



Strictures on Darwinism. Part III.-On Gradual Variation

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- From the ETHNOLOGICAL and ANTHROPOLOGICAL SOCIETY of ITALY.—
 Archivio per l'Antropologia e la Etnologia. Vol. iv, No. 1.
 From the AUTHOR.—The Ruins at Dunapar, on the Dunsin River,
 Asam. By Major Godwin-Austen.
 From the AUTHOR.—Pasigraphical Dictionary and Grammar, 3 copies,
 English, French, and German. By Anton Bachmaier.
 From the EDITOR.—Nature (to date).

FOR THE MUSEUM.

- From LOGAN D. H. RUSSELL, Esq.—Sword as used by Mandingo
 Chiefs ; Grass Bag from Abomey, the capital of Dahomey ; Grass
 Cloth from Angola.

Dr. Anton Bachmaier read an address from the Anthropological Society of Munich, and briefly described the object of his Pasigraphical System of Language.

The author read the following paper :

STRICTURES on DARWINISM. PART III.—On GRADUAL VARIATION.

IN a previous paper I have tried to show that Mr. Darwin's theory fails to meet the facts presented by the extinction of types, and that wherever we can test a case of extinction as occurring in nature, it has been by the operation of external causes, climatic and physical, and not by internal ones, and by the mutual struggle of individuals. I was told when I advanced this argument that I merely postponed the difficulty and put it another stage off, and that it would be better to criticise the origin, and not the extinction, of species. To this I now proceed. *In limine*, let me make the issue somewhat clearer than it has hitherto been. Mr. Darwin's disciples—not Mr. Darwin—argue as if the older naturalists knew nothing, and admitted nothing, or a very little, of the existence of variation ; and that, until Mr. Darwin appeared, everybody argued as if types were absolutely rigid and inflexible. Everybody, surely, from the earliest days of observation, has admitted the existence of variation ; has admitted that we cannot even find two individuals of a class identical in all respects ; that, however limited and small our area of observations, differences and varieties exist ; that nature never repeats the same model ; this we are all agreed in.

The most fanatical adherent of Aristotle's opinions, or of those of Linnæus and the older naturalists, admit this, and to show that

things vary is not to show anything new, nor is it Darwinism. Again, Darwinism is not the theory of evolution. That all living and dead things, that matter and thought may be deduced from a homogeneous matrix or germ, which has varied and varied until the original ovum has given birth to a universe, and that we can by an elaborate analytic process trace back the genealogical lines of being to their fountain source, is a grand theory—which may be styled Spencerism, but not Darwinism. By Darwinism, I mean what it is the great honour of Mr. Darwin to have invented and propounded—namely, the theory that variation, where it occurs, is due to the internal, and not to external, causes—to a struggle for existence among individuals and not to external pressure. Formerly, it was held that a change of climate, a change of food, of outward surroundings, etc., sufficed in the long run to produce very great differences of type. The extent of variation admitted may be tested by the fact that mankind was almost universally admitted to be of one species, differenced in different localities by differing circumstances. Similar variations were admitted in animals, though within narrower limits, and, in fact, no one conversant with the most elementary facts of breeding domesticated animals could be long ignorant of this fact. Mr. Darwin's cause is not to restate an old fact, but to give it a new explanation, and whatever the ignorant and the fanatical may have to say to him, one who has learnt more than he can tell from him, will not cease to say, while he differs from his analysis of the facts, that he holds him to have advanced the cause of zoology more than all its other recent professors put together, and to say it, he trusts, with the respectful deference of a scholar for his master.

In this paper I shall not deal with that kind of variation which takes place *per saltum*, and which gives rise to suddenly-developed varieties, otherwise called "sports." This I shall consider in a future paper, but shall confine myself to gradual variation. It will be at once seen that the subject has two aspects, which materially differ from one another; in one of which I fancy all naturalists, Darwinians or otherwise, will agree, however they may differ as to the other. There is, first, variation in the individual; and, secondly, variation in the class. It is one thing to explain how an individual comes to change, it is another thing to explain how this change should be a qualifying characteristic of a whole class of individuals.

It is generally admitted by everybody that we are constantly changing, that from day to day we are not exactly the same persons, that our bodies change altogether every few years, and that our history from childhood to old age is a continuous change. As I have said, we also differ from everybody else.

Notwithstanding this, we do conform to a certain normal standard, under which we are comprehended when we say we belong to such and such a type.

Now I fancy that everybody is agreed that the causes of variation in the individual, putting aside those due to mere growth and decay, are of two kinds—those which are inherited, and those which are induced by different conditions of living. Beyond these two, I know of no causes, and in this I fancy Mr. Darwin and everyone else agrees. Where we criticise any individual variation, and try to discover what is due to inheritance and what to external influences, the problem becomes a difficult one, but it is not a problem in issue at present. It is enough, if it be granted, that the latter is a very patent cause of individual variation. If it be granted that where an animal or a plant is subjected to a change of conditions, a change of features ensues in it. The smooth-skinned animal or the animal with wiry hair acquires a thick coat of woolly hair if transplanted to a cold climate; the dark-coloured animal or bird acquires a white covering, such as the stoat and the ptarmigan acquire if transplanted to a very cold climate, and this in proportion to the cold; the annual flower of our latitudes becomes the biennial and perennial of the tropics; the bee of our latitude ceases to collect honey where flowers are to be found all the year round; the bear of cold regions ceases to hibernate where winter and summer hardly differ in temperature. The young, fair-skinned boy who goes out to India comes home, in thirty years, a bronzed and altered veteran; and so on. In this, I fancy, all will agree; but I shall be told that this in no way affects Mr. Darwin's position, which is not a denial that individuals are not altered by external influences, but a discussion of how the individual difference becomes the class difference, how the type in fact changes. Yet surely one question is a very important element in the solution of the other. If these individual changes, which are caused by external influences, were like the changes induced by inheritance, irregular, and in various directions; if we were unable, as we are in the case of inherited differences, to predict within certain limits the effects of such a change upon any organism, this might be said. But when we can do so; when we can predicate absolutely that certain changes will take place if the individual is transferred to certain localities and put under certain influences, and test our prediction by experiment, then it surely follows that the individual difference must become the class difference, if the class, no less than the individual, is subjected to the same outward influences. Mr. Darwin's argument, as I understand it, is, that when a change of condition occurs, one individual will develop an idiosyncrasy fitting it better than

