

many *canards* in behalf of its party. At Stuttgart the *Schwabische Merkur* represents the moderate liberals and the *bourgeois*; the *Beobachter*, conducted by M. Charles Mayer, belongs to the democratic party. Its articles are not without ability, and have certainly the merit of courage. The above are the principal newspapers at present published in Germany. They are equally smaller in size and much lower in price than English papers, and cheaper even than the French. This is easily accounted for: in the first place the stamp duty is very trifling, and in the second postage for newspapers is exceptionally small and is in process of further reduction. It is regulated by the price of the journal, and was on the first of this year reduced by one half throughout Prussia.

## DARWIN ON DOMESTICATION AND VARIATION.\*

[FIRST ARTICLE.]

MR. DARWIN'S "Origin of Species" had the peculiar fortune, above every work of our day, of exciting the profoundest interest and the bitterest opposition among naturalists and philosophers, theologians and "general readers." It was so obviously the work of a master that the greatest naturalists read it with respect, even when they read it with dissent. It was so easy of comprehension, and so interesting in its facts, that the most ignorant of general readers felt himself carried pleasantly along. It exasperated those naturalists who had all their lives regarded fixity of species as a first truth, and had been wont to treat the idea of indefinite variability as shallow sciicism. It exasperated many theological philosophers, who, with their usual quickness in detecting attacks on their faith, saw in it the advent of a "dreary materialism" (not otherwise specified); and it delighted free-thinkers because it exasperated their opponents. Nor was this general excitement confined to England and America. In Germany the sensation was more exclusively confined to the scientific circles, but it was there profound, and has worked like a ferment; as we see in such works as "Für Darwin," by Fritz Müller, and the "Generelle Morphologie," by Ernst Haeckel. In France the philosophers have joined the naturalists in eulogy and outcry. In Italy only the naturalists have been moved. Everywhere "Darwinism" has become a byword, which has gone far to replace "materialism," as "materialism" replaced "Hobbism" and "Spinozism." Polemics find such brickbats handy.

Meanwhile, there can be no doubt that the yeasty agitation has been productive of immense benefit both to science and philosophy, in clearing up vague notions, and replacing them with definite instruction on many points. The advantage of Mr. Darwin's hypothesis is that it brings many questions within the limits of verification, and forces men to ascertain what are the actual facts on which their conclusions rest. To prove or disprove his positions naturalists had to collect and scrutinize a vast array of facts; and thus, whatever might be the fate of the original hypothesis, nothing but benefit could in the end result. In his "Origin of Species" Mr. Darwin was forced to content himself with only a small portion of the evidence he had collected. In the present work he has poured forth these treasures with a lavish hand; yet even these volumes form but an instalment, and there are more to come. May there be many more!

Let us at once acquit ourselves of our main duty as reviewers by briefly indicating the contents of these two volumes. After a brief Introduction setting forth the general bearing of the facts he has to relate on the vexed question of the "Origin of Species," he proceeds to record the variations in structure and habits which domestication is known to have produced in Dogs, Cats, Horses, Asses, Pigs, Cattle, Sheep, Goats, Rabbits, Pigeons, Fowls, Ducks, Geese, Peacocks, Turkeys, Guinea Fowls, Canaries, Goldfish, Bees, Silk-moths, Plants, Fruits, Trees, and Flowers. Such a collection was never made before, and it is a collection which will interest the ordinary reader almost as much as the naturalist. In the second volume subjects are expounded of the highest philosophical reach, which also touch our daily interests. They are—the laws of Inheritance and Reversion (Atavism); the Fixedness of Character; Prepotency and Limitation of Sex; Correspondence of Age; Crossing; Causes which interfere with the free Crossing of Varieties; Influence of Domestication on Fertility; Good effects of Crossing and evil effects of close Interbreeding; Advantages and Disadvantages of Changed Conditions; Hybridism; Selection by Man; Causes of Variability; Effect of External Conditions; Laws of Variation; and a Provisional Hypothesis of Pangenesis. To all country gentlemen, farmers, and breeders, these chapters will be as full of light and interest as to all biologists and speculative thinkers.

How far the last named will agree with the conclusions Mr. Darwin wishes to uphold we cannot presume to say, but we must call attention to the rare and noble calmness with which he expounds his own views, undisturbed by the heats of polemical agitation which those views have excited, and persistently refusing to retort on his antagonists by ridicule, by indignation, or by contempt. Considering the amount of vituperation and insinuation which has come from the other side, this forbearance is supremely dignified. On one occasion only, if our memory serves us, does he by a side glance quietly intimate to the reader that he is aware of the folly which has been uttered; and this is so lightly touched by him that we must quote it both for the reader's amusement and for Mr. Darwin's justification:—

Most fanciers believe that they (pigeons) are descended from several primitive stocks. The Rev. E. A. Dixon argues strongly on this side of the question; and one fancier even denounces the opposite conclusion by asking, "Do we not perceive pervading this spirit, the spirit of the *Deist*?"

Two points must be kept separate in judging this work. One is the insoluble question of the "Origin of Species," the other is the soluble question of the limits of variation. The one has a speculative interest, the other a practical interest. Although this present reviewer regards

Mr. Darwin's hypothesis as on the whole the most plausible one that has yet been propounded—that which best links together and gives a rational classification of the largest bodies of fact,—although he thinks it indisputable that the principle of Selection has determined the formation of some species (or varieties so marked as to be fairly entitled to the term), it remains a hypothesis, and one which from the nature of the case is incapable of ever being proved. The public in general, and even many men of science, have misty and unsteady conceptions of what is the function of a hypothesis. Instead of regarding it as a provisional mode of grouping facts, useful in proportion to its unforced disposition of the facts in a serial order which will enable other facts to be arranged in a luminous series, they are apt to treat it as if were propounded in the guise of a demonstrated truth from which deduction could be safely drawn. Mr. Darwin has never proposed his hypothesis as more than a tentative grouping of the facts. He has never concealed from himself, or his readers, the many and grave difficulties which have still to be met; but he insists, and truly, that "we are permitted to form any hypothesis we like, and that if it explains various large and independent classes of facts it rises to the rank of a well-grounded theory. The undulations of the ether, and even its existence, are hypothetical, yet every one now admits the undulatory theory of light. The principle of natural selection may be looked at as a mere hypothesis, but rendered in some degree probable by what we positively know of the variability of organic beings in a state of nature, by what we positively know of the struggle for existence, and the consequent almost inevitable preservation of favourable variations, and from the analogical formation of domestic races. Now, this hypothesis may be tested—and this seems to me the only fair and legitimate manner of considering the question—by trying whether it explains several large and independent classes of facts, such as the geological succession of organic beings, their distribution in past and present times, and their mutual affinities and homologies. If the principle of natural selection does explain these and other large bodies of facts, it ought to be received. On the ordinary view of each species having been independently created we gain no scientific explanation of any one of these facts. We can only say that it has so pleased the Creator to command that the past and present inhabitants of the world should appear in a certain order and in certain areas; that He has impressed on them the most extraordinary resemblances, and has classed them in groups subordinate to groups. But by such statements we gain no new knowledge; we do not connect together facts and laws; we explain nothing."

In the latter half of this passage many naturalists and philosophers will part company with Mr. Darwin. They will say that the principle of natural selection is not to be adopted simply because it explains certain facts, if it be in opposition to other facts of greater weight, but only if, while explaining many facts, it is not in contradiction with those which it fails to explain. The corpuscular hypothesis explains numerous phenomena of light, but it is in contradiction with others—such as interference—and is therefore not accepted. In like manner the principle of natural selection explains many facts in the formation of races, but—so say its opponents—it is in contradiction with the mass of facts which prove fixity of species, and therefore it cannot be accepted.

Here lies the battle-ground:—All naturalists admit variability; but one school maintains that there are fixed limits of variation (species), beyond which natural selection cannot reach; the other school maintains that not only do all animals bring with them in their constitution a tendency to vary, under varying conditions embryological or cosmical, but that this variability is *indefinite* in the race, though limited in the individual organism; and that thus, although *no one animal* can be modified to a very considerable extent, the cumulative modifications of *successive generations* will furnish an indefinite variability; that, in short, a modification in the individual animal, which is so slight as merely to mark it off from its parents and congeners as a "variety," will be the starting-point of a series of modifications in its descendants, which will finally present so great a divergence from the primary form as to constitute a new "species."

To accept either of these contending positions is, in the present state of our knowledge, easily justified; to dislodge an adversary from his position will not be easy. We have said enough to indicate the bearing of the vast array of facts which Mr. Darwin here collects. The amazing extent of variation proved to take place under domestication, although it is one of those facts which lie open to common observation, is brought home to the conviction with a new vividness when Mr. Darwin places before us the internal structural changes, no less than the changes in external form. He gives pictures of different breeds of pigeon (and, above all, of their skulls) which assuredly would be classed as different species, and even different genera, by any naturalist who was unacquainted with their origin. It is impossible, as he remarks, "not to be struck with the high degree of variability or plasticity of many of the bones. We see how erroneous the often repeated statement is that only the crests of the bones which give attachment to muscles vary in shape, and that only parts of slight importance become modified under domestication." After an elaborate and detailed description of the varieties of pigeon all proved to have descended from one stock, making, he says, some 150 distinguishable kinds, Mr. Darwin adds that if these had been found in a state of nature they would have been grouped in at least five genera. "If we could collect all the pigeons which have ever lived from before the time of the Romans to the present day, we should be able to group them in several lines diverging from the parent rock pigeon. Each line would consist of almost insensible steps occasionally broken by some slightly greater variation or sport, and each would culminate in one of our present highly modified forms. Of the many former connecting links some would be found to have become absolutely extinct without having left any issue, whilst others, though extinct, would be seen to be progenitors of the existing races."

