

In discussing the second factor, the quality of milk yield, the author describes an experiment conducted by Count Ahlefeldt, wherein Red Danish cattle, with an average yield of 3.42 per cent. milk, were crossed with Jerseys averaging a yield of 5.22 per cent. milk. The hybrid offspring averaged a yield of 4.15 per cent. These cross-bred animals were bred back to the parental Jerseys. The author points out that if quality of yield behaves in Mendelian fashion, one half of the animals, regardless of their other traits, would yield milk of Jersey quality, and one half of them would yield the cross-breed quality. Analyzing the table given by the author, we find that of the 15 offspring of such matings 7 yielded 4.7 per cent. or richer milk, and 8 yielded below this quality. If the types of offspring from the *Cross by Red Danish*, and *Cross by Cross* matings approximate as closely to the Mendelian expectation as the *Cross by Jersey* mating just described, and the matings are extensively made, then, even though yield may be governed by a host of unit traits, they would appear, for practical purposes, to move in synchronism, and the practical breeder would have a working principle of value. One would suspect, however, that such a complex thing as quality would shatter in the subsequent inbreeding of hybrids. More data are required.

The author points out that yield of butter is not a fair basis for breeding selection, because butter yield is dependent upon two factors, namely, quality and quantity of milk. Each one of these factors should be taken as a basis for selection, and a combination of high quality and high yield sought by Mendelian methods. He sees no sound reason why high quality and great quantity of yield should be mutually exclusive; he believes they can be combined by Mendelizing.

If any adverse criticism were to be rendered, it must be said that throughout the book the author disregards the exceptions to the rule when describing the heredity of an animal characteristic which appears to approximate Mendelian expectation. For instance, continual reference is made to color inheritance in Shorthorn cattle, assuming the case exactly

parallel to that of the Andalusian fowl, wherein the first generation hybrid is a blend and segregation occurs in the second generation according to Mendelian formula. Whereas it has been found that Shorthorn coat color is neither one unit nor a single group of units, but behaves in heredity as two units, or unit groups, the areas for the white hairs in the roan behaving as one unit, and the areas for the red as another. Moreover, a red mated with a red does not *always* produce a red, although it *generally* does so. If the whole coat color were a single unit, behaving in Mendelian fashion, then *red by red* would produce only red. To a well-known exception of this sort the author should not be blind; to him, as he so clearly points out in reference to the older studies and theories, it should point toward future studies and discoveries, each with its gold and dross. It would seem more reasonable continually to urge the analysis of gross somatic characteristics into heritable units which, without exception, behave according to rule. However, a rule that works nine times out of ten is a good one for the practical man to follow, and to him is an instrument of inestimable value, although to the theorist the one exception is the thing that commands his interest and work.

To summarize, the book is a special plea for the practical application of the Mendelian principles to animal breeding, and as such, the case is better established than in any other practical breeder's guide with which the reviewer is acquainted. In general, it recognizes the limitations of the present knowledge of Mendelian traits in domestic animals, and in a wholesome manner urges further investigation, as well as the courageous application of current theories by practical breeders.

The author's style is literary, his English clear, and his argument is easy to follow.

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The First Principles of Evolution. By S. HERBERT. London, A. & C. Black; New York, The Macmillan Co. 1913.

Notwithstanding the large number of books that have already been published on evolution, the author of the above work believes that there is still a need for another which will present the subject, not as a theory that is on trial, but as an established principle in terms of which men must be taught to think. The popular tendency to regard evolution and Darwinism as synonymous terms is the result of the historical development of the theory largely on the basis of facts derived from organic nature, and its wider application as a philosophical principle has been thereby obscured. To correct this misconception the earlier chapters of the present work are devoted to an exposition of cosmic, geological and atomic evolution, this last leading to a brief and rather inadequate consideration of the origin of life, whence there is a natural transition to the discussion of organic evolution. Unfortunately, however, for the broader conception which the author seeks to emphasize, this last and more familiar side of the subject is given more than three times the amount of space granted inorganic evolution and this is all the more regrettable since the treatment of organic evolution does not compare altogether favorably with that to be found in other familiar works which naturally suggest themselves, especially since the illustrations are merely reproductions of well-known figures from Darwin, Wallace, Weismann and especially Romanes. Credit must be given, however, for a clear and concise statement of the various theories that have been advanced as an explanation for organic evolution, Darwinism and Neo-Darwinism, Lamarckism and Neo-Lamarckism, mutations, orthogenesis, entelechies, Bathmism and even the metaphysical subtleties of Bergson being briefly expounded and criticized.

The last hundred pages of the book are devoted to what the author terms superorganic evolution, under which heading are discussed mental, moral and social evolution, sufficient being said upon each of these topics to give the reader a fair idea of the trend of modern thought in connection with questions of the utmost importance to society.

The book is one that may be sincerely recommended. Like an earlier work by Dr. Herbert, "The First Principles of Heredity," it is the outcome of a series of lectures delivered to popular audiences, and, while clear and concise in statement, it is excellent reading. A well-selected bibliography is appended and also a glossary of unavoidable technical terms.

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SPECIAL ARTICLES

ON FUNDAMENTAL METHODS OF ORIENTATION AND "IMAGINARY MAPS"

THE following paper presents a study of the reasons why civilized man is so apt to lose his bearings in unfamiliar regions. This question of orientation apparently has been neglected heretofore.

In an investigation of the "sense of direction" or the "sense of locality," it is important to classify the fundamental methods of orientation employed by living creatures. There appear to be two radically different methods; one used by civilized man, the other chiefly by living creatures of a lower order. The former, which employs the points of the compass, is acquired artificially by education. It is proposed to call this the *ego-centric method*. The latter is used not only by birds, beasts, fish, insects, etc., but also, in all probability, by young children and by a large proportion of mankind living in an uncivilized state. In this system of orientation the points of the compass play little, if any, part, and it may be designated as the *domi-centric method*. The selection of these terms by the author will be explained below.

The Ego-centric Method of Orientation.—Civilized man, by artificial training, has become accustomed to orient himself by the four points of the compass: north, east, south and west; and indeed wherever he may be, he usually finds his way by this method, except in the neighborhood of his dwelling place. In the immediate vicinity of the home the orientation nearly always relates to the home as a center of reference, irrespective of the points of the compass, and in this limited region the