the rest for the new circumstances, and this will give it such an advantage as against the rest that it and its progeny will eventually oust and supplant the rest. We argue—and it is no new argument—that the advantageous change induced in one individual is induced in another individual by the same causes; that the whole class is affected in the same direction; that there is no survival of the fittest in the sense used by Mr. Darwin; for the fittest is not produced in that way, and of course it is only in that sense that any one can quarrel with Mr. Darwin's conclusion; for the abstract position that the thing best fitted to survive survives is a mere identical expression, as true as that two and two make four, as well known for ages and as generally accepted.

As a rule, where the conditions have been constant, there we find the type constant too. It is a familiar mode of meeting Mr. Darwin's arguments to refer to Egypt, where we find embalmed bodies of men and animals and plants which we can compare with men and animals still living there, and show that there has been no variation, so far as we can test, during the interval; but this argument does not go further than this, that where the conditions are constant, the type remains constant too. We may take an enlarged example from geology, where we can deal, not with 3,000 or 4,000 years, but with a whole period. Here, too, we find the same rule confirmed. It is a familiar fact that, in comparing the remains found at the bottom and the top of *the same deposit*, however thick, where we can reasonably argue from the lithological and other features of the particular stratum that it was deposited under uniform conditions, that we find no variation—the forms are constant. We can test the same fact in another way. It is well known that the various breeds and varieties of domestic animals and plants have been educed from a few wild ancestors, chiefly by the alteration of outward circumstances. When we remove these circumstances and remit our plants and animals to their original surroundings, and place them as they were before they became domesticated, we find almost invariably that the type reverts to its original state, if the surrounding conditions are the same when the experiment is tried, as they are where the animal is indigenous. Mr. Darwin has cited numerous examples, and so did the father of our science in England, Dr. Pritchard, in his work on the "Natural History of Man," and the fact is extremely familiar to all who have kept a garden or turned tame rabbits into a warren. The extreme difficulty of preventing some flowers, such as the pansy, etc., from reverting to the wild original in the one case, and the rapidity with which the tame rabbits acquire the characteristics of wild

ones in the other, being very marked. So much is admitted by everybody, that individuals are liable to vary, but that where the condition remains constant the type remains true. Let us now examine what occurs when the conditions are altered, when there is a transplanting of animals or plants to a different area and different surroundings. Mr. Darwin has collected some valuable examples. It is notorious, he says, speaking of dogs, that most of our best European dogs deteriorate in India. . . . The Thibet mastiff degenerates on the plains of India, and can live only on the mountains. ("Var. of Animals and Plants," etc., i. 36.) They degenerate not only in their mental faculties, but in form. Captain Williamson, who carefully attended to this subject, states that hounds are the most rapid in their decline; greyhounds and pointers also rapidly decline. Bulldogs in two or three generations lose the underhung character of their lower jaws; their muzzles become finer and their bodies lighter. Stringent precautions to prevent crosses are of no avail. (*Op. cit.* i, 37 & 38.) Here we have the whole class changing together, and changing so that we can predict the result. The new type is not developed from the old by the survival of an individual and its progeny, but the whole type changes together, and even, according to Dr. Falconer and Mr. Everest, as cited by Mr. Darwin, in two or three generations. Again, with regard to horses: "Mr. D. Forbes, who has had excellent opportunities of comparing the horses of Spain with those of South America, informs me that the horses of Chile, which have lived under nearly the same conditions as their progenitors in Andalusia, remain unaltered, while the Pampas horses and the Puno ponies are considerably modified. There can be no doubt that horses become greatly reduced in size and altered in appearance by living on mountains and islands, and this apparently is due to want of nutritious or varied food," etc., etc. Again: "Much humidity is apparently more injurious to the horse than heat or cold, . . and this circumstance may perhaps partly account for the singular fact that to the eastward of the Bay of Bengal over an enormous and humid area, in Ava, Pegu, Siam, the Malayan Archipelago, the Loochoo Islands, and a large part of China, no full-sized horse is found. When we advance as far eastward as Japan the horse re-acquires his full size." (*Op. cit.* i, 52 & 53.) Here, again, we have effects which may be predicted, and which affect a whole class together. He adduces proofs which show that humidity tends to make the hair of cattle grow, and as the hair and horns are much connected, and often vary together, so that climate through the skin might indirectly affect the form and size of the horns. (*Op. cit.* i, 92). According to Pallas and Erman, the fat-tailed Kirghiz sheep, when bred for a few generations in Russia, degenerates, and the