We must endeavour in a subsequent paper to set this vexed question in such a light as will help some readers to a clearer appreciation of Mr. Darwin's work.

\* "The Variation of Animals and Plants under Domestication." By Charles Darwin, M.A., F.R.S. Two volumes, with Illustrations. (London: John Murray, 1868.)



## DARWIN ON DOMESTICATION AND VARIATION.

[SECOND ARTICLE.]

WE broke off in our notice of this work after having stated that the contest between the two schools of naturalists turned on the question whether the possibilities of Variation in organic forms had fixed limits, the terms of which were Species, or no fixed limits: on the latter supposition, although the individual could only be slightly modified, the successive generations might indefinitely multiply slight modifications, and the cumulative result be far greater than the difference between any two Species. The majority of those who maintain the fixity of Species do not, apparently, bear in mind this distinction between the modifications possible to an individual, and the modifications multiplied into each other of successive generations; yet this is the corner-stone of the development hypothesis.

In approaching this much debated question, would it not be desirable to settle, if possible, the preliminary question, Does there exist such a thing as Species? If it should turn out that *no* such thing exists, there would be obvious futility in arguing whether *it* were fixed or otherwise. And we believe that the denial of objective existence is as imperative in the case of Species as in the case of all the other Abstract Names which for many years usurped, in philosophy, the place of realities. Formerly it was believed that over and above the millions of individual men there was an existence, named Man; over and above the millions of vertebrates and invertebrates there was an existence, named Animal; over and above the individual sentiments and actions characterized as virtuous, there was an existence named Virtue. The objective reality of Man, Animal, and Virtue seemed as positive as the objective reality of the individuals. *Nous avons changé tout cela.* But the spirit still lingers, and as ghosts still linger in some corners of our island, Abstract Names are still believed to be realities in some corners of our science. Even so great a zoologist as Cuvier could maintain that Species was a real existence, although he declared classes, orders, and genera to be mere abstract names; yet it is clear that the only distinction between the two cases is that the animals we group together under the term Species differ less from each other than those grouped under the term Genus. Both are terms to express resemblances; nothing more. In certain fundamental characters all animals have a community, and that is why they are grouped under the general term Animal. But while all animals have thus certain resemblances, they have also certain differences. No two objects in nature are absolutely identical; some differences necessarily exist; these may be few and slight, or many and important. When they are few and slight we designate them as Varieties; when they reach a certain degree of importance we designate them as Specific; when they are still greater we designate them as Generic; and so on.

In denying the objective existence of Species there is not, of course, a denial of the objective phenomena grouped under the term—the resemblances between individuals are doubtless facts of great significance, and it is these facts which the term expresses. That all men closely resemble each other is a fact, although the objective existence of an abstract Man is not. When, therefore, the question of Fixity of Species arises we must bear in mind that it is not whether in the organic world there have been certain objects created which never change, which may be destroyed but cannot be altered—it is whether organic forms, admitted to be susceptible of modification, can be modified only within fixed limits?

Nature knows nothing of Species. It presents us with numberless individuals, and these we group together according to their resemblances, or separate according to their differences. To assert therefore that Species are fixed is in one sense true, for it only asserts that Names have a fixed meaning; but in another sense it is to assert that the forms which now present resemblances in certain individuals cannot vary in the descendants of those individuals, or can vary but in slight and superficial characters. This brings the question within the range of Verification; and it is the eminent merit of Mr. Darwin's work to have brought together an amount of evidence in support of indefinite variability which will go far towards a final solution of the question. By getting rid of the misleading fiction of an existent Species, and keeping steadily in mind the fact that Nature presents us with nothing but Individuals, and that these are by the laws of organic life necessarily variable, we come to the plain question, Is this necessary variability confined within prescribed limits (such as those expressed in our specific groups), or is it illimitable?

That Domestication has produced such great variations in structure, external aspect, habits, and instincts, as to make the so-called specific distinctions seem quite arbitrary, Mr. Darwin abundantly proves. The most experienced naturalists, as he reminds us, have often disputed whether domestic races are descended from one or more aboriginal stocks, and this clearly shows that there is no palpable distinction between species and races. Domestic races propagate their kind far more truly and endure for much longer periods than most naturalists are willing to admit. Breeders feel no doubt on this head; ask a man who has long reared Shorthorn or Hereford cattle, Leicester or Southdown sheep, Spanish or game poultry, tumbler or carrier pigeons, whether these races may not have been derived from common progenitors, and he will probably laugh you to scorn. The breeder admits that he may hope to produce sheep with finer or longer wool, and with better carcasses, or handomer fowls, or carrier pigeons with beaks just perceptibly longer to the practised eye, and thus be successful at an exhibition. Thus far he will go, but no farther. He does not reflect on what follows from adding up, during a long course of time, many slight successive modifications; nor does he reflect on the former existence of numerous varieties connecting the links in each divergent line of descent. He concludes that all the chief breeds to which he has long attended are aboriginal productions. The systematic naturalist, on the other hand, who generally knows nothing of the art of breeding, who does not pretend to

know how and when the several domestic races were formed, who cannot have seen the intermediate gradations, for they do not now exist, nevertheless feels no doubt that these races are sprung from a single source. But ask him whether the closely allied natural species which he has studied may not have descended from a common progenitor, and he, in his turn, will perhaps reject the notion with scorn. Thus the naturalist and the breeder may mutually learn a useful lesson from each other."

Mr. Darwin's pages are crowded with examples of the changes which are produced in organic forms under domestication. But these are not wholly to be assigned to the influence of external conditions. That such influence largely operates no one disputes; but many naturalists have been inclined to exaggerate its extent, and have thereby weakened their cause, especially in the eyes of opponents who have had no difficulty in showing how certain forms resist all variety of external change compatible with life. Mr. Darwin more philosophically points to another potent cause of variation—namely, an inherited tendency; and there is a third cause which lies in the organic constitution. Consider this very striking case which he brings forward. He is speaking of the peach:—

This tree has been cultivated by the million in various parts of the world, has been treated differently, grown on its own root, and grafted on various stocks, planted as a standard against a wall, and under glass; yet each bud of each sub-variety keeps true to its kind. But occasionally at long intervals of time, a tree in England, or under the widely different climate of Virginia, produces a single bud, and this yields a branch which ever afterwards bears nectarines. Nectarines differ, as every one knows, from peaches in their smoothness, size, and flavour; and the difference is so great that some botanists have maintained that they are specifically distinct. So permanent are the characters thus suddenly acquired that a nectarine produced by bud variation has propagated itself by seed. To guard against the supposition that there is some fundamental distinction between bud and seminal variation, it is well to bear in mind that nectarines have likewise been produced from the stone of the peach, and reversely peaches from the stone of the nectarine. Now is it possible to conceive external conditions more closely alike than those to which the buds on the same tree are exposed? Yet one bud alone out of many thousands borne by the same tree, suddenly without any apparent cause produced a nectarine. But the case is even stronger than this—for the same flower-bud has yielded a fruit one-half or one quarter a nectarine and the other half or three-quarters peach.

Assuredly we may agree with him that no class of facts is "better adapted to force on our minds the conviction that what we call the external conditions of life are quite insignificant in relation to any particular variation in comparison with the organization or constitution of the being which varies." There are two factors in the great problem of Life which require to be incessantly allowed for: one is the Organism as a complex of forces, the other is the external Medium, or complex of Conditions. Vital phenomena are the resultant of the two. Every change in the external Conditions must affect the Organism; but its influence will of course depend on the peculiar susceptibility of the Organism to react; and that peculiar susceptibility depends on the nature of its structure. Now this structure we know to be different in every individual; the differences may be slight or they may be great; inevitably they exist. It is a law of organic substance that (in this so unlike inorganic substance) it is *indefinite* in elementary composition. It is a law of organisms that they are individually unlike, because added to their dissimilarities in elementary composition there are the differences impressed on them by inheritance. The mere fact that the offspring is the union of two parents, each parent not only differing in organic structure, but widely differing in ancestral influences, suffices *a priori* to show that the offspring must in some respects vary from its progenitors. And it is important to remember that all variations bring with them others. Mr. Darwin has noticed many remarkable examples of correlated variations, showing that animals and plants never vary by one character alone; and the pregnant suggestion of Treviranus that each organ acts as a secreting organ to the rest, makes it clear to us why all variations more or less affect the whole structure.

Once given an inevitable tendency to vary we have only to connect it with the other organic law of Inheritance—like producing like—to see that any or every variation may be transmitted, and by accumulation the difference which at first was scarcely noticeable multiplied into a difference which is specific. "We have good grounds," Mr. Darwin remarks, "for believing that the influence of changed conditions accumulates so that no effect [he means no *visible* effect] is produced on a species until it has been exposed during several generations to continued cultivation or domestication. Universal experience shows us that when new flowers are first introduced into our gardens they do not vary [that is, the variations are too slight to attract attention], but ultimately all, with the rarest exceptions, vary to a greater or less extent." The organism with fixed inherited tendencies does not visibly respond to the new stimulus; but by the accumulation of slight effects a visible variation results. How the inherited tendency acts in resisting the new influences is seen in the converse fact that the more any type has entered into a state of variation the greater is its facility to continue varying, and the great French horticulturist, Vilmorin, sagaciously remarks that when any particular variation is desired the first step is to get the plant to vary in any manner whatever, and to go on selecting the most variable individuals, even though they vary in the wrong direction; for the "fixed character of the species being once broken the desired variation will sooner or later appear."

The explanation seems to us very simple. The organism which was established under one set of conditions resists the influence of new conditions in proportion as they are uncongenial to it, and whenever in any degree it begins to react upon the new conditions it begins thereby to adapt its structure to them, and this adaptation once begun will increase in a geometrical ratio. The fixed character is an inherited tendency; and "the crossing of distinct forms, which have already become variable, increases in the offspring the tendency to further variability by the unequal commingling of the characters of the two parents, by the reappearance of long-lost characters, and by the appearance of absolutely new characters."

