

OF THE DEGENERATION OF ANIMALS.

WHENEVER man began to change his climate, and to migrate from one country to another, his nature was subjected to various alterations. In temperate countries, which we suppose to be adjacent to the place where he was originally produced, these alterations have been slight; but they augmented in proportion as he receded from this station: And, after many ages had elapsed; after he had traversed whole continents, and intermixed with races already degenerated by the influence of different climates; after he was habituated to the scorching heats of the South, and the frozen regions of the North; the changes he underwent became so great and so conspicuous, as to give room for suspecting, that the Negro, the Laplander, and the White, were really different species, if, on the one hand, we were not certain, that one man only was originally created, and, on the other, that the White, the Laplander, and the Negro, are capable of uniting, and of propagating the great and undivided family of the human kind. Hence those marks which

distinguish men who inhabit different regions of the earth, are not original, but purely superficial. It is the same identical being who is varnished with black under the Torrid Zone, and tawned and contracted by extreme cold under the Polar Circle. This circumstance is alone sufficient to show, that the nature of man is endowed with greater strength, extension, and flexibility, than that of any other terrestrial being; for vegetables, and almost all the animals, are confined to particular soils and climates. This extension of our nature depends more on the qualities of the mind than on those of the body. It is by the mind that man has been enabled to find those resources which the delicacy of his body required, to brave the inclemency of the sky, and to conquer the rigidity and barrenness of the earth. He may be said to have subdued the elements: By an exertion of his intellect, he produced the element of fire, which had no existence on the surface of the earth. His sagacity taught him how to clothe his body, and to build houses for defending himself against every external attack. By the powers of genius he supplied all the qualities which are wanting in matter. Without possessing the strength, the magnitude, or the robustness of most animals, he knew how to conquer, to tame, and to confine them: He made himself master of those regions which Nature seemed to have resigned to them as an exclusive possession.

The earth is divided into two great continents. The antiquity of this division exceeds that of all human monuments; and yet man is more ancient; for he is the same in both worlds. The Asiatic, the European, and the Negro, produce equally with the American. Nothing can be a stronger proof that they belong to the same family, than the facility with which they unite to the common stock. The blood is different; but the germ is the same. The skin, the hair, the features, and the stature, have varied, without any change in the internal structure. The type is general and common: And if, by any great revolution, man were forced to abandon those climates which he had invaded, and to return to his native country, he would, in the progress of time, resume his original features, his primitive stature, and his natural colour. But the mixture of races would produce this effect much sooner. A white male with a black female, or a black male with a white female, equally produce a mulatto, whose colour is brown, or a mixture of black and white. This mulatto intermixing with a white, produces a second mulatto less brown than the former; and, if the second mulatto unites with a white, the third will have only a slight shade of brown, which will entirely vanish in future generations. Hence, by this mixture, 150, or 200 years, are sufficient to bleach the skin of a Negro. But, to produce the same effect by the influence of climate alone,
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many centuries would perhaps be necessary. Since the Negroes were transported to America, which is about two hundred years ago, the Negro families, who have preserved themselves from mixture, seem not to have lost any shade of their original colour. The climate of South America, it is true, being sufficiently hot to tawm its inhabitants, we ought not to be surpris'd that the Negroes there continue black. To put the change of colour in the human species to the test of experiment, some Negroes should be transported from Senegal to Denmark, where the inhabitants have generally white skins, golden locks, and blue eyes, and where the difference of blood and opposition of colour are greatest. These Negroes must be confined to their own females, and all crossing of the breed scrupulously prevented. This is the only method of discovering the time necessary to change a Negro into a White, or a White into a Black, by the mere operation of climate.

This is the greatest alteration that climate has produced in man, and yet it is only superficial. The colour of the skin, hair, and eyes, varies by the influence of climate alone. The other changes, such as those of stature, figure, features, and quality of the hair, seem to require the joint operations of climate and other causes; for, in the Negro race, who have generally crisped wool instead of hair, a flat nose, and thick lips, there are whole nations with long hair and regular features:

features: And, in the race of Whites, if we compare the Dane to the Calmuck Tartar, or even the Finlander to the Laplander, whose nations are contiguous, we shall find among them as great a difference in features and size as takes place among the Negroes. To produce such alterations, therefore, which are deeper than the former, some other causes must concur with the influence of climate. The most direct and general cause is the quality of the food. It is chiefly by aliment that man receives the influence of the soil which he inhabits: That of the air and climate acts more superficially. While the climate changes the colour of the skin, food acts upon the internal form by its qualities, which are always related to those of the earth by which it is produced. Even in the same country, we see striking differences between those who occupy the heights and those who inhabit the low grounds. The inhabitants of the mountains are always better made, more vivacious, and more beautiful than those of the valley. Hence, in countries remote from the original climate, where the herbs, fruits, grains, and the flesh of animals, differ both in quality and substance, the men who feed upon these articles must undergo still greater changes. These impressions are not suddenly made. A considerable time is necessary before man receives the tinge peculiar to the climate, and a still longer time before the soil communicates to him its qualities.