mass of fat dwindles away. . . . Burnes says the Karakol breed, which produces a fine curled black and valuable fleece, when removed from its own canton near Bokhara to Persia, or to other quarters, loses its peculiar fleece. . . . In the West Indies, in the third generation, sheep lose their wool and look like goats with dirty floor-mats on their backs. (*Op. cit.* i, 99 & 100). Here, again, we have results which may be predicted, which will occur to any individual sheep exposed to the new conditions—that is, which affect the whole type together. In describing the peculiar breed of Porto Santo rabbits, which sprang from some Spanish rabbits set free there by the navigator J. Gonzales Zarco in 1418 or 1419, Mr. Darwin mentions how they differ from the European rabbit in colour, yet when one was imported into England “under the English climate this individual rabbit had recovered the proper colour of its fur in rather less than four years.” (*Op. cit.* i, 114). Here we have a remarkable case of variation under new climatic influences being neutralised by a migration to the old ones, proving as effectually as proof can that the effects were due to climate. Pallas remarks “that even in domestic animals, as horses and cows, the winter coat is of a lighter colour than the smoother covering which succeeds it in the spring. This difference is much more considerable in wild animals. I have shown instances of it in two kinds of antelope (saiga and gutterosa), in the musk animal (*moschus moschifer*), and in the equus hemionus. The Siberian roe, which is red in summer, becomes of a greyish white in winter; wolves and the deer kind, particularly the elk and the reindeer, become light in the winter; the sable (*M. zibellina*) and the martin (*M. martis*) are browner in summer than winter.” (“*Novæ Species Quadrupedum*,” quoted by Lawrence, “*Natural History of Man*,” 438.) These changes, which are intermittent in temperate climates, give rise to permanent changes of the same character where the whole year is wintry or summery. What is true of mammals is true also of birds. Mr. Darwin has described how the wild turkey was altered when transported to England, while “in India,” he says, “the climate has apparently wrought a still greater change in the turkey, for it is described by Mr. Blyth as being much degenerated in size, utterly incapable of rising on the wing, of a black colour, and with the long pendulous appendages over the beak enormously developed.” (*Op. cit.* i. 294.) The guinea fowl has altered a good deal when transferred to the West Indies—has altered in size, its legs have become black, whereas the legs of the aboriginal African bird are said to be grey. (*Id.* 294.) The great work which Messrs. Sharpe and Dresser are now publishing on European birds offers abundant materials for testing the same position. It can hardly be credited that a large number of the

species there described, which differ from other species merely in the constancy with which certain feathers are coloured, are anything but varieties dependent on different climatic conditions. Among other tribes, those of the spotted woodpeckers, the larks, the nuthatchers, etc., are notable. If similar tests of species were applied to pigeons or fowls, to domestic cattle or dogs, the term variety would lose its connotation. It can hardly be doubted that the red grouse is a variety of the willow grouse created by different conditions.

In regard to fish we have similar evidence. The invasion of a salt water basin by fresh water, and the gradual change of its saline character, is followed by a corresponding change in its inhabitants. So with the mollusca. Thus, in the Baltic, which has become gradually less salt, the shells have become greatly affected, and the change may be traced by comparing the fossil shells that are found on the old beaches high above the Swedish lakes with the similar shells still living in the sea. In the same manner the gradual desiccation and consequent increasing saltiness of the lakes of Central Asia, inclusive of the Caspian, has led to the distortion of the fish found in them. This cause, operating not on a single individual and its progeny, but on a whole class. The golden carp is an example of the great variation which ensues when a fish is surrounded by entirely different conditions. The number of its varieties and eccentric forms almost rival those of the pigeon. Plants are even more forcible examples than animals of what I am arguing for. Mr. Darwin describes the changes that took place in some maize experimented upon by Metzger. His commentary I cannot improve as an argument for my contention. He says: "These facts afford the most remarkable instance known to me of the direct and prompt action of climate on a plant. It might have been expected that the tallness of the stem, the period of vegetation, and the ripening of the seed would have been thus affected; but it is a surprising fact that the seeds should have undergone so rapid and great a change. As, however, flowers, with their product the seed, are formed by the metamorphosis of the stem and leaves, any modification in those latter organs would be apt to extend, through correlation, to the organs of fructification. (*Op. cit.* 322.) The amount of variation that can be artificially produced, and in a certain direction known beforehand, is extraordinary. Thus it is said that the Chinese have a method of changing the colour of the hair by diet. I find it on record that several instances have been produced where red and light-coloured hair has been made black. Thus l'Abbé Imbert came to Paris in 1823 to prepare for his mission to China. His hair was then of a glaring red. On his arrival he

was sent to a secret retreat, and subjected to a constitutional and internal treatment, which speedily turned to black all the hair on his body. M. l'Abbé Voisin told the lecturer that his hair, formerly grey, had been similarly changed by internal treatment. Other cases are quoted in the same account. The supposed operating cause of the change was an infusion of three kinds of plants, followed up by a peculiar regimen. There are certainly cases on record where the hair has changed colour under medical treatment. ("Year Book of Facts for 1841," p. 189.) These cases may be compared with others. Ravenstein, in his work on the Anur, says that the further east we go in Siberia, the darker the furs become. The squirrel changes the colour of its fur, and the Russians attribute it to a change of food. The black ones live chiefly on mushrooms, the brown ones and reddish ones on hazel nuts. Dr. Lawrence tells us that singing birds, chiefly of the lark and finch kinds, are known to become gradually black if they are fed on hemp-seed only. ("Natural History of Man," 439.) There are certain pigs which have become semiferal in the Southern States of America, whose bones have acquired a black colour, and this is said to be due to their food.

To these facts may be added others quoted by Mr. Darwin himself. "Mr. Wallace has also recorded a more wonderful fact. The Indians of South America have a curious art by which they change the colours of the feathers of many birds. They pluck out those from the part they wish to paint, and inoculate the fresh wound with the milky secretion from the skin of a small toad. The feathers grow of a brilliant yellow colour, and, on being plucked out, it is said, grow again of the same colour, without any fresh operation." (Darwin, *op. cit.* ii, 280.) "It is well known," he again says, "that caterpillars fed on different food sometimes either themselves acquire a different colour or produce moths different in colour." These cases and many like them have been accumulated by the indefatigable labours of Mr. Darwin, and what do they prove? Not only that altered food will alter an individual animal, but, inasmuch as the alteration may be predicted, it will alter the whole type together. Similar and more familiar instances are the dwarfing of animals and plants by particular diet. Gin is said to be so used by dog breeders in England. In Japan the spirit called saki is used for the same purpose. (See Fortune's "China and Japan," 98.) The process of dwarfing plants is described in the same work in very interesting language, which I extract: "In Japan, as in China, dwarf plants are greatly esteemed, and the art of dwarfing has been brought to a high state of perfection. President Meylau in 1826 saw a box, which he describes as only one inch square