Mr. Darwin's explanation differs from the one we have ventured to suggest. After expounding his ingenious hypothesis of Pangenesis, in which every cell of the organism is made to throw off a gemmule capable

\* "The Variation of Animals and Plants under Domestication." By Charles Darwin, M.A., F.R.S. Two volumes, with Illustrations. (London: John Murray, 1863.)



of reproducing it, he comes upon this very question. "It is generally, perhaps always necessary," he says, "that an organism should be exposed during several generations to changed conditions or habits in order that any modification in the structure of the offspring should ensue. This may be partly due to the changes not being at first marked enough to catch the attention, but this explanation is insufficient; and I can account for the fact only by the assumption that gemmules derived from each cell before it had undergone the least modification are transmitted in large numbers to successive generations, but that the gemmules derived from the same cells after modification naturally go on increasing under the same favourable conditions, until at last they become sufficiently numerous to overpower and supplant the old gemmules." If the hypothesis be granted the explanation follows; but there are great difficulties in the way of the hypothesis, and the effect of cumulative changes suffices to explain the phenomena.

Our discussion of the central position of Mr. Darwin's work has left us no space to touch upon any of the interesting details in which his chapters abound, we must therefore recur to the volume in a third notice.

### DARWIN ON DOMESTICATION AND VARIATION.\*

[THIRD ARTICLE.]

No chapters will be read with so general an interest as the very remarkable chapters in which Mr. Darwin discusses the questions of interbreeding and cross-breeding. The practical importance of these subjects is equalled by their speculative interest. He collects a wide range of facts to show both the advantages and disadvantages of crossing and interbreeding. Critical readers may perhaps demur to several of these facts, but the general results seem firmly supported by evidence.

The advantage of interbreeding is indisputable if the aim sought be the retention of a particular character, but it is shown to be accompanied, in the long run, by the disadvantages of a diminished constitutional vigour and diminished fertility. Hence the conclusion that "it is a great law of nature that all organic beings profit from an occasional cross with individuals not closely related to them in blood; and that, on the other hand, long-continued close interbreeding is injurious." Nor has he overlooked the fact that many plants and animals are double-sexed, and these, it might be thought, would have been for long ages subject to the closest possible interbreeding, since they would be self-fertilized; but the very fact is by him turned into an argument in support of his view, since "there is no single species, as far as I can discover, in which the structure ensures self-fertilization. On the contrary, there are in a multitude of cases, as briefly stated in the fifteenth chapter, manifest adaptations which favour or inevitably lead to an occasional cross between one hermaphrodite and another of the same species; and these adaptive structures are utterly purposeless, as far as we can see, for any other end."

We do not dispute the assertion of so accomplished an investigator; but we venture to ask at least whether one case has not escaped his notice? It was maintained by Aristotle (on evidence altogether illusory) that the perch is self-productive; and this notion was confirmed by Cavolini and Valenciennes, who described the bi-sexual structure of this fish. In quite recent days the point has been satisfactorily established by the researches of M. Dufosse in 368 specimens of perch. He not only ascertained them to be normally bi-sexual, but observed them depositing their ova and at the same time casting their milt. Here self-fertilization must assuredly be normal; and indeed one may reasonably doubt whether, in this case, it is ever otherwise.

Among the illustrations of the evil effects of long-continued "breeding in and in" there is one of a sow who would not breed at all to her sire, but bred at once to a stranger in blood. Another sow, the product of close interbreeding for three generations, when paired with her own uncle (known to be productive with other sows) produced a litter of only six, and another time only five weak pigs. But paired with a boar of a small black breed (which produced seven to nine young with his own breed) she who had been so unproductive with her uncle yielded twenty-one, and in a second litter eighteen pigs!

I will now briefly describe the two most striking cases as yet observed by me. Six crossed and six self-fertilized seeds of *Ipomoea purpurea* were planted as soon as they germinated in pairs on opposite sides of two pots, and rods of equal thickness were given them to twine up. Five of the crossed plants grew from the first more quickly than the opposed self-fertilized plants; the sixth, however, was weakly, and for a time beaten, but at last its sounder constitution prevailed, and it shot ahead of its antagonist. As soon as each crossed plant reached the top of its seven-foot rod its fellow was measured, and the result was that when the crossed plants were seven feet high, the self-fertilized had attained the average height of only five feet four and a half inches. The crossed plants flowered a little before and more profusely than self-fertilized plants. On opposite sides of another small pot a large number of crossed and self-fertilized seeds were sown, so that each had to struggle for bare existence: a single rod was given to each lot. Here again the crossed plants showed from the first their advantage; they never quite reached the summit of the seven-foot rod, but relatively to the self-fertilized plants their average height was as seven feet to five feet two inches. The experiment was repeated in the two following generations—the crossed plants produced 121 seed capsules, the self-fertilized only 84 capsules.

After adding a similar case, Mr. Darwin says, "Had I not watched these plants during their whole growths, I could not have believed it possible that

a difference apparently so slight as that of the pollen being taken from the same flower and from a distinct plant growing in the same pot could have made so wonderful a difference in the growth and vigour of the plants produced." It has recently been discovered that certain plants even growing in their native country and under natural condition cannot be fertilized with pollen from the same plant, and can be fertilized by pollen of a distinct species, or even a distinct genus. Fritz Müller discovered that in some cases the pollen acts like a poison to its own stigma!

Mr. Darwin connects this undoubted fact of the beneficial influence on fertility of slight changes in the conditions, with the empirical observation of medical men and farmers, who have long held that such slight changes as the removal from one room to another—still more from one part of the country to another—and a change of pasture, exert a striking influence on convalescents and cattle. The medical prescription of "change of air" has a physiological justification. "In the case of plants the evidence is strong, that a great advantage is derived from exchanging seeds, tubers, bulbs, and cuttings from one soil or place to another as different as possible."

If certain slight changes act thus beneficially, others act injuriously. Nothing is better established than the influence of domestication and confinement in producing sterility in most animals; indeed, one may say that it is only those animals which will breed in confinement that have become domesticated. In almost every part of the world the natives are extremely fond of taming quadrupeds and birds, but they rarely or never succeed in making them breed. The elephant is the most remarkable case of animals not breeding in captivity, though in India they are kept in large numbers, live to a good old age, and are very vigorous. Most of the pig family breed readily in our menageries. Even the Red River hog from the sweltering plains of West Africa has bred in our Zoological Gardens. The lion breeds freely enough, but the tiger rarely. Mr. Bartlett adds the curious fact that lions breed more freely in travelling menageries than in the Zoological Gardens; probably the constant excitement and irritation produced by moving from place to place, or change of air, may have considerable influence in the matter.

Turning to another point, among the strange and inexplicable cases of correlation must be mentioned that of the immunity against poison which accompanies certain colours. Nothing startled people more than to learn in the "Origin of Species" that cats with blue eyes were always deaf. Mr. Darwin qualifies this statement now, and says that they are almost always deaf, but if the cat has only one eye blue it hears.

The case of correlation in cats has struck many persons as marvellous. There is nothing unusual in the relation between blue eyes and white fur, and we have already seen that the organs of sight and hearing are often simultaneously affected. In the present instance the cause probably lies in a slight arrest of development of the nervous system in connection with the sense organs. Kittens during the first nine days whilst their eyes are closed appear to be completely deaf; I have made a great clanging noise with a poker and shovel close to their heads both when they were asleep and awake, without producing any effect. Now as long as the eyes continue closed the iris is no doubt blue, for in all kittens which I have seen this colour remains for some time after the eye is open. Hence if we suppose the development of the organs of sight and hearing to be arrested at the stage of the closed eyelids, the eyes would remain permanently blue, and the ears incapable of perceiving sound.

Connected with this we may mention the observed fact that colour-blindness in men is often associated with a corresponding incapacity to distinguish musical sounds; a fact which is more intelligible when we reflect on the essential resemblances between the terminal structures of the optic and auditory nerve.

But we have wandered from our point, which was the correlation of immunity against poison and the colour of the hair. Mr. Darwin, after quoting Professor Wyman to the effect that in one part of Virginia the pigs are all black because only the black varieties can feed on a certain root which abounds there and not be poisoned, adds that "in the Tarentino the inhabitants keep black sheep alone because the *Hypericum crispum* abounds there, and this plant does not injure black sheep, but kills the white ones in about a fortnight." To these we may add the fact recorded by Livingstone that the black rhinoceros feeds on the graceful but deadly *Euphorbia candellabrum*, while the white rhinoceros is inevitably poisoned if it happen to eat thereof, which it does willingly.

Complexion and liability to certain diseases are believed to run together. Certainly white terriers suffer more from distemper than terriers of other colours. White bulldogs are affected with red mange. "In North America plum trees are liable to a disease believed to be caused by insects, and the kinds bearing purple fruits are most affected." In Mauritius it is the white sugar-cane which is most severely attacked by disease. White chickens are more liable to parasitic worms in the trachea than chickens of any other colour. White verbenas are especially liable to mildew. Near Malaga during the vine disease the green sorts suffered most; the red and black grapes even when intermingled with the sick plants did not suffer at all.

