

dearly best, often with indifferent success, to imitate the habits of London and Paris, and we know what that is. And it is not surprising that she should deliver her soul in the matter of education and late fashions and all the other features of the cultured civilization alike of England and America. Common sense always revolts against frivolous and costly dissipation, and the frivolous and costly dissipation goes on with entirely unaltered force. Wealthy and, on the whole, badly cultivated communities, like New York and London, are sure to run off into expensive follies and stupid pleasures, and nothing that cultivated people can say in other places will have any influence on a kind of people who, being uncultivated, have no common ground with their neighbors. The saying that every good American when he dies goes straight to Paris, is full of meaning, and the meaning is not one which a patriotic American can regard with any satisfaction. Let us, in conclusion, ask Mrs. Stone whether a wise American would think it advisable to imitate the national vanity, or whether, on the whole, the wisest is not already quite sufficiently developed? It is a very likely just to suppose American society to "a splendid selfish, half-built, and deluged by rude wallowing, only with the cloak of morals, blending the eye with the dust of time, and endangering our heads with false-hold tricks, we make our way over seas of shavings and lumber to view the stately apartment," &c. &c. But why add—"Let us not do all this cry out that the old red-hot manacles of former ages, by their moil and noise and cockade, are better than the new pattern; there is no time-dust, no stink of weeds, no rough wallowing there to be seen, and life goes on very quietly; but there is the foul air of slow and sure decay." We object to this kind of silly talk, not simply because we are among the cockades, going to slow and sure decay, but because it spoils the American themselves.

## MR. DARWIN ON DOMESTICATION\*

(Second Notice.)

THE most resolute opponent of Mr. Darwin's special hypothesis will hardly withhold a tribute of admiration from the very rich and varied stores of learning which he has brought together in the course of his defence and illustration of it. Nor will those who dissent at the outset to drawing any analogy from the operation of artificial culture to that of the unaided influence of nature, shut their eyes to such proofs of the almost boundless power exerted by domestication in varying the forms and functions of animals or plants. Whatever theory may be held concerning the primary origin of existing species—whether we incline to trace any particular class or race to a single pair or a multiple percentage—history and observation abound with proofs of the extent to which the agency of man has made itself felt upon successive generations. It matters not under what climate, or for what purpose they have been kept, whether as food for man or beast, for draught or hunting, for clothing or some pleasure; under all these circumstances domesticated animals and plants are shown to have developed in time a greater degree of variation from their parent stock and from each other than is comprised within the limits of what generally passes for a single or distinct species in the field of nature.

Why certain animals and plants have varied more than others under domestication we do not know, any more than we can tell why some are rendered more sterile than others under changed conditions of life. But of a certain degree of variation we can judge by the actual production of numerous and diversified races. We can also clearly see why, in many cases, the amount of development has not occurred—namely, because slight and successive variations have not been steadily accumulated for a definite end. Such variations will, in fact, only be accumulated when an animal or a plant has been much valued, or closely observed, or kept in large numbers for an adequate space of time. Of the whole amount of modification which our domestic species have undergone, it is indeed difficult to judge. In some cases the parent-stock has become extinct, or cannot be recognized with certainty, or the species has become so dissimilar to its origin as to be widely modified. In other cases, the intervention of allied forms has introduced an unknown element of change. Nor is it possible in any existing stock to ascertain the point at which the prototype of any existing race passed from the wild state into that of culture; that is, at what point the first limit of domestication is to be set. But our entire breeds of the dog, the ox, the pig, and other animals respectively spring each from a single wild stock, or from several distinct wild varieties? It seems likely that the multiple origin of our chief domestic species has been produced by many broods, and by some few accidents, in an uncontrolled extent. Yet, on the whole, the result of Mr. Darwin's wide and searching inquiries is in favour of the supposition of several original stocks. This is not, indeed, the case with the pigeon, duck, rabbit, and most kinds of fowl, or regarding which we know that all our domestic breeds are descended in each instance from a single species. But let us take the instance of the dog, with which Mr. Darwin begins his investigations. We shall soon, he allows, probably be able to ascertain with certainty whether the widely different varieties of the dog have descended from a single wild species—from the wolf, the jackal, or from some unknown and extinct type, or some naturalists have believed.

