a change in the mean of the character in a particular direction in consequence of selection actually displaces in the direction of selection the centre of gravity of variation, so that in a very true sense selection makes possible further variation in that same direction."

Selection cannot start new lines of variation, but it can continue and extend variation already initiated.

J. A. T.

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THE FUTURE OF THE TRADE IN COLONIAL RAW MATERIALS.

IT is now well known that before the war large quantities of raw materials produced in the British Colonies found their way in the first instance to Germany, where they were converted into manufactured products, of which considerable quantities were then exported from Germany to this country and other parts of the Empire. Most people are now of opinion that this indirect method of trading should not be resumed after the war, and that these intermediate processes of manufacture should be carried on in this country, or at least within the Empire. It has also become clear, especially in the last few months, that immediately after the war there will be great competition among all the manufacturing countries for supplies of raw materials, and probably most people in the Allied countries, who realise that the Allies effectively control the bulk of the world's supplies of such materials, are of opinion that the Allies should utilise this advantage to meet their own requirements first.

There can be little doubt as to the trend of public opinion on these points, but it is not at all clear what action, if any, is being taken to give effect to it, except in the one case of West African oil-seeds, which was investigated by a special committee appointed by the Colonial Office in 1915. That committee recommended the imposition of an export duty on palm kernels exported from British West Africa to be crushed in countries outside the Empire, and this recommendation was adopted by the Secretary of State for the Colonies, with the result that the palm-kernel crushing industry established in this country since the war is likely to remain here in future. The publication of the results of the British committee's investigations has apparently stimulated the Colonial Institute at Marseilles into conducting similar inquiries into the sources of supply of the raw materials which form the basis of two of the chief industries carried on in Marseilles, namely, oil-seeds and cereals.

Committees have been appointed by the Marseilles Colonial Institute to investigate these two groups of raw materials, and the Oil-seeds Committee has already published two special bulletins. The first of these contains the report (in French) of the British West African Oil-seeds Committee, and the second gives a *résumé* of some of the evidence taken by that committee, a translation of a portion of the Imperial Institute monograph on oil-seeds and feeding-cakes (Murray, 1915), and some preliminary information regarding the work of the French committee. The latter is first taking up questions connected with the trade in ground nuts, the most important oil-seed crushed in Marseilles; and the bulletin contains evidence for and against the decortication of ground nuts before shipment, a matter of first-rate importance in connection with the ground-nut trade of India. Hitherto, it has been held that ground-nut oil of edible quality cannot