by three inches high, in which were actually growing and thriving a bamboo, a fir, and a plum tree, the latter in full blossom. The price of this portable grove was 1,200 Dutch gulden, or about £100. . . . Pines, junipers, thujas, bamboos, cherries, and plum trees are generally chosen. . . . The art of dwarfing trees, as commonly practised both in China and Japan, is in reality very simple and easily understood. It is based upon one of the commonest principles of vegetable physiology. Anything which has a tendency to check or retard the flow of the sap in trees also prevents, to a certain extent, the formation of wood and leaves. This may be done by grafting, by confining the roots in a small space, by withholding water, by bending the branches, and in a hundred other ways which also proceed upon the same principle. This principle is perfectly understood by the Japanese, and they take advantage of it to make nature subservient to this particular whim of theirs. They are said to collect the smallest seeds from the smallest plants, which I think is not at all unlikely. I have frequently seen Chinese gardeners selecting suckers from the plants of their gardens. Stunted varieties were generally chosen, particularly if they had the side branches opposite or regular, for much depends upon this. A one-sided dwarf tree is of no value in the eyes of the Chinese or Japanese. The main stem was then in most cases twisted in a zigzag form, which process checked the flow of the sap, and at the same time encouraged the productions of side branches at those parts of the stem where they were most desired. The pots in which they were placed were narrow and shallow, so that they held but a small quantity of soil compared with the wants of the plants, and no extra water was given than was actually necessary to keep them alive. When new branches were in the act of formation they were tied down and twisted in various ways. The points of the leaders and strong growing shoots generally were nipped out, and every means were taken to discourage the production of young shoots possessing any degree of vigour. Nature generally struggles against this treatment for a while, until her powers seem to be in a great measure exhausted, when she quietly yields to the power of art. The artist is, however, on the watch, for should the roots of his plants get through the pots into the ground, or happen to receive a liberal supply of moisture, or should the young shoots be allowed to grow in their natural position for a while, the vigour of the plant, which has so long been lost, will be restored, and the finest specimens of Oriental dwarfing destroyed." (Fortune's "China and Japan.")

This system is carried out on a grand scale in nature's laboratory, in climbing mountains, or in going from temperate to

very cold latitudes, plants become dwarfed and altered in this, often contrasting remarkably with animals. The *raison d'être* is probably the same, I believe, in both cases, the size depending on the abundance of food rather than on the harshness of the climate. I will quote only one example of the effect of a hard climate and soil upon plants. I find the following passage in the "Journal of the Geographical Society": "The difference between the Daur birch (*betula Dahurica*) and the Mongolian oak (*quercus Mongolica*) is striking if compared in both localities—*i. e.*, the Kinghan Mountains and the Amur Valleys. The species, which on the banks are knotted, almost stunted, and mostly dry-trunked (as the oak), are found some six or seven versts inland, quite straight, and of a height of sixty to seventy feet. The black birch undergoes an entire change in its exterior in the mountains. Its trunk in general divides into two, while on the banks it branches off into a great number of crooked and knotted boughs, reminding me of the old birch tree of my native land." ("Notes on the Amur and adjacent District," by Radde, *op. cit.* 422).

It is well known that the whole constitution of plants alters in different latitudes. Not only do the periods of flowering and seeding, and the rate of growth, but almost every character of their lives changes. Travellers relate how, under the intense actinic energy of the short arctic summer, plants may be almost seen in the act of growing; how the desolate shores of some of the arctic islands grow rapidly green, and as rapidly decay, with the same kinds of plants that are much more lethargic in their movements in other latitudes. Particular soils produce variegated leaves, while even more extraordinary results occur from similar causes, as the following passage from Mr. Darwin suffices to show: "The chemical qualities, odours, and tissues of plants are often modified by a change which seems to us slight. The hemlock is said not to yield conicine in Scotland. The root of the *aconitum napellus* becomes innocuous in frigid climates. The medicinal qualities of *digitalis* are easily affected by culture. The rhubarb flourishes in England, but does not produce the medicinal substance which makes the plant so valuable in Chinese Tartary. As the *pistacia lentiscus* grows abundantly in the south of France the climate must suit it, but it yields no mastic. The *laurus sassafras* of Europe loses the odour proper to it in North America." (Darwin, *op. cit.* ii. 274.) And thus he goes on with closely-crowded examples of the same law; but it is surely a law at issue with Mr. Darwin's great contention. Here we have climatic and other effects produced upon a whole class, and not a revolution created by the gradual development of some idiosyncrasy in a particular family, which, by giving that family

some advantage in the struggle for existence, enables it, cuckoo-like, to elbow out its neighbours.

In regard to the size of the individuals of some areas, which has been made an element in discriminating species, the cause is more clearly external. It has long been known that the reindeer of the highest latitudes are the largest in size, and that they diminish as they approach more temperate regions. Mr. De Capel Brooke and others have collected abundant evidence in regard to the Spitzbergen and Lapland reindeer. This fact has been enlarged by Dr. Baird into a general law. He says: "Many of our animals become smaller as we proceed southwards, until on the sea coast of Georgia, Florida, and the Gulf they reach their minimum. This is very strikingly seen in the common deer, which on the sea islands of Georgia is so small as to be readily lifted and thrown across a horse with perfect ease by a man of ordinary strength. It is in the sciuridæ next to the deer we find this law to prevail most decidedly. Nearly all the species of extensive north and south range will be found on careful examination to substantiate this position." This law is directly contrary to our *à priori* prepossessions; but it seems to show that we have been apt, perhaps, to lay too much stress upon the climatic features of zoological distribution instead of studying the distribution of food. With abundant food and a dry climate there seems no limit to the cold which big mammals can live in, as is well shown in the case of the Thibetan plateau; but this is no support to the doctrine of natural selection. Here also we have a cause operating upon a whole class. The horses and cattle of Holstein, which feed on rich meadow land, are big animals; the horses and cattle of Skye, of Brittany, etc., etc., where food is poor and scanty, are small.

