

any of the great studs average more than 15 lb. for a ewe and more than 20 lb. for a ram—wool, too, of better quality.

Photographs of the champion rams each year from 1895 until 1936 show clearly the changes which have taken place in the body form of the Australian merino. Progress in the development of the body and in the constitution has been marked. The hardest improvement to obtain appears to have been to increase the length of the staple without loss of the other properties, but this has been done by the gradual process of selection. The success of the outstanding Peppin stock is attributed to the founder's idea of letting the sheep develop to suit the food and climate of the country. The failure of the Vermont stock from America, after their size had led to a craze for their importation, is attributed to a lack of suitability to environmental conditions.

It is concluded that breeders should preserve and utilize by inbreeding the outstanding qualities of every excellent animal: inbreeding is the most powerful tool available to the breeder. Inbreeding of a good strain makes it possible to produce superior animals more quickly than by any system of selecting and mating unrelated animals. The behaviour of strains when submitted to inbreeding is the surest test of their worth.

As to probable future developments, the author foresees breeding in much smaller flocks, and with this the danger of the loss of uniformity which is the feature where one man has directive control over large numbers of animals. A knowledge, too, is needed of the chemical nature of the food best suited to wool growth, for the best sheep are produced on the medium grass and salt bush country and not on the rich fattening areas.

J. H.

Science and Free Will

Free Will or Determinism

By Dr. M. Davidson. Pp. xv + 203. (London: Watts and Co., 1937.) 10s. 6d. net.

IN recent years experimental work in physics has led to theoretical conceptions which suggest that the movements of atoms and electrons are just as indeterminate as human action. Yet it is doubtful if Prof. Max Planck's quantum theory will rule out determinism for those who prefer, for logical or other reasons, to hold to that view. It has not made Dr. M. Davidson or Prof. H. Levy relinquish a strictly mechanistic view of Nature. Prof. Levy, for example, argues that those who maintain that recent physical research has exposed a fundamental indeterminacy in Nature must explain away the determinism that has been established on the large scale. On the other hand, Sir Arthur Eddington asserts that "Classical physics foists a determinate scheme on us by a trick; it smuggles the unknown future into the present, trusting that we shall not press an inquiry as to whether it has become any more knowable in that way". Perhaps the truth is that if one believes in free will for other reasons—the experience of volition, for example—one is thankful for the quantum theory as a crack in the fabric of the mechanistic view of Nature. Judicious leverage may, one hopes, make it wider. Hence the anxiety in some quarters to fill it with cement.

Perhaps the best line of attack on the mechanists

is not to look for cracks in their system, but to ask whether a strictly mechanistic view has not its difficulties too, though they can be easily ignored because they lie on the surface. Is it not now coming to be recognized that the method of science is, after all, realist, not nominalist (to use the scholastic terminology)? Does science not proceed on the theory that reason and logic have a reality of their own, even apart from particulars? In a word, is not science idealist (to use modern terminology)?

In his chapter on the mechanistic view of life, Dr. Davidson seems to end up on a note of some dubiety. For while he says that Loeb and his school have pushed the problem back a long way, he adds that it still remains unsolved, though it does seem that "some day the final word on vital phenomena may be spoken by the physicist". Then he observes that, "In the present state of our knowledge we can only endorse the words of Dr. Benjamin Moore: 'In the processes of cell reproduction and division there is a type of energy at work never found elsewhere than in living organisms'." But the late Dr. Moore's doctrine of a vital force was, from the mechanistic point of view, a heresy.

Dr. Davidson has provided a useful summary of arguments in favour of holding fast by the deterministic view, though he cannot be said to have contributed anything new to the solution of the problem.

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