Palæontology throws little light upon the matter. The skulls of extinct and living wolves and jackals certainly show far closer resemblance to each other than do the skulls of the several breeds of domestic dogs. What we have to reflect upon, however, is, first, the inherent impossibility of man having chosen for domestication throughout the world one single species alone of a group so widely distributed, so useful, and so easily tamed as the Canine; next, the extreme antiquity of certain breeds, as established by the Egyptian, Assyrian, and Korean monuments, and more especially the close similarity, both in external structure and habits, between the domestic dogs of various countries and the wild species still inhabiting those countries. The balance of evidence here is strongly in favour of the belief in the existence of many wild primary stocks, and much of the difference now existing can be explained by the difference between their parent species. We can hardly account, by any amount of spontaneous crossing, for such extreme forms as greyhounds, spaniels, bull-dogs, Bloodhounds, pug, terrier, and the like. At the same time we cannot conceive that forms so extreme and uncontrolled ever did or could exist in a wild state. There is no trace of their having been reared in their present form by man. When compared with all known members of the race of Canine, they betray a distinct and abnormal origin. They are, in fact, the product of long-continued civilization, and afford some measure of the power that resides in nature to modify and develop points of distinction inherent and latent under nature.

Whether our manifold breeds of the horse are descended from one or more parent stocks is a matter of much dispute. Mr. Darwin is led by numerous facts and much careful reasoning to think it more probable that all have sprung from a single wild species. The history of the horse, indeed, is lost in antiquity. The remains of several species and varieties are found in the later tertiary deposits; and if our domestic breeds have descended from a multiplicity of stocks, their primitive stock most probably have become extinct in the wild state. What are now occasionally taken for wild horses are more probably sprung from escaped domestic animals. There seems to be little doubt that the numerous first breeds of North and South America are the offspring of parents introduced in modern times from Europe. None were known to exist when the Spaniards first introduced the culture by the novel process of the mounted cavaliers. And we can scarcely form a more conspicuous instance of the variability of primary types, either in a state of nature or under domestication, than the history of the horse upon that continent affords. We wonder that Mr. Darwin has not made more of it than he has in his reasoning upon the central hypothesis. If less than three centuries have sufficed to effect contrasts so wide as those between the several existing breeds, what limit can be assigned to the operations of nature extending over thousands of years? While the horses of Chili, living under nearly the same conditions as their progenitors in Andalusia, remain unaltered, the Peruvian horses are extensively modified in form, strength, and size. The Paso ponies, which inhabit the lofty regions of the Cordillera, are strong little creatures, very different from their Spanish progenitors. There were, or are still, on some islands on the coast of Virginia ponies like those of the Channel Islands, which are supposed to have originated through exposure to unfavourable conditions of climate and food. In the Falkland Islands the offspring of horses imported in 1784 have already so much deteriorated as to be unsuited for catching wild cattle with the lance, so that fresh horses have to be brought for this purpose from La Plata. Strange varieties are at times met with, from which it is conceivable that what might be called monstrous breeds could easily have been perpetuated. Mr. Waterston records the case of a mare which produced successively three foals without tails, so that a tailless race of horses might have kept company with the tailless race of dogs and the case of the life of Man. A Humber breed is said to have blinded hinds, and Assan speaks of horses being born in Paraguay, but generally defective with hair like that of the pig. Other specimens are absolutely hairless. Such facts make it less hazardous to conclude as unlikely as our dry-bone, our cow-horn, and our Highland pony, should have had a common source. From considerations of the changes of colour in horses, and the tendency to develop stripes, Mr. Darwin inclines to the belief that the parent stock was of a dun colour, more or less striped, closely connected with the silver or grays, and that the horse and the ox, who may be traced in all his varieties to a single type, the entire progeny of Ahyrcania, had a common progenitor in some early but now extinct member of the wide equine group.

What diverse breeds of cattle have originated through variation, independently of descent from distinct species, is shown by what we see in South America, where the guinea cow was not unknown, and where the cattle which now exist in such vast numbers are the descendants of a few imported from Portugal or Spain. In Colombia, Rueda describes two peculiar breeds—ponies, with extremely thin and long hair, and oxen, extremely naked. Cattle without horns, and others with reversed hair, have also originated in Paraguay. On the banks of the Plata Mr. Darwin himself came across the singular breed called *caraca* or *caraca*, which has the same relation to other breeds that bull or pig does to the wild ones, or that improved pig, according to R. von Nathusius, do to common pigs. They are believed by Hensler to belong to the primitive type, which is still represented amongst ourselves by the wild Chillingham breed. They have certain characteristics of skull and jaw in common with the extinct and gigantic oxen of India. Modifications of this extreme kind have

\* The Varieties of Domestic and Feral canis. Domestication. By Charles Darwin, M.A., F.R.S., &c. 2 vols. London: John Murray, 1868.