In closing this very imperfect account of a book which must soon be in everybody's hands, let us note the singular urbanity and scrupulousness which it exhibits. Nowhere has the author a word that could wound the most sensitive self-love of an antagonist; nowhere does he, in text or note, expose the fallacies and mistakes of brother investigators—a practice which his brother investigators would do well to imitate!—but while abstaining from impertinent censure, he is lavish in acknowledging the smallest debts he may owe; and his book will make many men happy. Perhaps the epithet applied to Mr. Buckle (his "grand work on civilization") would have been better moderated; and, as the praise of a writer like Mr. Darwin necessarily carries great weight, we could have wished that, in giving due recognition to the merit of M. Lucas for his big book "De l'Hérédité," it had not been styled a great book, without any qualification relative to the glaringly uncritical credulity which has presided over its collection of facts, or the poverty of the physiological knowledge brought to bear on them.

\* "The Variation of Animals and Plants under Domestication." By Charles Darwin, M.A., F.R.S. Two volumes, with illustrations. (London: John Murray. 1858.)



many *canards* in behalf of its party. At Stuttgart the *Schwabische Merkur* represents the moderate liberals and the *bourgeois*; the *Beobachter*, conducted by M. Charles Mayer, belongs to the democratic party. Its articles are not without ability, and have certainly the merit of courage. The above are the principal newspapers at present published in Germany. They are equally smaller in size and much lower in price than English papers, and cheaper even than the French. This is easily accounted for: in the first place the stamp duty is very trifling, and in the second postage for newspapers is exceptionally small and is in process of further reduction. It is regulated by the price of the journal, and was on the first of this year reduced by one half throughout Prussia.

## DARWIN ON DOMESTICATION AND VARIATION.\*

[FIRST ARTICLE.]

MR. DARWIN'S "Origin of Species" had the peculiar fortune, above every work of our day, of exciting the profoundest interest and the bitterest opposition among naturalists and philosophers, theologians and "general readers." It was so obviously the work of a master that the greatest naturalists read it with respect, even when they read it with dissent. It was so easy of comprehension, and so interesting in its facts, that the most ignorant of general readers felt himself carried pleasantly along. It exasperated those naturalists who had all their lives regarded fixity of species as a first truth, and had been wont to treat the idea of indefinite variability as shallow sciolism. It exasperated many theological philosophers, who, with their usual quickness in detecting attacks on their faith, saw in it the advent of a "dreary materialism" (not otherwise specified); and it delighted free-thinkers because it exasperated their opponents. Nor was this general excitement confined to England and America. In Germany the sensation was more exclusively confined to the scientific circles, but it was there profound, and has worked like a ferment; as we see in such works as "Für Darwin," by Fritz Müller, and the "Generelle Morphologie," by Ernst Haeckel. In France the philosophers have joined the naturalists in eulogy and outcry. In Italy only the naturalists have been moved. Everywhere "Darwinism" has become a byword, which has gone far to replace "materialism," as "materialism" replaced "Hobbism" and "Spinozism." Polemics find such brickbats handy.

Meanwhile, there can be no doubt that the yeasty agitation has been productive of immense benefit both to science and philosophy, in clearing up vague notions, and replacing them with definite instruction on many points. The advantage of Mr. Darwin's hypothesis is that it brings many questions within the limits of verification, and forces men to ascertain what are the actual facts on which their conclusions rest. To prove or disprove his positions naturalists had to collect and scrutinize a vast array of facts; and thus, whatever might be the fate of the original hypothesis, nothing but benefit could in the end result. In his "Origin of Species" Mr. Darwin was forced to content himself with only a small portion of the evidence he had collected. In the present work he has poured forth these treasures with a lavish hand; yet even these volumes form but an instalment, and there are more to come. May there be many more!

Let us at once acquit ourselves of our main duty as reviewers by briefly indicating the contents of these two volumes. After a brief Introduction setting forth the general bearing of the facts he has to relate on the vexed question of the "Origin of Species," he proceeds to record the variations in structure and habits which domestication is known to have produced in Dogs, Cats, Horses, Asses, Pigs, Cattle, Sheep, Goats, Rabbits, Pigeons, Fowls, Ducks, Geese, Peacocks, Turkeys, Guinea Fowls, Canaries, Goldfish, Dees, Silk-moths, Plants, Fruits, and Flowers. Such a collection was never made before, and it is a collection which will interest the ordinary reader almost as much as the naturalist. In the second volume subjects are expounded of the highest philosophical reach, which also touch our daily interests. They are—the laws of Inheritance and Reversion (Atavism); the Fixedness of Character; Prepotency and Limitation of Sex; Correspondence of Age; Crossing; Causes which interfere with the free Crossing of Varieties; Influence of Domestication on Fertility; Good effects of Crossing and evil effects of close Interbreeding; Advantages and Disadvantages of Changed Conditions; Hybridism; Selection by Man; Causes of Variability; Effect of External Conditions; Laws of Variation; and a Provisional Hypothesis of Pangenesis. To all country gentlemen, farmers, and breeders, these chapters will be as full of light and interest as to all biologists and speculative thinkers.

How far the last named will agree with the conclusions Mr. Darwin wishes to uphold we cannot presume to say, but we must call attention to the rare and noble calmness with which he expounds his own views, undisturbed by the heats of polemical agitation which those views have excited, and persistently refusing to retort on his antagonists by ridicule, by indignation, or by contempt. Considering the amount of vituperation and insinuation which has come from the other side, this forbearance is supremely dignified. On one occasion only, if our memory serves us, does he by a side glance quietly intimate to the reader that he is aware of the folly which has been uttered; and this is so lightly touched by him that we must quote it both for the reader's amusement and for Mr. Darwin's justification:—

Most fanciers believe that they (pigeons) are descended from several primitive stocks. The Rev. E. A. Dixon argues strongly on this side of the question; and one fancier even denounces the opposite conclusion by asking, "Do we not perceive pervading this spirit, the spirit of the Deist?"

Two points must be kept separate in judging this work. One is the insoluble question of the "Origin of Species," the other is the soluble question of the limits of variation. The one has a speculative interest, the other a practical interest. Although this present reviewer regards

Mr. Darwin's hypothesis as on the whole the most plausible one that has yet been propounded—that which best links together and gives a rational classification of the largest bodies of fact,—although he thinks it indisputable that the principle of Selection has determined the formation of some species (or varieties so marked as to be fairly entitled to the term), it remains a hypothesis, and one which from the nature of the case is incapable of ever being proved. The public in general, and even many men of science, have misty and unsteady conceptions of what is the function of a hypothesis. Instead of regarding it as a provisional mode of grouping facts, useful in proportion to its unforced disposition of the facts in a serial order which will enable other facts to be arranged in a luminous series, they are apt to treat it as if it were propounded in the guise of a demonstrated truth from which deductions could be safely drawn. Mr. Darwin has never proposed his hypothesis as more than a tentative grouping of the facts. He has never concealed from himself, or his readers, the many and grave difficulties which have still to be met; but he insists, and truly, that "we are permitted to form any hypothesis we like, and that if it explains various large and independent classes of facts it rises to the rank of a well-grounded theory. The undulations of the ether, and even its existence, are hypothetical, yet every one now admits the undulatory theory of light. The principle of natural selection may be looked at as a mere hypothesis, but rendered in some degree probable by what we positively know of the variability of organic beings in a state of nature, by what we positively know of the struggle for existence, and the consequent almost inevitable preservation of favourable variations, and from the analogical formation of domestic races. Now, this hypothesis may be tested—and this seems to me the only fair and legitimate manner of considering the question—by trying whether it explains several large and independent classes of facts, such as the geological succession of organic beings, their distribution in past and present times, and their mutual affinities and homologies. If the principle of natural selection does explain these and other large bodies of facts, it ought to be received. On the ordinary view of each species having been independently created we gain no scientific explanation of any one of these facts. We can only say that it has so pleased the Creator to command that the past and present inhabitants of the world should appear in a certain order and in certain areas; that He has impressed on them the most extraordinary resemblances, and has classed them in groups subordinate to groups. But by such statements we gain no new knowledge; we do not connect together facts and laws; we explain nothing."

In the latter half of this passage many naturalists and philosophers will part company with Mr. Darwin. They will say that the principle of natural selection is not to be adopted simply because it explains certain facts, if it be in opposition to other facts of greater weight, but only if, while explaining many facts, it is not in contradiction with those which it fails to explain. The corpuscular hypothesis explains numerous phenomena of light, but it is in contradiction with others—such as interference—and is therefore not accepted. In like manner the principle of natural selection explains many facts in the formation of races, but—so say its opponents—it is in contradiction with the mass of facts which prove fixity of species, and therefore it cannot be accepted.

Here lies the battle-ground:—All naturalists admit variability; but one school maintains that there are fixed limits of variation (species), beyond which natural selection cannot reach; the other school maintains that not only do all animals bring with them in their constitution a tendency to vary, under varying conditions embryological or cosmical, but that this variability is *indefinite* in the race, though limited in the individual organism; and that thus, although *no one animal* can be modified to a very considerable extent, the cumulative modifications of *successive generations* will furnish an indefinite variability; that, in short, a modification in the individual animal, which is so slight as merely to mark it off from its parents and congeners as a "variety," will be the starting-point of a series of modifications in its descendants, which will finally present so great a divergence from the primary form as to constitute a new "species."

To accept either of these contending positions is, in the present state of our knowledge, easily justified; to dislodge an adversary from his position will not be easy. We have said enough to indicate the bearing of the vast array of facts which Mr. Darwin here collects. The amazing extent of variation proved to take place under domestication, although it is one of those facts which lie open to common observation, is brought home to the conviction with a new vividness when Mr. Darwin places before us the internal structural changes, no less than the changes in external form. He gives pictures of different breeds of pigeon (and, above all, of their skulls) which assuredly would be classed as different species, and even different genera, by any naturalist who was unacquainted with their origin. It is impossible, as he remarks, "not to be struck with the high degree of variability or plasticity of many of the bones. We see how erroneous the often repeated statement is that only the crests of the bones which give attachment to muscles vary in shape, and that only parts of slight importance become modified under domestication." After an elaborate and detailed description of the varieties of pigeon all proved to have descended from one stock, making, he says, some 150 distinguishable kinds, Mr. Darwin adds that if these had been found in a state of nature they would have been grouped in at least five genera. "If we could collect all the pigeons which have ever lived from before the time of the Romans to the present day, we should be able to group them in several lines diverging from the parent rock pigeon. Each line would consist of almost insensible steps occasionally broken by some slightly greater variation or sport, and each would culminate in one of our present highly modified forms. Of the many former connecting links some would be found to have become absolutely extinct without having left any issue, whilst others, though extinct, would be seen to be progenitors of the existing races."