It is remarkable, even in a cursory view of the matter, how the number of species in a genus, that is, how the amount of variation, increases, as we advance from the cold regions about the Poles towards the tropics—advance, in fact, from where there is a monotonous constancy in the surroundings of life in climate, food, etc., to where there is immense variety in the same features. It is from the tropical forests that the exuberant profusion that characterise botanical and entomological catalogues is recruited. This law is apparently reversed in conchology, in which we find a very marked degree of variation in the arctic regions. These laws might be used effectively in geological reasoning. They seem to me to show that, inasmuch as they are not confined to particular classes, but affect the whole fauna and flora, that they also generalise a result of external influences upon life, and not any result of internal struggle.

I have said that geology might gain from a study of these

laws. It in turn has its lessons for us in this controversy. Among its deductions one of the most generally received is that of a glacial period, during which the climate of a large part of America and Europe was very severe and very uniform. This likeness would affect, if our contention be right, the zoology and botany of those regions, and would make it correspondingly uniform. This suggests a short review of their present botanical and zoological facies. Let us confine ourselves to the mammals of America and of Europe and of Northern Asia. It is well known that naturalists constitute this vast area girdling the globe in the northern part of the temperate and subarctic regions of the Northern Hemisphere one zoological and botanical province—that they divide it into two sections known as the Nearctic or American, and the Palæarctic or European and Asiatic regions. We shall confine ourselves to the mammalian portion of the faunas solely. Dr. Baird, Mr. Murray, and others, will hardly allow that any two mammals of these two regions are specifically the same. It is very rash in one like myself disputing with such authorities, but I cannot blind myself to the fact that the distinctions they insist upon, persistent though they be, are such as distinguish varieties rather than species. If we found one or two or half-a-dozen forms only in the one area having corresponding but slightly differing forms in the other area—a mere per-centage, in fact, of the whole fauna—then we might be sceptical; but this is not so. The resemblance extends to the whole or very nearly the whole mammalian fauna, and there is hardly a single species in the one area which has not a corresponding one in the other so nearly allied to it that it requires some discrimination to separate them. Even according to Dr. Baird, the wolves of America, except the Prairie wolf, are only varieties of one species, which he calls the American wolf, which is so like the European that Mr. Murray says, “Whether the European is the same as the American wolf is a much vexed question; the preponderance of opinion in former times was rather in favour of their identity, while nowadays the opposite view prevails”—this, be it noted, from a naturalist whose aim is to separate the faunas of the two areas as much as possible. Again, “A doubt, similar to that entertained regarding the wolves, exists as to the identity of the common red fox of Eastern North America with the common fox of Europe. Dr. Giebel (*“Saagethiere,”* 1859, p. 827) considers them the same, etc., etc. (*Vide* Murray, “Distribution of Mammals,” 109.) The *canis fulvus* is probably but a variety of the red fox. Another variety is the sooty fox, which Dr. Richardson says is found both in America and Iceland.

Pennant considers that the Canada lynx is the same species as the European. The common European weasel is undoubtedly

found in the States. (Richardson, *op. cit.* i. 45.) He says Captain Bayfield presented the Zoological Society with specimens of the common weasel, killed on the borders of Lake Superior, which agree in all respects with the European species. The ermine is found commonly in America from its northern limits to the middle districts of the United States. (*Id.* p. 46.)

The otters of North America and Europe seem to be identical; they only differ somewhat in colour and size. The sea otters of Eastern Asia and of America are, I believe, indistinguishable. The polecat is subject to some variation, and its varieties in the palæarctic regions have been reduced to one species by Radde, "Reisen in Süden von ost Siberien," St. Petersburg, 1862. The mink of America corresponds to the European *mustela lutreola*. (Richardson and Murray, *op. cit.*) The European and the American badgers are almost indistinguishable externally. Their dentition differs somewhat, due probably to difference of food. "The glutton, or wolverine, is generally believed to be found in all the three countries of Europe, Asia, and America, although there are still some authors who are disinclined to admit the identity of the Old World and the New World specimens." (Murray, *op. cit.* 116.) The most recent authorities on the bears, unless I have misread the testimony of Mr. Bush and Mr. Boyd Dawkins, is to discard many former species and to greatly consolidate the class. The grizzly bear is probably but a larger variety of the brown bear. "Middendorf," says Mr. Murray, "holds that the species of bear found in Europe and Northern Asia and the grizzly bear of North America are all varieties of the *ursus arctos*, and he gives a series of minute measurements and comparisons in support of his conclusions." De Blainville and Temminck more or less support this view. The walrus and the seals of the coasts of Northern Europe, Asia, and America are apparently the same. The *ovibos moschatus* is now confined to the Arctic Archipelago, North of America; but its skulls have been found on the Siberian tundras and the rivers Ob and Lena. The European and American bison and the extinct bison *priscus* are but varieties of one species.