that have effected under nature, or under the rude and imperfect selection, or culture possible in half-civilized countries. What has been done for sheep, pigs, rabbits, and other domestic animals by the skill and perseverance of our own scientific breeders must be within the observation of every one. Mr. Darwin's chapters on these heads afford a succinct account of the principal principles in this new manipulation of nature, of which the improved breeds of our public exhibitions form the experimental proof. He has been led to study domestic pigeons with particular care, because the descent from a single known source is more clearly established in the case of the pigeon than in that of any other domesticated animal. It is in this part of his book which abounds the fullest in nature and interesting details. Strange as it may seem at first sight, there can be no doubt that such singular and semi-tortured breeds as pouters, tumblers, fantails, and varieties have all sprung from a common wild progenitor, the rock-pigeon, or rock pigeon. The difficulty in attempting to graft a wonder is, however, in truth just that which the principle of selection, together with that of inherited particularity, tends to remove. What is really a difficulty of the highest moment in the way of Mr. Darwin's principle itself is the tendency of these and all other extremes, as, as we may say, artificial breeds to revert to the original wild or natural type as soon as the pressure of culture is relaxed. We should have wished to see Mr. Darwin address himself, more directly and explicitly than he has done in the volume before us, to the removal of this objection. The chapters on reversion or atavism hardly meet what has been felt all along as the great standing-block in the way of his hypothesis.

The most novel portion of the book, and that in which Mr. Darwin makes the only step of consequence in advance of his original theories, is that in which he lays down with much diffidence what he terms the "provisional hypothesis of Pangenesis." In previous chapters he had discussed large classes of facts bearing no real relation, the various forms of inheritance, and the cause and laws of variation. And he felt himself led, or rather forced, to form a view which, to a certain extent, promised to connect these facts by a tangible method. Upon the important question of reversion he had arrived at certain scientific conclusions, by correlating the observations and discoveries of eminent physiologists. The difference between the two classes of sexual and asexual reproduction has been shown to be more imaginary than real. Asexual generation is effected in many apparently generative, that is, by the formation of buds of various kinds, and by division, whether by spontaneous or artificial division. The notion of Johannes Müller that there was an essential distinction between the process of generation and function has been set aside by most physiologists. Professor Huxley remarks that "function is hardly less than a peculiar mode of building," and Professor H. J. Clark has shown to detail that there is sometimes "a congruence between self-division and building." Again, between the production by self-division of two or more complete individual cells, and the repair of even a very slight injury, there has been shown to be so perfect and inseparable a gradation that it is impossible to doubt their being connected processes. "The process of development from the embryo," says Mr. Paget, "is identical with those started for the replacement of lost ligatures. In other words, the process are the same by which perfection is first achieved, and by which, when lost, it is recovered." Thus we may conclude that the several forms of generation and regeneration, the repair of injuries, the metamorphosis of each part in its proper state, and the growth or progressive development of the whole structure of the embryo, are all essentially the results of one and the same great power. Between sexual and asexual reproduction, the limits of the two sexual elements has generally been taken as the broad mark of distinction. But the well-ascertained cases of parthenogenesis prove that this distinction is not only so great as it at first appears. Ovids occasionally, and even in some cases frequently, become developed into perfect beings without the concurrence of an extraneous element. And corals and beehives have been admitted by J. Müller to have the same essential nature. In the process of metamorphosis which occurs in certain splanchnic insects as many as twenty forms, and which Mr. John Lubbock represents as probably extending to us in succession the normal stages of development which are concealed or masked through or suppressed in most other insects, we have a further instance of the same great power of life before us open of. An analogous instance may be seen in what Professor Owen has termed "metagenesis," in which the new persons are not moulded upon the inner surface of the old ones, but by a new and distinct development of the plastic form. But Professor Huxley has shown how curiously metamorphosis in quadrates, or in star-fishes, into generation or self-formation, which is, in fact, the same as metamorphosis. One while generation, then, seems to include these manifold operations of the great vital force. The whole organism being made up of a multitude of elemental parts, which are to a great extent independent centres of life, though serving on each other a reciprocal account of action, it is easy to conceive every such organ or tissue of ultimate cells bearing its own conditions of nutrition, of expansion, and even of reproduction. Each, as it is cut off or dissolved, is replaced by another. Whether we conceive cells that to be derived from former cells by what we might call a process of mechanical growth, or through certain chemical changes, we can form ourselves of the process by which the properties or characteristics of one organ or member of the body may be transmitted to the successive elements that take its place in the organism, through the action

of the supposed new formations of life. Hence the inherited effects of the use or disuse of certain organs; and hence, too, the wonderful property of reversion, which is in fact but another form of inheritance, the restoration of characters seemingly lost, but dormant. Upon such considerations of recent physiology as these Mr. Darwin proceeds to build up his new hypothesis.