We must endeavour in a subsequent paper to set this vexed question in such a light as will help some readers to a clearer appreciation of Mr. Darwin's work.

\* "The Variation of Animals and Plants under Domestication." By Charles Darwin, M.A., F.R.S. Two volumes, with Illustrations. (London: John Murray, 1868.)



# DARWIN ON DOMESTICATION AND VARIATION.

[SECOND ARTICLE.]

WE broke off in our notice of this work after having stated that the contest between the two schools of naturalists turned on the question whether the possibilities of Variation in organic forms had fixed limits, the terms of which were Species, or no fixed limits: on the latter supposition, although the individual could only be slightly modified, the successive generations might indefinitely multiply slight modifications, and the cumulative result be far greater than the difference between any two Species. The majority of those who maintain the fixity of Species do not, apparently, bear in mind this distinction between the modifications possible to an individual, and the modifications multiplied into each other of successive generations; yet this is the corner-stone of the development hypothesis.

In approaching this much debated question, would it not be desirable to settle, if possible, the preliminary question, Does there exist such a thing as Species? If it should turn out that *no* such thing exists, there would be obvious futility in arguing whether it were fixed or otherwise. And we believe that the denial of objective existence is as imperative in the case of Species as in the case of all the other Abstract Names which for many years usurped, in philosophy, the place of realities. Formerly it was believed that over and above the millions of individual men there was an existence, named Man; over and above the millions of vertebrates and invertebrates there was an existence, named Animal; over and above the individual sentiments and actions characterized as virtuous, there was an existence named Virtue. The objective reality of Man, Animal, and Virtue seemed as positive as the objective reality of the individuals. *Nous avons changé tout cela*. But the spirit still lingers, and as ghosts still linger in some corners of our island, Abstract Names are still believed to be realities in some corners of our science. Even so great a zoologist as Cuvier could maintain that Species was a real existence, although he declared classes, orders, and genera to be mere abstract names; yet it is clear that the only distinction between the two cases is that the animals we group together under the term Species differ less from each other than those grouped under the term Genus. Both are terms to express resemblances; nothing more. In certain fundamental characters all animals have a community, and that is why they are grouped under the general term Animal. But while all animals have thus certain resemblances, they have also certain differences. No two objects in nature are absolutely identical; some differences necessarily exist; these may be few and slight, or many and important. When they are few and slight we designate them as Varieties; when they reach a certain degree of importance we designate them as Specific; when they are still greater we designate them as Generic; and so on.

In denying the objective existence of Species there is not, of course, a denial of the objective phenomena grouped under the term—the resemblances between individuals are doubtless facts of great significance, and it is these facts which the term expresses. That all men closely resemble each other is a fact, although the objective existence of an abstract Man is not. When, therefore, the question of Fixity of Species arises we must bear in mind that it is not whether in the organic world there have been certain objects created which never change, which may be destroyed but cannot be altered—it is whether organic forms, admitted to be susceptible of modification, can be modified only within fixed limits?

Nature knows nothing of Species. It presents us with numberless individuals, and these we group together according to their resemblances, or separate according to their differences. To assert therefore that Species are fixed is in one sense true, for it only asserts that Names have a fixed meaning; but in another sense it is to assert that the forms which now present resemblances in certain individuals cannot vary in the descendants of those individuals, or can vary but in slight and superficial characters. This brings the question within the range of Verification; and it is the eminent merit of Mr. Darwin's work to have brought together an amount of evidence in support of indefinite variability which will go far towards a final solution of the question. By getting rid of the misleading fiction of an existent Species, and keeping steadily in mind the fact that Nature presents us with nothing but Individuals, and that these are by the laws of organic life necessarily variable, we come to the plain question, Is this necessary variability confined within prescribed limits (such as those expressed in our specific groups), or is it illimitable?

That Domestication has produced such great variations in structure, external aspect, habits, and instincts, as to make the so-called specific distinctions seem quite arbitrary, Mr. Darwin abundantly proves. The most experienced naturalists, as he reminds us, have often disputed whether domestic races are descended from one or more aboriginal stocks, and this clearly shows that there is no palpable distinction between species and races. Domestic races propagate their kind far more truly and endure for much longer periods than most naturalists are willing to admit. Breeders feel no doubt on this head; ask a man who has long reared Shorthorn or Hereford cattle, Leicester or Southdown sheep, Spanish or game poultry, tumbler or carrier pigeons, whether these races may not have been derived from common progenitors, and he will probably laugh you to scorn. The breeder admits that he may hope to produce sheep with finer or longer wool, and with better carcasses, or handsomer fowls, or carrier pigeons with beaks just perceptibly longer to the practised eye, and thus be successful at an exhibition. Thus far he will go, but no farther. He does not reflect on what follows from adding up, during a long course of time, many slight successive modifications; nor does he reflect on the former existence of numerous varieties connecting the links in each divergent line of descent. He concludes that all the chief breeds to which he has long attended are aboriginal productions. The systematic naturalist, on the other hand, who generally knows nothing of the art of breeding, who does not pretend to

know how and when the several domestic races were formed, who cannot have seen the intermediate gradations, for they do not now exist, nevertheless feels no doubt that these races are sprung from a single source. But ask him whether the closely allied natural species which he has studied may not have descended from a common progenitor, and he, in his turn, will perhaps reject the notion with scorn. Thus the naturalist and the breeder may mutually learn a useful lesson from each other.\*

Mr. Darwin's pages are crowded with examples of the changes which are produced in organic forms under domestication. But these are not wholly to be assigned to the influence of external conditions. That such influence largely operates no one disputes; but many naturalists have been inclined to exaggerate its extent, and have thereby weakened their cause, especially in the eyes of opponents who have had no difficulty in showing how certain forms resist all variety of external change compatible with life. Mr. Darwin more philosophically points to another potent cause of variation—namely, an inherited tendency; and there is a third cause which lies in the organic constitution. Consider this very striking case which he brings forward. He is speaking of the peach:—

This tree has been cultivated by the million in various parts of the world, has been treated differently, grown on its own root, and grafted on various stocks, planted as a standard against a wall, and under glass; yet each bud of each sub-variety keeps true to its kind. But occasionally at long intervals of time, a tree in England, or under the widely different climate of Virginia, produces a single bud, and this yields a branch which ever afterwards bears nectarines. Nectarines differ, as every one knows, from peaches in their smoothness, size, and flavour; and the difference is so great that some botanists have maintained that they are specifically distinct. So permanent are the characters thus suddenly acquired that a nectarine produced by bud variation has propagated itself by seed. To guard against the supposition that there is some fundamental distinction between bud and seminal variation, it is well to bear in mind that nectarines have likewise been produced from the stone of the peach, and reversely peaches from the stone of the nectarine. Now is it possible to conceive external conditions more closely alike than those to which the buds on the same tree are exposed? Yet one bud alone out of many thousands borne by the same tree, suddenly without any apparent cause produced a nectarine. But the case is even stronger than this—for the same flower-bud has yielded a fruit one-half or one quarter a nectarine and the other half or three-quarters peach.

Assuredly we may agree with him that no class of facts is "better adapted to force on our minds the conviction that what we call the external conditions of life are quite insignificant in relation to any particular variation in comparison with the organization or constitution of the being which varies." There are two factors in the great problem of Life which require to be incessantly allowed for: one is the Organism as a complex of forces, the other is the external Medium, or complex of Conditions. Vital phenomena are the resultant of the two. Every change in the external Conditions must affect the Organism; but its influence will of course depend on the peculiar susceptibility of the Organism to react; and that peculiar susceptibility depends on the nature of its structure. Now this structure we know to be different in every individual; the differences may be slight or they may be great; inevitably they exist. It is a law of organic substance that (in this so unlike inorganic substance) it is *indefinite* in elementary composition. It is a law of organisms that they are individually unlike, because added to their dissimilarities in elementary composition there are the differences impressed on them by inheritance. The mere fact that the offspring is the union of two parents, each parent not only differing in organic structure, but widely differing in ancestral influences, suffices *a priori* to show that the offspring must in some respects vary from its progenitors. And it is important to remember that all variations bring with them others. Mr. Darwin has noticed many remarkable examples of correlated variations, showing that animals and plants never vary by one character alone; and the pregnant suggestion of Treviranus that each organ acts as a secreting organ to the rest, makes it clear to us why all variations more or less affect the whole structure.

Once given an inevitable tendency to vary we have only to connect it with the other organic law of Inheritance—like producing like—to see that any or every variation may be transmitted, and by accumulation into a difference which at first was scarcely noticeable multiplied into a difference which is specific. "We have good grounds," Mr. Darwin remarks, "for believing that the influence of changed conditions accumulates so that no effect [he means no *visible* effect] is produced on a species until it has been exposed during several generations to continued cultivation or domestication. Universal experience shows us that when new flowers are first introduced into our gardens they do not vary [that is, the variations are too slight to attract attention], but ultimately all, with the rarest exceptions, vary to a greater or less extent." The organism with fixed inherited tendencies does not visibly respond to the new stimulus; but by the accumulation of slight effects a visible variation results. How the inherited tendency acts in resisting the new influences is seen in the converse fact that the more any type has entered into a state of variation the greater is its facility to continue varying, and the great French horticulturist, Vilmorin, sagaciously remarks that when any particular variation is desired the first step is to get the plant to vary in any manner whatever, and to go on selecting the most variable individuals, even though they vary in the wrong direction; for the "fixed character of the species being once broken the desired variation will sooner or later appear."