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It requires ages, joined to the constant use of the same food, to change the features, the size of the body, and the substance of the hair, and to produce those internal alterations which, when perpetuated by generation, become general and permanent characteristics which distinguish the different races and nations who compose the aggregate of the human species.

In brute animals, these effects are greater and more suddenly accomplished; because they are more nearly allied to the earth than man; because their food being more uniformly the same, and nowise prepared, its qualities are more decided, and its influence stronger; and because the animals, being unable to cloathe themselves, or to use the element of fire, remain perpetually exposed to the action of the air, and all the inclemencies of the climate. For this reason, each of them, according to its nature, has chosen its zone and its country: For the same reason, they remain there, and, instead of dispersing themselves, like man, they generally continue in those places which are most friendly to their constitutions. But, when forced by men, or by any revolution on the globe, to abandon their native soil, their nature undergoes changes so great, that, to recognise them, recourse must be had to accurate examination, and even to experiment and analogy. If to these natural causes of alteration in free animals, we add that of the empire of man over those which he has reduced to slavery,

slavery, we will be astonished at the degree to which tyranny can degrade and disfigure Nature; we will perceive the marks of slavery, and the prints of her chains; and we will find, that these wounds are deeper and more incurable, in proportion to their antiquity; and that, in the present condition of domestic animals, it is perhaps impossible to restore their primitive form, and those attributes of nature which we have taken from them.

Thus the temperature of the climate, the quality of the food, and the evils produced by slavery, are the three causes of the changes and degeneration of animals. The effects of each merit a separate examination; and their relations, when viewed in detail, will exhibit a picture of Nature in her present condition, and of what she was before her degradation.

Let us compare our pitiful sheep with the mouflon, from whom they derived their origin. The mouflon is a large animal. He is fleet as a stag, armed with horns and thick hoofs, covered with coarse hair, and dreads neither the inclemency of the sky, nor the voracity of the wolf. He not only escapes from his enemies by the swiftness of his course, but he resists them by the strength of his body, and the solidity of the arms with which his head and feet are fortified. How different from our sheep, who subsist with difficulty in flocks, who are unable to defend themselves by their numbers, who cannot

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not endure the cold of our winters without shelter, and who would all perish, if man withdrew his protection? In the warmest climates of Asia and Africa, the mouflon, who is the common parent of all the races of this species, appears to be less degenerated than in any other region. Though reduced to a domestic state, he has preserved his stature and his hair; but the size of his horns are diminished. Of all domestic sheep, those of Senegal and India are the largest, and their nature has suffered least degradation. The sheep of Barbary, Egypt, Arabia, Persia, Kalmuck, &c. have undergone greater changes. In relation to man, they are improved in some articles, and vitiated in others. But, with regard to Nature, improvement and degeneration are the same thing; for they both imply an alteration of original constitution. Their coarse hair is changed into fine wool. Their tail, loaded with a mass of fat, has acquired a magnitude so inconvenient, that the animals trail it with pain. While swollen with superfluous matter, and adorned with a beautiful fleece, their strength, agility, magnitude, and arms, are diminished: These long tailed sheep are half the size only of the mouflon. They can neither fly from danger, nor resist the enemy. To preserve and multiply the species, they require the constant care and support of man.

The degeneration of the original species is still greater in our climates. Of all the qualities

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ties of the mouflon, our ewes and rams have retained nothing but a small portion of vivacity, which yields to the crook of the shepherd. Timidity, weakness, resignation, and stupidity, are the only melancholy remains of their degraded nature. To restore their original size and strength, our Flanders sheep should be united with the mouflon, and prevented from propagating with inferior races; and, if we would devote the species to the more useful purposes of affording us good mutton and wool, we should imitate some neighbouring nations in propagating the Barbary race of sheep, which, after being transported into Spain, and even into Britain, have succeeded very well. Strength and magnitude are male attributes; plumpness and beauty of skin are female qualities. To obtain fine wool, therefore, our rams should have Barbary ewes; and, to augment the size, our ewes should be served with the male mouflon.