It is almost universally admitted that cells, or the units of the body, propagate themselves by self-division or procreation, retaining the same nature, and ultimately becoming covered like the various stems and branches of the body. But because the nature of human I assume that cells, before their complete and complete passage, or "fission," consist of some of which granules or atoms, which diffuse freely throughout the system, and when united with proper nutrient matter by self-division, subsequently becoming developed into cells like those from which they are derived. Thus granules in the state of disintegration may be self-reproduction, as in the ordinary nature, is not fully established, simply granules. They are supposed to be transmitted from the parents to the offspring, and are usually engaged in the generation which immediately succeeds, but are often transmitted in a dormant state during many generations and are then developed. Their development is supposed to depend on their union with other partially developed cells or granules which granules in the regular course of growth. Why I use the term cells, will be seen in the next chapter. I have no objection on this subject, and the term "granules" is convenient in the work of a very early cell, but only during the initial state, but during all the stages of development. Lastly, I assume that the granules in their dormant state have a special affinity for each other, leading to their aggregation either into buds or into the sexual elements. Hence, speaking broadly, it is not the reproductive elements, say the buds, which generate new organisms, but the cells themselves throughout the body. These assumptions constitute the provisional hypothesis which I have called Pangenesis.

The ruling idea of this hypothesis is that the whole organism, in the sense of every separate atom or unit, reproduces itself. Physiologists at large consider that each cell, though to a great extent dependent upon others, is likewise to a certain extent independent or autonomous. Mr. Darwin goes a step further. He assumes that each cell consists of a free granule, which is capable of reproducing a similar cell. Thus the entire organism grows, repairs, and reproduces itself by virtue of a law acting on each separate cell or physiological unit. The existence of such free granules is, in the author's view, a provisional assumption. What never under this name, or that of the "blastema," or anything else, we prefer to figure to ourselves as the ultimate unit of life, must remain as much a matter of hypothesis as the other which is taken to particular the manifestations of life. Conspicuous among what granules have been started by Müller under the name of "organic molecules," and Huxley's well-known but unfulfilled theory of multilateral spores of perfect forms isolated within germ in cellular secretion. Mr. Darwin explains how his theory differs in detail from these, as well as from Mr. Herbert Spencer's view of a "physiological unit," though safely able to stand in fundamental points. He concurs with Professor Owen's account of the agency of the transmission and multiplication of germ cells as the agent in propagation by self-division and in the reproduction of ligatures, but does not, like him, look upon the germ cell as necessarily fertilized within the organism of the female by the male. His granules are supposed to be formed, quite independently of such concourse, by each separate cell or unit within the body, and to be merely aggregated within the reproductive organ. These organs, accordingly, do not create or constitute the sexual elements. They merely determine or permit the aggregation of the granules in a special manner. Each living creature must be looked upon as a microcosm—a little universe, formed of a host of self-propagating organisms, inconceivably minute, and as numerous as the stars in heaven. Mr. Darwin may fairly claim to have been the first to put forth a view professing even to connect in one these several great classes of facts. No man is ever credit due to him for the logical clearness and diligence with which he has put it forward. Important as his conclusions is to be, and want as my chain of proof must inevitably be where so many of the functions of life are shrouded in mystery and complexity, it brings at least the main lines of physiological discovery within my grasp. In the course of conversing, which may be over-patience toward the great problem of life, it will in all probability have the immediate centre, and indicate for a long time the track of progress.

#### LE DIACON<sup>2</sup>

THE regular and excellent novels which bear the joint names of Rodmann-Claretton have a peculiar significance at a time when the subject of conscription has assumed such unusual importance in France. They look at the question of war from the peasant's, the citizen's, the country's point of view. The ancient military enthusiasm of the Republic, and the warlike fanaticism of the Empire, who held for a creed that there was no God but the God of battle, and that Napoleon was his prophet, are shown by these authors in just and spirited colours. But they are introduced chiefly as foils in the humble and obscure position of the community who bear the real burden of the Emperor's wars, the peasants whose houses were laid waste, the shopkeepers whose trade was destroyed, the independent poor whose scanty means were wrong, the families that lived in terror of the conscription. While the battles were breathing victory and glory, and boasting of the patriotism which impelled the people of France to arms, the people, year by year, learned to view as a Malakoff the ruler whom

<sup>2</sup> Le Diable Epique et le Dieu de l'Empire. Par MM. Rodmann-Claretton. Paris.