The explanation seems to us very simple. The organism which was established under one set of conditions resists the influence of new conditions in proportion as they are uncongenial to it, and whenever in any degree it begins to react upon the new conditions it begins thereby to adapt its structure to them, and this adaptation once begun will increase in a geometrical ratio. The fixed character is an inherited tendency; and "the crossing of distinct forms, which have already become variable, increases in the offspring the tendency to further variability by the unequal commingling of the characters of the two parents, by the reappearance of long-lost characters, and by the appearance of absolutely new characters."

Mr. Darwin's explanation differs from the one we have ventured to suggest. After expounding his ingenious hypothesis of Pangenesis, in which every cell of the organism is made to throw off a gemmule capable

\* "The Variation of Animals and Plants under Domestication." By Charles Darwin, M.A., F.R.S. Two volumes, with Illustrations. (London: John Murray, 1863.)



of reproducing it, he comes upon this very question. "It is generally, perhaps always, necessary," he says, "that an organism should be exposed during several generations to changed conditions or habits in order that any modification in the structure of the offspring should ensue. This may be partly due to the changes not being at first marked enough to catch the attention, but this explanation is insufficient; and I can account for the fact only by the assumption that gemmules derived from each cell before it had undergone the least modification are transmitted in large numbers to successive generations, but that the gemmules derived from the same cells after modification naturally go on increasing under the same favourable conditions, until at last they become sufficiently numerous to overpower and supplant the old gemmules." If the hypothesis be granted the explanation follows; but there are great difficulties in the way of the hypothesis, and the effect of cumulative changes suffices to explain the phenomena.

Our discussion of the central position of Mr. Darwin's work has left us no space to touch upon any of the interesting details in which his chapters abound, we must therefore recur to the volume in a third notice.

### "THE EPICURE'S YEAR BOOK."\*

This pretty little book is a model of good taste as to its paper, its type, its illustrations, and its binding, and contains a variety of pleasant papers more or less connected with the science of eating and drinking, rather copiously seasoned with extracts from French works on gastronomy which we fancy we have seen once or twice before. It announces itself as the first of a series of volumes, to be published annually, recording the progress of the gastronomic art in England, specifying any new dishes or wines that may appear, and giving the *menus* of any remarkable dinners that may have been eaten during the past year. However admirable the scheme of this undertaking may be, we cannot say anything in praise of the manner in which it has been carried out. A very slight examination of the "Year Book" will convince the most partial critic that "Fin Bec," as its editor designates himself, though a smart, lively writer, knows no more about gastronomy than he does about the philosopher's stone. It is impossible that we can accept as our culinary guide, philosopher, and friend a gentleman who affects a familiarity he evidently does not possess with the works of one "Grinrod," who personally vouches for the palatable and appetizing quality of the dishes at what he calls "the diner *du cheval*" given on the 19th of December, 1867, who gives us the bills of fare of a variety of public dinners eaten at the Freemasons' Tavern and at Willis's Rooms in 1867 as specimens of first-class cookery, who dwells on the food presented to the guests at the farewell dinner to Charles Dickens as a triumph of gastronomic perfection, and who eulogizes the sparkling wines of Keffesia and Hymettus, so widely advertised by the enterprising Denman, and the delicious Capri, *grown on the slopes of Vesuvius*.

Nor can we deem a writer who proposes to revolutionize the cookery of England by the introduction of such fatuous abominations as the following—which he styles "easy and dainty dishes"—in any way worthy of the *nom de plume* he has assumed:—

**FRIED FOWL.**—Take the least tender parts of a fowl. Roll them in thick paste and fry them.

**FOWL WITH MUSTARD.**—You can eat the legs and wings of a cold turkey grilled with mustard, oil, and chopped gherkins.

**PARISIAN SOUP.**—*Ingredients:* Leeks, potatoes, butter, salt, pepper, and beef broth or water. Cut the leeks up in slips and fry them in butter, then pour water or beef broth over them, adding potatoes, cut in slices. Let them cook well; if you have boiled them in water, add butter, salt, pepper, and serve it on some fried bread already laid in the tureen.

**BROTH THAT CAN BE KEPT.**—Boil for two hours with some red wine (ordinaire) with onions, carrots cut in slices, thyme, laurel leaves, parsley, a few cloves, salt and pepper. Salt, or fresh fish can be boiled in it. Then strain the broth, and keep it in bottles well corked. Each time that you wish to use it, add a little wine, a glass of brandy, and, if possible, a little Madeira. The more it is used the better it is. If you wish to preserve some part of a large fish cooked in this way (?), such as salmon, you must cut in slices and put it with this broth in a jar that will just admit the slices; pour a little oil on the surface of the broth, cork it up or cover it with paper as if it were jam, and each time you want a slice of salmon either warm or cold, you can take it out.

It is really humiliating to have to denounce such trash as this, after having had to call attention so recently to the glorious "Livres de Cuisine" of Jules Gouffé. The truth is that almost all English writers on culinary subjects have, since the days when Walker penned his "Art of Aristology" in the *Original*, been either copyists, who have vamped up old receipt books under new titles, or impostors, who, accumulating *excerpts* from foreign writers on the gastronomic art, have passed off their stolen goods at the dinner tables of London as original matter on the innocent and the credulous.

England as a nation has no sentiment of cookery. Our vigorous digestions and coarse palates affect strong and coarse meats. Turtle and mulligatawny, salmon and lobster sauce, cod and oyster sauce, fat beef and mutton, highly-seasoned ducks and geese, rich puddings and marrow-bones, and such-like substantial fare, are to be had in perfection in almost any tavern in London; but we know not a single house where two or three individuals can obtain at any price an impromptu dinner of first-class cookery such as may be eaten in almost any restaurant on the boulevards of Paris. In a few clubs, and at the tables of the wealthy, excellent results are occasionally obtained by means of lavish expenditure and foreign artists, but there is no country in the world, Abyssinia scarcely excepted, where all classes of society suffer more from unintelligent and wasteful cookery than in England.

It is indeed much to be desired that some influential culinary reformer should arise, who should teach us to make the best of the excellent materials with which our climate, our soil, and our seas supply us in abundance, but "Fin Bec," the editor of the "Epicure's Year Book," is clearly not the man to head such a revolution.

### Notice to Advertisers.

Advertisements for the PALM MALL GAZETTE should be sent to the Office before Half-past Nine o'clock on the day of publication. Advertisements to be displayed should be sent on the previous day.

Announcements of Births, Marriages, and Deaths are inserted in the PALM MALL GAZETTE at a charge of Half-a-crown. They may be sent through an Advertising Agent, Newsagent, or Librarian; or, properly authenticated, to the office of the PALM MALL GAZETTE.

### THE THEATRES.

COVENT GARDEN.—The Goose with the Golden Eggs.—The Babes in the Wood. Seven.

DRURY LANE.—The Hypocrite.—Faw Fee Fo Fum. Seven.

HAYMARKET.—The Broken-hearted Club.—A Wife Well Won.—An Utter Per-version of the Brigand. Seven.

ADELPHI.—Up for the Cattle Show.—(At Eight) No Thoroughfare. Seven.

PRINCESS'S.—Arrah-na-Pogue.—The Octoroon. Seven.

LYCEUM.—Who's to Win Him?—Cock Robin and Jenny Wren. Seven.

OLYMPIC.—Hen and Chickens.—One too many for Him.—If I had a Thousand a Year.—Betty Martin. Seven.

ST. JAMES'S.—The Needful.—The Chimney Corner.—The Skyrocket. Half-past Seven.

STRAND.—Old Salt.—The Caliph of Bagdad.—Coal and Coke. Seven.

NEW QUEEN'S.—He's a Lunatic.—(At Half-past Seven) Dearer than Life.—La Vivandière. Seven.

HOLBORN.—Flying Scud.—Valentine and Orson. Seven.

NEW ROYALTY.—John Jones.—(At Eight) Daddy Gray.—The Latest Edition of Black Eyed Susan. Half-past Seven.

PRINCE OF WALES'S.—(At Eight) Play.—A Dead Shot.—Mrs. White.

**PROFESSOR BENNETT'S CANTATAS.**—THE WOMAN OF SAMARIA (first time in London) and THE MAY QUEEN, FRIDAY EVENING, February 21. Eight o'clock. ST. JAMES'S HALL. Mmes. Rudersdorff, Miss Katherine Poyntz, Mmes. Sainton-Dolby, Mr. W. H. Cummings, Signor Foli. Full Orchestra and Chorus. Conductors, Professor BENNETT and Mr. W. G. CUSINS. Stalls, 10s. 6d.; Tickets, 7s. 5s., and 2s. 6d.—Lamborn, Cook, Addison, and Co., 63, New Bond-street; Keith, Prowse, and Co., 43, Cheapside; Austin, 28, Piccadilly.

**THEATRE ROYAL, COVENT GARDEN.**—Under the sole Management of Mr. JOHN RUSSELL.—The Fantomime commences at Eight and terminates at a few minutes before Eleven.