The European mouflon, the Asiatic argali, and the big horn of America are very nearly allied, and the distinguishing characteristics relied upon by Dr. Baird ought not to be treated as specific. (See Ermann's "Travels," ii. 457, who identifies the Argali and Rocky Mountain sheep as identical.) The chamois, Mr. Murray says, is not distantly allied to the American so-called mountain goat, the *aplocerus montanus*, and stands in affinity between it and the *Antilocropa Americana*. The American moose and European elk are almost indistinguishable. Dr. Richardson's elaborate examination only discloses the fact of

the American form having a slightly broader face. The reindeer of Europe and the cariboo of America are also identical, save in very slight particulars, as the Lapland and Siberian varieties also differ from one another. The red deer is spoken of by Dr. Richardson as a very near relative indeed to the American wapiti, and it was long considered by the fur traders as the same species. The roedeer is compared with the American roe or long-tailed deer. The common mole extends with three varieties from Europe to Japan. A similar mole is found in California, which Mr. Lord says he could not distinguish from the Japanese species (or variety), while the whole American genus scalops is so like our moles that Mr. Murray says that, until a naturalist takes them in hand and points out the differences, they would be passed by any moderately observant person as identical. (*Op. cit.* 231.) It is hard to see the characteristics which have made zoologists erect the European variable and the American polar hare into separate species. Even Mr. Murray says they are so much alike that there is the greatest difficulty in distinguishing them. (*Op. cit.* 253.) The squirrels form a genus dear to species mongers, and most perplexing to students. Pallas considered the *sciurus lysteri* of America as identical with the Asiatic *sciurus striatus*. (*Vide* Richardson.) Brandt and the Russian zoologists consider the *spermophilus eversmanni* of Siberia and the *S. parryi* of America as identical. Dr. Richardson says the Quebec marmot is like the *arctomys bobac* of Europe in form and general appearance.

The North American and European beavers, long considered identical species, have only been recently separated by the hypercriticisms of zoologists. Even Dr. Baird allows that the *arvicola agrestis* is identical with an American mouse. Forster and Pennant both identified the former with the *arvicola Pennsylvanica*. Middendorf has reduced the American lemmings to two species, both found in the Old World as well as the New. (Murray, 269.) Pennant makes the American field mouse the *mus leucopus*, only a variety of the *mus sylvaticus* of Europe, and in this Richardson agrees.

This is but a bald and rapid survey of a vast field. Some mistakes occur possibly in it; but the vast majority of the cases quoted are supported by the names of too experienced naturalists for much doubt to arise as to their general correctness, and the moral to be drawn from them is that the mammalian fauna of America and Europe are practically identical, and most probably descends at a no distant period from common ancestors. How have the differences, such as they are, arisen? By means of natural selection? Surely not. Along the arctic borderland, where the conditions of climate and of surroundings have been

constant, there has been no variation. The polar bear, the wolverine, the hare, the lemming, the walrus, the white fox, the stoat, etc., etc., are the same in all longitudes, and be it remarked that it is here, if anywhere, that a struggle for existence must be going on—where food is scarce and the conditions of life most severe; and, if Mr. Darwin's theory be the true one, it is here that forms with slight advantages will have the greatest opportunity; and in such a vast area as the whole polar borderland we ought to find, if his theory be true, many cases where inferior forms are giving way to superior ones evolved from the struggle; but, on the contrary, we find here a perfect monotony of type kept up, and this type maintained since the earlier era of the Pleistocene deposits, and not in one species only, but in the whole fauna. Surely it would be difficult to find a better test of the whole position; but let us continue. It is when we come to the more temperate latitudes of the Subarctic Regions, with their various climates and conditions, that we find a similar variation occurring in our forms, and we are compelled to conclude that such variation is in fact due to no struggle for existence, but to a changed food, climate, or habit, and this is amply confirmed in other ways.

Civilised man, as a rule, is little affected by change of *habitat*, for he has facilities for taking with him food, clothing, and housing, and can in most climates by artificial means produce a more or less uniform condition in his surroundings. It is not strange, therefore, that we do not find such marvellous changes among the emigrants to some climates that the *à priori* philosophy of some writers, and perhaps our own, would seem to require, or at least it takes a very long period for the effects to be produced. The case of North America is, strangely enough, a remarkable contrast to the general rule. The change that two hundred and fifty years have produced in the inhabitants of the old states of New England is most marked. Although of Anglo-Saxon, or rather, *pace* Mr. Freeman, of English descent, they have acquired a very distinct type. Their hair has grown long, scant, and wiry; their whiskers have almost disappeared, and the hair on the face been more and more confined to the chin. The face has grown square, the cheek-bones projecting, the limbs long and wiry, the body thin, the colour sallow and brown; and so markedly, that the typical Yankee is a well-known sub-variety of the human species. In all these respects the race has rapidly approached to the indigenous American type—namely, that of the Indians. It will not be argued that this has been due to the mixture of native blood. Pocahontas was almost a solitary case. Neither will it be argued that natural selection has produced it. The land has been too wide and human beings too much in de-

mand for there to have been any struggle for existence among them. Even the most decrepid and abnormal individuals have been welcome, and further, as I showed in the previous paper, the tendency of the American type is to die out, and the population is practically kept up by the immigrants and their immediate descendants of two or three generations. The only reasonable cause is that of a change of climate, etc., which rapidly converts the English type into one like the indigenous Indian type, a great external cause dependent upon no struggle of individuals, nor operating from within, but acting upon the whole race simultaneously. Let us now turn to the Spanish colonists of Central and South America, and let me premise that Creole, as used in South America, means one born in the country as distinguished from an immigrant. Mr. Kennedy, writing of Yucatan, says: "The Creoles were evidently to be distinguished from their European brethren. With them, without any suspicion of mixture of blood, I could observe the figure more lanky, the hair coarser on the head and scantier on the face, the colour and skin assuming a parchment hue, and the whole character becoming apathetic, with a drawling accent different from the natives of Spain, which could scarcely have been brought about by the heat of the climate merely, inasmuch as that differed little from the temperature of Spain, but might have arisen from geological causes operating throughout the continent." ("Supplementary Notices of the American Indians," "Journ. Eth. Soc." 1857.) This change has not been confined to the white race. Mr. Kennedy, whom I have previously quoted, and who was one of the soundest ethnologists our country can boast, and whose papers have not had their meed of attention drawn to them, says: "In the course of upwards of thirteen years' residence at the Havana, where I had many hundreds of Africans under my superintendence, I soon became able easily to recognise youths who had been born in Africa from those of the same class who had been born in Cuba. If they had been brought very young from Africa, as they very frequently were, they grew up equally intelligent and cleanly, the one as the other, but still distinctly different from each other in the character of the countenance. Their colour at first would assume a brighter, glossier black than the colour of the adult African. . . . What that colour might eventually become in the island of Cuba, which is on the borders of the tropics, in the lapse of any considerable number of years, I could not judge of, as, from the policy of the slave dealers and slave owners, few females comparatively were brought over, as they found it easier to buy the adult slave ready for work than to rear up their progeny. But in the coloured population of the Bahama Islands and of the Southern States of the American