Our goats might be managed in the same manner. By intermixing them with the goat of Angora, their hair might be changed, and rendered equally useful as the finest wool. In our climate, the species of the goat is not so much degenerated as that of the sheep. It appears to be still more degenerated in the warm countries of Africa and India. The smallest and weakest goats are those of Guiney, Juda, &c. and yet these countries produce the largest and strongest sheep.

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The species of the ox is more influenced by nourishment than that of any other domestic animal. In countries where the pasture is rich, and always springing, they acquire a prodigious size. The ancients gave to the oxen of Ethiopia, and some provinces of Asia, the appellation of *elephant-bulls*; because, in these countries, they approach to the magnitude of elephants. This effect is produced by the abundance of rich and succulent herbage. Of this our own climate affords a proof. An ox fed on the tops of the green mountains of Savoy or Switzerland, acquires double the size of our oxen; and yet the oxen in Switzerland, like ours, are fed in stables during the greatest part of the year. The difference arises from this circumstance, that the Switzerland oxen are set out to free pasture as soon as the snow melts; but ours are not permitted to enter the meadows till the hay, which is reserved for the horses, is carried off; and, of course, they are neither fully nor properly nourished. It would be extremely useful to the state, if a regulation were made for abolishing promiscuous pasturage, and encouraging inclosures. The climate has likewise considerable influence on the nature of the ox. In the northern regions of both continents, he is covered with long soft hair, like fine wool. He has also a large bunch on his shoulders; and this deformity is common to the oxen of Asia, Africa, and

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America. Those of Europe alone have no bunch. The European oxen, however, are the primitive race, to which the bunched kind ascend, by intermixture, in the first or second generation. This race is a variety only of the other, as appears from its being subject to very great degradations. The differences in their size is enormous. The small zebu of Arabia is not one tenth part of the magnitude of the *Æthiopian bull-elephant*.

In general, the influence of food is greater, and produces more sensible effects upon such animals as feed on herbs or fruits. Carnivorous animals, on the contrary, are less affected by this cause than by the influence of climate; because flesh is an aliment already assimilated to the nature of the animal by which it is devoured. But grass is the first product of the soil, and has all the properties of it; and these terrestrial qualities are immediately communicated to the animal.

Thus the dog species, upon which food seems to have a very slight influence, is more varied than that of any other carnivorous animal. In his degradations, he appears to follow exactly the differences of climate. He is naked in the warmest climates, covered with a coarse thick hair in the northern regions, and adorned with a fine silky robe in Spain and in Syria, where the mild temperature of the air converts the hair

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of most animals into a kind of silk. But independent of these external varieties, which are produced by the influence of climate alone, the dog is subjected to other changes which proceed from his situation, his captivity, or the nature of the intercourse he holds with man. The augmentation and diminution of his size, are effects of the attention bestowed in uniting the largest and smallest individuals. The shortening of the tail, muzzle, and ears, proceeds likewise from the hand of man. Dogs who, for a few generations, have had their ears and tail cut, transmit these defects, in a certain degree, to their descendants. I have seen dogs produced without tails, which I at first apprehended to be individual monsters: But I have since learned, that this race exists, and is perpetuated by generation. Pendulous ears, the most general and most certain mark of domestic servitude, are common to almost all dogs. Of thirty different races, which compose the species, two or three only have preserved their primitive ears. The shepherd's dog, the wolf-dog, and the dog of the North, have alone erect ears. The voice of these animals has likewise undergone strange alterations. The dog seems to have become clamorous and noisy in the society of man, who employs his tongue more than any other being; for the dog, in a state of nature, is almost mute, uttering a kind of howling when pressed with hunger only. He acquired his

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faculty of barking by commerce with men in polished society; for, when transported to extreme climates, and among a gross people, such as the Laplanders or Negroes, he loses his barking, assumes his natural howling, and becomes almost perfectly mute. The dogs with erect ears, and particularly the shepherd's dog, which is least degenerated, makes also the least use of his voice. As he passes a solitary life in the country, and has no intercourse but with sheep and a few simple men, like them, he is serious and silent, though, at the same time, very active and intelligent. Of all dogs, he has fewest acquired talents, and possesses a greater number of those which are natural. He is likewise the most useful for guarding our flocks, and for the preservation of good order. His race ought, therefore, to be more multiplied than those of other dogs, who minister only to our amusements, and whose numbers are so great, that, in every town and village, the provisions consumed by them would nourish many families.