THIS EVENING, at Seven o'clock, the laughable Farce, THE GOOSE WITH THE GOLDEN EGGS.—Messrs. J. Clarke, W. Robins, and J. D. Stoye; and Miss Florence Eveleigh. After which, with magnificent scenery, costumes, and decorations, the GRAND COMIC CHRISTMAS PANTOMIME, entitled THE BABES IN THE WOOD; or, HARLEQUIN, ROBIN HOOD AND HIS MERRY MEN. Characters by Messrs. J. Clarke, J. D. Stoye, Lingham, Fred. Payne, and W. H. Payne; Miss Amy Sheridan, Miss Harris, Miss Nelly Harris, Miss Florence Eveleigh, and Miss Polly Marshall. Conductor, Mr. BETJEMANN. Harlequin, Mr. Fred. Payne; Columbine, Mdlle. Esta; Pantaloon, Mr. Paul Herring; and Clown, Mr. Harry Payne. Private Boxes from 4s. 4s. to 10s. 6d.; Stalls, 7s.; Dress Circle, 5s.; Upper Boxes, 4s.; Amphitheatre Stalls, reserved, 3s.; unreserved, 2s.; Pit, 2s. 6d.; Gallery, 1s. The Box-office is open from Ten till Five.

**THEATRE ROYAL, DRURY LANE.** THIS EVENING, THE HYPOCRITE. After which, the DRURY LANE ANNUAL GRAND CHRISTMAS PANTOMIME, written by E. L. BLANCHARD, Esq., entitled FAW FEE FO FUM, or HARLEQUIN, JACK THE GIANT KILLER. Scenery by Mr. William Beverley. Miss E. Poole, Mmes. Edith Stuart, Mr. Joseph Irving, and Percy Roselle.

**THEATRE ROYAL, HAYMARKET.** THIS EVENING, THE BROKEN-HEARTED CLUB.—Mr. Gordon, Mr. Braid, Mrs. Chippendale, &c. After which, A WIFE WELL WON.—Messrs. Sothorn, Buckstone, Howe, Kendall, Rogers, Braid, Weathersby, &c., and Miss Robertson. AND AN UTTER PER-VERSION OF THE BRIGAND.—Messrs. Compton, Kendal, Rogers, Clark, Braid, Weathersby, Johnson, &c.; Mmes. Burke, Wright, Dalton, &c.

**PRINCESS'S THEATRE.** THIS EVENING, THE OCTOORON AND ARRAN-NA-POGUE.—Mr. and Mrs. Dion Boucicault, Mr. J. S. Clarke, Mr. Vining, Messrs. Dominick Murray, G. F. Neville, J. G. Shore; Miss H. Simms, Misses E. Barnett, K. Sanger, and Mrs. Addie.

**PRINCE OF WALES'S ROYAL THEATRE.**—THIS EVENING, at Eight (First Time), a New and Original Comedy in Four Acts, entitled PLAY, by T. W. Robertson.—Messrs. Hare, Montague, Blakeley, and Bancroft; Mmes. L. Murray, Lydia Foote, and Marie Wilton. Box-office open from Eleven till Five.

**ROYAL ALHAMBRA PALACE.** (Managing Director, Mr. F. STRANGE). Three Ballets, 200 Dancers, 60 Instrumentalists, Singers, Acrobats, Mimics; Pictures, Latest Telegrams, Saloons, Supper-rooms, Lavatories, Smoking-rooms, Evening Papers; 10 Orchestral Pieces Every Night. Open at Half-past Seven, begin at Eight. Prices—1s., 2s., and 6d.; reserved seats, 4s.; private boxes, from 1s. Box office open from Eleven to Four.

**ROYAL AGRICULTURAL HALL, ISLINGTON.** SANGERS' GRAND HIPPODROME AND CIRCUS.

No sight in the World can equal the gorgeous spectacle of

ST. GEORGE AND THE DRAGON. The wonderful achievements of that renowned Artiste, Professor PALMER, the Ceiling Walker. Grand change of Programme for MONDAY, February 10, and during the week.

N.B.—Morning Performances on Tuesdays and Saturdays only, at Two o'clock. Every Evening, Half-past Seven.

The Hall perfumed by Benham's Patent Diffuser, 25, Poultry.

**GUSTAVE DORÉ'S GREAT PAINTINGS ARE NOW ON EXHIBITION** at the EGYPTIAN HALL, Piccadilly. Open daily from 11 A.M. till 6 P.M. Admission One Shilling. The Hall is lighted up day and night.

**WILL CLOSE ON SATURDAY,** February 20.—FINAL EXHIBITION of SIMPSON'S INDIA, THIBET, and CASHMERE (nearly 200 Water-colour Drawings), for a short time, at the PALM-MALL GALLERY, 43, Pall-mall, and Sale of the Drawings at greatly reduced prices. Admission, including Catalogue, 1s.; Ten till dusk. Priced Catalogues by post, on application.—Mr. W. M. THOMPSON, 43, Pall-mall, S.W.

**WILL CLOSE ON THE 29TH OF FEBRUARY.**—THE EXHIBITION OF THE PHOTOGRAPHS from the Remains of the Seven Churches of Asia of the Revelation of St. John, at the ARCADE ROOMS, 24, Old Bond-street, W. Admission by presentation of private address card. Prospectus of the publication sent by post on application to the Secretary of the Arundel Society, 24, Old Bond-street.

**ON VIEW, MRS. CAMERON'S PHOTOGRAPHS,** till FEBRUARY 25 only, at the GERMAN GALLERY, 158, New Bond-street. Entrance free, on presentation of your own Card, from 10 A.M. till 10 P.M.

**STATISTICAL SOCIETY.** FOURTH ORDINARY MEETING. Of the Session, On TUESDAY NEXT, the 18th inst. PAPERS.

1. Mr. HAMILTON—"On Trade with the Coloured Races of Africa."  
2. Major-General BAPOUR, C.B.—"On English and French Budgets."  
The Chair will be taken at Eight.

**ROYAL SCHOOL OF MINES,** JERMYN-STREET.

Professor WILLIS, M.A., F.R.S., will commence a course of Thirty-six Lectures on APPLIED MECHANICS on MONDAY, the 17th of February, at Twelve o'clock, to be continued on every succeeding week day but Saturday at the same hour. Fee for the course £3.

Professor RAMSAY, LL.D., F.R.S., will commence a course of Thirty-two Lectures on GEOLOGY on MONDAY, the 17th of February, at Two o'clock, to be continued on each succeeding Tuesday, Wednesday, Thursday, and Monday, at the same hour. Fee for the course, £3.  
TRENHAM REEKS, Registrar.

**NEXT PRESENTATION** to a most desirable LIVING in the South-west of England for SALE. There is an excellent house, small population (exclusively agricultural), and capital society. Annual value £700. Incumbent nearly eighty years of age, non-resident. The curacy may be arranged for at once.—Particulars, by principals or their solicitors, from Mr. ARBER, Estate Agent, 1A, Mount-street, Berkeley-square.

**MALVERN COLLEGE.** A MODERN DEPARTMENT has recently been opened at this College, consisting partly of pupils who add to the usual public school curriculum the study of English literature, partly of those who wish to discontinue Greek entirely. The latter class will go through a course of the following subjects—Latin, Mathematics, Modern History and Languages, English Literature and Composition, Chemistry, Political and Physical Geography, Precious-writing, &c. PROFESSOR OF ENGLISH LITERATURE AND HEAD OF THE MODERN DEPARTMENT, REV. G. P. HARRIS, M.A., Trin. Coll., Camb.

**STATHAM DEFENCE FUND.** The List of Subscriptions to this Fund will be Closed on February 20. Gentlemen who have promised or intend to assist are therefore requested to send their contributions to E. SAUNDERS, Esq., 13a, George-street, Hanover-square, Hon. Treasurer to the Fund, on or before that date.

**HOMELESS BOYS OF LONDON.** FUNDS are earnestly solicited for the purchase of Food and Clothing for the 165 Boys on board the *Chichester* training ship. 150 Boys in the Refuge, 8 Great Queen-street. 95 Girls in the Refuges, 19, Broad-street, and Ealing.

417 Children. 415 will keep a boy or girl for one year. Contributions received by the London and Westminster Bank, 214, High Holborn, and 41, Louthbury, E.C., and by WILLIAM WILLIAMS, Secretary, No. 8, Great Queen-street, Lincoln's-inn-fields.

**PARALYSIS AND EPILEPSY** (the INFIRMARY for), Charles-street, Portman-square, W.—FUNDS are urgently required for this much-needed Charity. Bankers—Messrs. Glyn, Mills, and Co., and Messrs. Drummond. President—The Right Hon. Lord WHARFCLIFFE.

**NOTICE.**

**CAMBRIDGE CLUB,** GRAFTON-STREET, BOND-STREET. A GENERAL MEETING of the Members of this Club will be held on WEDNESDAY, the 19th inst. at Three o'clock, for the purpose of electing a new Committee for the ensuing year, and other business.

**WANTED** in an old-established Firm of Commission Merchants in Manchester, a PARTNER (active or otherwise), with £30,000, to take the place of a gentleman who is retiring. None but principals or their solicitors will be treated with.—Apply to JOHN SUDLOW, Esq., Messrs. Sudlow and Hinde, 18, Princes-street, Manchester.

**INVESTMENT SAFE AND PROFITABLE.**—ON SALE, a limited number of Debentures of £10 each charged upon Freehold Land and Buildings of large value in London, bearing interest at Six per cent. per annum, payable half-yearly by coupons, attached to the Bonds, redeemable in three years from April 1, 1868, at Ten per cent. premium, thus giving a return of £9 6s. 8d. per cent. per annum.—For full particulars apply to GROEBCKER and Co., 54, Threadneedle-street, London, E.C.