Union I observed their colour was already manifestly becoming lighter or brown or olive—I may say so universally that I could only ascribe it to the climate, and not to any admixtures. The hair certainly still remained woolly, but the climate was perhaps yet too familiar to the African in temperature to have any effect upon it for a much longer period of time than had elapsed since their progenitors were brought there. But this was not all. Not only was the colour lightened, but their features were also altered, and I thought I could distinctly trace in the coloured population the same cast of countenance which we find marks the white natives of that continent in a very early stage of their generations. This cast of countenance some of our ethnographers may perhaps some time hence describe as the Yankee type, . . . for which, if any illustrations are required, I have only to refer you to the portraits of the Presidents and other leading statesmen of the Union and to the general average number of American citizens, whom we cannot fail to recognise almost at a glance in our streets. We observe in them an elongated countenance of a whitey-brown colour, strong coarse hair, a rigidity of features, lank figures, with a length of arms and legs disproportionate to their frame. The females lose the colour of their European parents, and attain a statuesque style of beauty, in like manner very different from the softness and fulness of the English—these changes resulting in the same type, whether their parents were of British or Continental origin.” (“Ethnological Notices of the Philippine Islands”—“Transactions Ethnological Society.”)

I am told by a friend long resident in Brazil that the same fact as to the alteration of the negro type has been noticed in the Brazils. The same cause is, I believe, the origin of the various differences which separate the so-called species of North America and the Palæarctic Regions. The red fox of America has been supposed by some inquirers to be descended from some imported European foxes. Dr. Newberry says that in Ohio, Kentucky, and Michigan, the most densely-wooded of the middle states, the pioneer settler found only the grey fox, or at least that species occupied the territory so nearly exclusively that they considered any other as like themselves—interlopers. As the forest gradually fell before the axe of the woodman, and broad and continuous stretches of waving grain replaced the thickly-set trunks of oak, ash, and hickory, the grey fox became gradually more rare, while the swifter, stronger, and more cunning red fox by degrees almost entirely usurped its place. Hence the farmers supposed they had themselves introduced this farmyard pest, and that it had been the companion of their migration from the east. Dr. Baird remarks that the fact of

their present abundance and extent of distribution is no barrier to the reception of this idea, as the same has been the case with horses brought over and set at liberty by the Spaniards after the discovery of America. *Nor is there any serious difficulty to be met with in the different characteristics of the American animal, as the finer fur, brighter colour, narrower and more delicate head, sharper muzzle, etc., as it is precisely in such peculiarities that the Anglo-American race differs from its English stock.* (Murray, *op. cit.* 110.)

A revolution is now progressing in Lancashire, familiar enough to our doctors, in which external influences are greatly altering the type of the inhabitants. The mill system, which confines the people in a hot damp atmosphere, is having a deteriorating tendency. They are becoming much more stunted in size, crooked in limbs, and haggard and sallow in complexion, and this notably among the weavers, who, in my own town, Rochdale, are a remarkably pure race, not having mixed with the Irish immigrants. The decrease in stature is very remarkable.

The subject is so fertile that our commentary might become interminable. It is time one came to an end. But it is hardly necessary to have gone over the ground even thus cursorily; the facts of domestication are enough. Wherever plants and animals have been domesticated—which means that their food and outward surroundings have been enormously modified—there we find correspondingly enormous variation: the greater and more assiduous the cultivation the greater the variety. Move the common field flowers into the green-house, and they at once begin to vary. Move the green-house plants into the open, and, where they manage to survive the change, they are similarly altered. The almost endless varieties of cabbage, strawberries, apples, etc., etc., which have arisen from common ancestors is a very forcible example of the alteration induced by cultivation and altered circumstances, for these varieties do not occur in the wild state, where the conditions are constant.

I have tried to test another factor in Mr. Darwin's theory, and I confess that I cannot see how his reading of the evidence can be supported. Wherever we can examine a gradual change of type in progress, so far as we know the change has been continuous along the whole line, and has not been in favour of any individual and its progeny; I refuse to accept human selection in the laboratory as a test at all, until I see some evidence that selection is a part of nature's scheme, save in very exceptional cases. I see that a change affects a whole type at once wherever I can examine change going on in nature beyond the control of man, and I must conclude that this has been the case in former times as much as now. If I could find that in surveying the palæontology of any deposit, that a particular type at the bottom of the stratum

was very scarce compared with others, and that at the top of the stratum it had increased, so as almost to have monopolised their place—if I found this to be the rule, I should then say that natural selection was supported by the geological record, although I could not support it from a survey of the current and contemporary topography of life ; but I can find no such evidence, and I am forced to conclude that an hypothesis founded upon its existence must have a faulty foundation. In the next paper of this series I shall commence an examination of a much more potent and influential form of variation than that to which I have referred in this paper, and which I believe to be even more hostile to Mr. Darwin's main conclusion. This is sudden variation or sporting, and I shall commence by examining the facts of Albinism and Melanism.

DISCUSSION.