The domestic state has greatly contributed to vary the colour of animals, which, in general, was originally brown or black. The dog, the ox, the goat, the sheep, the horse, have assumed all kinds of colours. The dog has changed from black to white; and pure white, without any spots, seems to mark the last degree of degeneration, and is generally accompanied with

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essential imperfections. In the race of white men, those who are remarkably white, and whose hair, eye-brows, beard, &c. are likewise white, have often a defect in their hearing, and, at the same time, red and weak eyes. In the black race, the white Negroes are still more feeble and defective. All those quadrupeds which are absolutely white, have the same faults of dullness of hearing and red eyes. This kind of degeneration, though more frequent among domestic animals, sometimes appears among the wild species, as in those of the elephant, stags, fallow-deer, monkeys, moles, and mice; in all of which this colour is uniformly accompanied with smaller or greater degrees of bodily weakness, and bluntness of the senses.

But slavery seems to have made the deepest and most conspicuous impressions on the camel. He is brought forth with bunches on his back, and callosities on his breast and knees. These callosities are evidently blemishes occasioned by friction; for they are filled with pus and corrupted blood. As he never walks but under a heavy load, the pressure of which prevents the uniform extension and growth of the muscles of the back, and produces a swelling in the parts adjacent; in the same manner, when he lies down or sleeps, he is at first obliged to rest upon his folded limbs. This posture becomes at last habitual. For several hours every day, the whole weight of his body is

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supported by his breast and knees. The skin of these parts is rubbed off by pressing against the earth, and they soon become callous, and lose their organization. The lama, which, like the camel, passes his life under a burden, and also reposes on his breast, has similar callosities, which are perpetuated by generation. The baboons and monkeys, whose general posture, whether asleep or awake, is sitting, have callosities on their buttocks. This callous skin even adheres to the bones against which it is continually pressed by the weight of the body. But the callosities of the baboons and monkeys are dry and heal; because they proceed not from restraint, nor from the weight of any foreign load. They are, on the contrary, effects of a natural habit; for these animals continue longer in a sitting than in any other posture. The callosities of the monkeys are similar to the double skin on the sole of a man's foot. This sole is a natural callosity, which our constant habit of walking or standing renders more or less thick, according to the quantity of exercise we take.

The wild animals, not being under the immediate dominion of man, are not subject to such great changes as the domestic kinds. Their nature seems to vary with different climates; but it is no where degraded: If they were capable of choosing their climate and their food, the changes they undergo would be still less.

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But, as they have at all times been hunted and banished by man, or even by the strongest and most ferocious quadrupeds, most of them have been obliged to abandon their native country, and to occupy lands less friendly to their constitution. Those whose nature had ductility enough to accommodate themselves to this new situation, have diffused over vast territories; while others have had no other resource than to confine themselves in the deserts adjacent to their own country. There is no animal which, like man, has spread over the whole surface of the earth. A great number of species are limited to the southern regions of the Old, and others to the same regions of the New Continent. Others, though fewer, are confined to the northern regions, and, instead of extending to the south, have passed from the one Continent to the other, by routes which are still undiscovered. Other species inhabit only particular mountains or valleys: And the changes in their nature are, in general, less sensible, the more they are confined to a small circle.

As climate and food have little influence on wild animals, and the empire of man still less, the chief varieties amongst them proceed from another cause. They depend on the number of individuals of those which produce, as well as of those that are produced. In those species in which the male attaches himself to one female, as in that of the roebuck, the young de-

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monstrate the fidelity of their parents by their entire resemblance to them. In those, on the contrary, the females of which often change the male, as in that of the stag, the varieties are numerous: And as, through the whole extent of Nature, there is not one individual perfectly similar to another, the varieties among animals are proportioned to the number and frequency of their produce. In species, the females of which bring forth five or six young three or four times a year, the number of varieties must be much greater than in those which produce but a single young once a year. The small animals, accordingly, which produce oftener, and in greater numbers than the larger kinds, are subject to greater varieties. Magnitude of body, which appears to be a relative quality only, possesses positive rights in the laws of Nature. Magnitude is as fixed as minuteness is changeable. Of this fact we shall soon be convinced by the following enumeration of the varieties which take place in the large and small animals.

In Guiney, the ears of the wild boar are very long, and lie on his back. In China, his belly is large and pendulous, and his legs are very short. At Cape Verd, and in other places, his tusks are very thick, and bended like the horns of an ox. In a domestic state, and in cold or temperate climates, his ears are half pendulous, and his bristles are white. I reckon neither

the pecari, nor the babiroussa, among the varieties of the wild boar; because they belong not to this species, though they approach nearer to it than to any other.

In warm, dry, and mountainous countries, such as Corsica and Sardinia, the stag has lost one half of his size, his hair has become brown, and his horns blackish. In cold and moist countries, such as Bohemia and the Ardennes, his size is increased, his coat and horns are almost black, and his hair is so long that it forms a kind of beard on his chin. In North America, the horns of the stag are extended, and branched with crooked antlers. In a domestic state, his hair changes from yellow to white; and, unless when at liberty, or in very large inclosures, his limbs are deformed and crooked. The axis is not to be reckoned among the varieties of the stag: It approaches nearer to that of the fallow-deer, of which, perhaps, it is only a variety.