\* "The Epicure's Year Book." (London: Bradbury, Evans, and Co. 1868.)



in India with a young ensign, and reminds us that in those days almost everybody defended the system. Happily, Whittingham's friends were wiser than himself, and the matter was privately arranged. For the details of the arrangement, and for many another illustration of the realities of a soldier's life, we must refer the reader to the life itself, only adding that some of the letters would have been better omitted and many of them condensed, as not necessary to the completeness of the biography and as making the book somewhat too long. Considering, too, how energetically and justly the biographer protests against the mischievous effects of the cold shade of aristocracy in damaging the discipline and officering of the army, his congratulating himself that the name of Whittingham, though not noble or squirearchical, "is not redolent of trade," is scarcely consistent with these protests. Besides, it was certainly trade which enabled the son of the Bristol wholesale dealer to buy his commission; and when he dispensed his liberal hospitalities to brother officers, aristocratic and non-aristocratic alike, it does not appear that any of them ever held it to be a reproach that his fortune was gained honourably in business. The affectionate intimacy in which he lived with men who were not only thoroughly gentlemen themselves, but were sprung from the purely oligarchical caste, was rather a proof that even from the counting-house and the warehouse a character could come to which the severest critic would not dream of imputing a taint of vulgarity.

### DARWIN ON DOMESTICATION AND VARIATION.\*

[THIRD ARTICLE.]

No chapters will be read with so general an interest as the very remarkable chapters in which Mr. Darwin discusses the questions of interbreeding and cross-breeding. The practical importance of these subjects is equalled by their speculative interest. He collects a wide range of facts to show both the advantages and disadvantages of crossing and interbreeding. Critical readers may perhaps demur to several of these facts, but the general results seem firmly supported by evidence.

The advantage of interbreeding is indisputable if the aim sought be the retention of a particular character, but it is shown to be accompanied, in the long run, by the disadvantages of a diminished constitutional vigour and diminished fertility. Hence the conclusion that "it is a great law of nature that all organic beings profit from an occasional cross with individuals not closely related to them in blood; and that, on the other hand, long-continued close interbreeding is injurious." Nor has he overlooked the fact that many plants and animals are double-sexed, and these, it might be thought, would have been for long ages subject to the closest possible interbreeding, since they would be self-fertilized; but the very fact is by him turned into an argument in support of his view, since "there is no single species, as far as I can discover, in which the structure ensures self-fertilization. On the contrary, there are in a multitude of cases, as briefly stated in the fifteenth chapter, manifest adaptations which favour or inevitably lead to an occasional cross between one hermaphrodite and another of the same species; and these adaptive structures are utterly purposeless, as far as we can see, for any other end."

We do not dispute the assertion of so accomplished an investigator; but we venture to ask at least whether one case has not escaped his notice? It was maintained by Aristotle (on evidence altogether illusory) that the perch is self-productive; and this notion was confirmed by Cavolini and Valenciennes, who described the bi-sexual structure of this fish. In quite recent days the point has been satisfactorily established by the researches of M. Dufossé in 368 specimens of perch. He not only ascertained them to be normally bi-sexual, but observed them depositing their ova and at the same time casting their milt. Here self-fertilization must assuredly be normal; and indeed one may reasonably doubt whether, in this case, it is ever otherwise.

Among the illustrations of the evil effects of long-continued "breeding in and in" there is one of a sow who would not breed at all to her sire, but bred at once to a stranger in blood. Another sow, the product of close interbreeding for three generations, when paired with her own uncle (known to be productive with other sows) produced a litter of only six, and another time only five weak pigs. But paired with a boar of a small black breed (which produced seven to nine young with his own breed) she who had been so unproductive with her uncle yielded twenty-one, and in a second litter eighteen pigs!

I will now briefly describe the two most striking cases as yet observed by me. Six crossed and six self-fertilized seeds of *Ipomoea purpurea* were planted as soon as they germinated in pairs on opposite sides of two pots, and rods of equal thickness were given them to twine up. Five of the crossed plants grew from the first more quickly than the opposed self-fertilized plants; the sixth, however, was weakly, and for a time beaten, but at last its sounder constitution prevailed, and it shot ahead of its antagonist. As soon as each crossed plant reached the top of its seven-foot rod its fellow was measured, and the result was that when the crossed plants were seven feet high, the self-fertilized had attained the average height of only five feet four and a half inches. The crossed plants flowered a little before and more profusely than self-fertilized plants. On opposite sides of another small pot a large number of crossed and self-fertilized seeds were sown, so that each had to struggle for bare existence; a single rod was given to each lot. Here again the crossed plants showed from the first their advantage; they never quite reached the summit of the seven-foot rod, but relatively to the self-fertilized plants their average height was as seven feet to five feet two inches. The experiment was repeated in the two following generations—the crossed plants produced 121 seed capsules, the self-fertilized only 84 capsules.

After adding a similar case, Mr. Darwin says, "Had I not watched these plants during their whole growths, I could not have believed it possible that

a difference apparently so slight as that of the pollen being taken from the same flower and from a distinct plant growing in the same pot could have made so wonderful a difference in the growth and vigour of the plants produced." It has recently been discovered that certain plants even growing in their native country and under natural condition cannot be fertilized with pollen from the same plant, and can be fertilized by pollen of a distinct species, or even a distinct genus. Fritz Müller discovered that in some cases the pollen acts like a poison to its own stigma!

Mr. Darwin connects this undoubted fact of the beneficial influence on fertility of slight changes in the conditions, with the empirical observation of medical men and farmers, who have long held that such slight changes as the removal from one room to another—still more from one part of the country to another—and a change of pasture, exert a striking influence on convalescents and cattle. The medical prescription of "change of air" has a physiological justification. "In the case of plants the evidence is strong that a great advantage is derived from exchanging seeds, tubers, bulbs, and cuttings from one soil or place to another as different as possible."

If certain slight changes act thus beneficially, others act injuriously. Nothing is better established than the influence of domestication and confinement in producing sterility in most animals; indeed, one may say that it is only those animals which will breed in confinement that have become domesticated. In almost every part of the world the natives are extremely fond of taming quadrupeds and birds, but they rarely or never succeed in making them breed. The elephant is the most remarkable case of animals not breeding in captivity, though in India they are kept in large numbers, live to a good old age, and are very vigorous. Most of the pig family breed readily in our menageries. Even the Red River hog from the sweltering plains of West Africa has bred in our Zoological Gardens. The lion breeds freely enough, but the tiger rarely. Mr. Bartlett adds the curious fact that lions breed more freely in travelling menageries than in the Zoological Gardens; probably the constant excitement and irritation produced by moving from place to place, or change of air, may have considerable influence in the matter.

Turning to another point, among the strange and inexplicable cases of correlation must be mentioned that of the immunity against poison which accompanies certain colours. Nothing startled people more than to learn in the "Origin of Species" that cats with blue eyes were always deaf. Mr. Darwin qualifies this statement now, and says that they are almost always deaf, but if the cat has only one eye blue it hears.

The case of correlation in cats has struck many persons as marvellous. There is nothing unusual in the relation between blue eyes and white fur, and we have already seen that the organs of sight and hearing are often simultaneously affected. In the present instance the cause probably lies in a slight arrest of development of the nervous system in connection with the sense organs. Kittens during the first nine days whilst their eyes are closed appear to be completely deaf; I have made a great clanging noise with a poker and shovel close to their heads both when they were asleep and awake, without producing any effect. Now as long as the eyes continue closed the iris is no doubt blue, for in all kittens which I have seen this colour remains for some time after the eye is open. Hence if we suppose the development of the organs of sight and hearing to be arrested at the stage of the closed eyelids, the eyes would remain permanently blue, and the ears incapable of perceiving sound.

Connected with this we may mention the observed fact that colour-blindness in men is often associated with a corresponding incapacity to distinguish musical sounds; a fact which is more intelligible when we reflect on the essential resemblances between the terminal structures of the optic and auditory nerve.

But we have wandered from our point, which was the correlation of immunity against poison and the colour of the hair. Mr. Darwin, after quoting Professor Wyman to the effect that in one part of Virginia the pigs are all black because only the black varieties can feed on a certain root which abounds there and not be poisoned, adds that "in the Tarentino the inhabitants keep black sheep alone because the *Hypericum crispum* abounds there, and this plant does not injure black sheep, but kills the white ones in about a fortnight." To these we may add the fact recorded by Livingstone that the black rhinoceros feeds on the graceful but deadly *Euphorbia candelabrum*, while the white rhinoceros is inevitably poisoned if it happen to eat thereof, which it does willingly.

Complexion and liability to certain diseases are believed to run together. Certainly white terriers suffer more from distemper than terriers of other colours. White bulldogs are affected with red mange. "In North America plum trees are liable to a disease believed to be caused by insects, and the kinds bearing purple fruits are most affected." In Mauritius it is the white sugar-cane which is most severely attacked by disease. White chickens are more liable to parasitic worms in the trachea than chickens of any other colour. White verbenas are especially liable to mildew. Near Malaga during the vine disease the green sorts suffered most; the red and black grapes even when intermingled with the sick plants did not suffer at all.

In closing this very imperfect account of a book which must soon be in everybody's hands, let us note the singular urbanity and scrupulousity which it exhibits. Nowhere has the author a word that could wound the most sensitive self-love of an antagonist; nowhere does he, in text or note, expose the fallacies and mistakes of brother investigators—a practice which his brother investigators would do well to imitate!—but while abstaining from impertinent censure, he is lavish in acknowledging the smallest debts he may owe; and his book will make many men happy. Perhaps the epithet applied to Mr. Buckle (his "grand work on civilization") would have been better moderated; and, as the praise of a writer like Mr. Darwin necessarily carries great weight, we could have wished that, in giving due recognition to the merit of M. Lucas for his big book "*De l'Hérédité*," it had not been styled a *great* book, without any qualification relative to the glaringly uncritical credulity which has presided over its collection of facts, or the poverty of the physiological knowledge brought to bear on them.

\* "The Variation of Animals and Plants under Domestication." By Charles Darwin, M.A., F.R.S. Two volumes, with Illustrations. (London: John Murray, 1863.)