MR. BOUVERIE-PUSEY said he was sure all felt grateful to Mr. Howorth for the interesting paper he had read, giving an account of numerous instances of variation, real or supposed. In investigating these things we ought carefully to examine our facts, and to make sure, first, that the thing supposed to have varied is really descended from the thing it is supposed to have varied from, and without intermixture ; and, secondly, to distinguish the effects of disease or ill-health from those of change of type. To examine in this way all the instances given in the interesting paper we had just heard would fill a thick volume. He would only remark on the case of the rabbit. Mr. Howorth said that black rabbits, etc., when turned loose, revert to the original grey colour. He did not see how it could be known that this takes place without intermixture. His father turned out black rabbits and also white rabbits twenty years ago, and now one or two of those colours occasionally appear (by reversion) in the same place. He was inclined to think, pending further evidence, that tame rabbits turned loose are absorbed into the wild rabbit rather than that they revert to it.

SIR DUNCAN GIBB warmly eulogised the author's paper, but he himself had considerable diffidence in rising to say a few words, because the subject was one upon which he did not feel competent to discuss, although he admired and respected Mr. Darwin as one of the cleverest men of the day, upon whose views much variety of opinion existed. In reference to the changes in the colour of the human hair mentioned by the author, he would remark that much importance could not be attached to it when induced by external circumstances, and indeed sometimes in a single individual his hair will vary in depth of colour according as he goes north or south several hundred miles. As an old sportsman he recollected very well that the hares he has shot in Canada in the winter time were perfectly white like the snow, and in the summer season the same animals had a bluish grey coat of

fur, yet no conclusion one way or the other should be drawn from this fact so far as Darwinism is concerned. The same also with bones and feathers. But as regards the bones, every physiologist was aware that their colour can be changed by feeding an animal upon certain substances, madder for example, which gives them a red colour. These things, therefore, are exceptional, and not the rule. The author has described the peculiar appearance presented by the American people, with their mode of speaking, etc. Now he (Sir D. Gibb) thought their mode of living had a great deal to do with this; they were rapid eaters, and scarcely took time to masticate their food, which accounted for a great deal both in their appearance and their state of health. Their mode of speaking, with its accompaniments, was that of the original English provincialism of two centuries back, now much intensified; and in our inland counties of the present day the traveller who has been in the United States sees and hears the progenitors of Yankee land. One observes nothing of this kind among the English Canadians of the present day, for there is a total absence of the provincialism of the United States unless it becomes acquired by living near the borders of the States. To say that the American people as a race are acquiring the appearance of the Indians who are dying out, from living in the same country, is a theory that has not a shadow of proof to support it.

Mr. W. J. GRAZEBROOK thought it was generally known that the hares on the Scotch hills became white in the winter season and changed colour again in the spring, a change of which every sportsman was aware. Referring to the remarks of the learned doctor who preceded him, he had often been struck with the marked characteristics of physiognomy by which visitors coming from the United States could be recognised even in the streets of London. It was extraordinary that such changes should occur in the course of a generation or two. He thought also that native-born Canadians had a characteristic appearance likewise, although differing considerably from the Yankees in appearance. If the descendants from English parents, without any admixture of Indian blood, came to assume the characteristics of the indigenous Indian races in a few generations, he had for many years held a theory which might account for this tendency to assume the indigenous type. He was strongly of opinion that the atmosphere of the United States had a greater proportion of oxygen present than in the air in England, the cause being the greater proportion of vegetation than in England. An evidence of this might be found in the earlier maturity of the American people, their greater vitality (or energy) in early and middle life, and their decay at an earlier period than in England. All this looked like a more rapid combustion from a superabundance of oxygen in the air. His experience of marine zoology (having kept aquariums at the commencement of this science) had led him to study the laws by which the balance of nature is maintained, both on the land and in the sea, the carbonic gas of the animal world being absorbed and corrected by the oxygen of vegetable life, hence, owing to the immensely greater proportion of vegetable life in

America, he found grounds upon which to base his theory that, on an accurate examination, there would be found a slightly greater amount of oxygen in the American atmosphere than in England. Considering the vast volume (3,600 gallons per diem) passing through the lungs of an adult, and the same cause also probably affecting in like degree the constituents of his food both animal and vegetable, a sufficient cause may be found in this to account for the tendency in man to revert back after a few generations to the original indigenous Indian type.

The PRESIDENT remarked that, although he fully admitted the value of the collection of facts bearing upon the production of changes in races of animals, in consequence of changes in the outward conditions to which they were exposed, and duly appreciated the care and labour bestowed upon the compilation of his materials by the author, he was quite at a loss to perceive in what way the paper bore adversely on the Darwinian hypothesis, so far as that was based upon "natural selection and the so-termed struggle for existence." On the contrary, it seemed to him that so far as such changes as those noticed by Mr. Howorth prove anything at all, they are, like many of the facts connected with artificial selection or breeding, rather in favour of the hypothesis than the reverse. It appeared obvious to him that the circumstances and considerations adduced by Mr. Howorth, so far as they related to the production of diversities of race by natural causes, only served still further to confirm the self-evident proposition that in all cases of important changes in the external conditions, those forms or varieties of animal or plant best fitted to meet them must eventually remain occupants of the field. And surely there is nothing in this opposed to the Darwinian hypotheses.

Dr. RICHARD KING and Mr. E. CHARLESWORTH also joined in the discussion.

The author replied, and the meeting separated.

MAY 12TH, 1874.

Professor BUSK, F.R.S., *President, in the Chair.*

THE minutes of the previous meeting were read and confirmed.

The following members were elected: WILLIAM GEORGE THORPE, Esq., F.G.S., Gloucester House, Larkhall Rise, S.W., and Burton's House, Ipplepen, Devon; J. ELDRIDGE SPRATT, L.F.P.S. Glasgow, 8, Bolton Row, Mayfair, W.

The thanks of the meeting were voted for the following presents:—