In the fallow-deer, it is difficult to ascertain the original species. He is no where entirely domestic nor absolutely wild. He varies indifferently from yellow to pied, and from pied to white. His horns and tail are also larger and longer, in different races, and his flesh is good or bad, according to the soil and climate. Like the stag, he is found in both Continents; and he seems to be larger in Virginia, and other temperate provinces of America, than in Eu-

rope. The roebuck is likewise larger in the New than in the Old Continent. But, in other respects, all his variations are confined to some differences in the colour of the hair, which changes from yellow to brown. The smallest roebucks are generally brown, and the largest yellow. The roebuck and fallow-deer are the only animals common to both Continents which are larger and stronger in the New than in the Old World.

The ass, though subjected to the pressure of the most wretched servitude, has undergone few changes; for his nature is so obdurate, that it equally resists bad treatment and the inconveniences of a foreign climate and of coarse food. Though originally a native of warm countries, he can exist and even multiply, without the assistance of man, in temperate climates. Formerly there were onagers, or wild asses, in all the deserts of Asia Minor; but they are now rare, and are numerous in the deserts of Tartary only. The mule of Dauria*, called *caigibai* by the Tartars, is probably the same animal with the onager of the other Asiatic provinces. The former differs from the latter only in the length and colour of the hair, which, according to Mr. Bell, is undulated with brown and white†.

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* *Mulus Dauricus secundus, Caigibai Mongolorum* in Dauria; *Mus. Petropolitavum*, p. 335.

† In the forests near Kazanetzky on the river Tom, one of the

These *caigibais* are found in the forests of Tartary as far as the 51st and 52d degree of latitude. They must not be confounded with the zebra, whose colours are more vivid, and differently disposed. Besides, the zebra constitutes a particular species, as different from the ass as from the horse. In the domestic ass, the skin has become softer, and lost those small tubercles which are dispersed over that of the onagers, and of which the inhabitants of the Levant make the leather called *chagrin*.

The nature of the hare is both flexible and firm; for, though it is diffused over almost every climate of the Old Continent, yet it continues nearly the same. In very cold climates, its hair whitens during the winter, and, in summer, resumes its natural colour, which varies only from yellow to red. The quality of the flesh likewise changes. The flesh of the reddish hares is always the best. But the rabbit, though not of so flexible a nature as the hare, being less diffused, and even confined to certain countries, is subject to more variations; because the hare is

the sources of the river Oby, in lat. 51 and 52, there are wild asses. I have seen many of their skins; they have in every respect the shape of the head, tail, and hoofs of the common ass; but their skin is undulated with white and brown; *Bell's Travels to China*. Note, The skins which Mr. Bell saw might be those of the zebra: for other travellers allege not that the *caigibais* or onagers of Dauria are striped, like the zebra, with brown and white. Besides, in the Peterburg cabinet, there are skins both of the zebra and of the *caigibai*, which are equally shown to strangers.

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every where wild, while the rabbit is almost every where half domestic. The colour of the burrowed rabbits varies from yellow to gray, white, and black. They likewise vary in size, and in the quantity and quality of the hair. This animal, which is originally a native of Spain, has acquired a long tail in Tartary, and bushy hair, like felt, in Syria, &c. In cold countries, black hares are sometimes found. It is likewise alleged, that, in Norway, and some other northern regions, there are hares with horns. M. Klein has given figures of two of these horned hares*. From inspection of these figures, it is easy to perceive, that the horns are similar to the *wood*, or horns, of the roebuck. This variety, if it exists, is individual only, and probably appears in such places alone where the hare cannot find herbage, and is obliged to feed upon woody substances, as the bark, buds, and leaves of trees, &c.

The elk, whose species is confined to the northern regions of both Continents, is only smaller in America than in Europe; and we see, from the enormous horns found under the ground in Canada, Russia, Siberia, &c. that these animals were formerly much larger than they are present. This difference of size was perhaps owing to the perfect tranquillity they enjoyed in their forests; and, as man had not yet penetrated into these climates, they had it in

* Klein de Quad. p. 52. tab. 3. fig. n^o 5 21.

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their power to choose their abode in those places where the air, the soil, and the water, were most agreeable to them. The rain-deer, which the Laplanders have rendered domestic, is, for this reason, more changed than the elk, which has never been reduced to slavery. The wild rain-deer are larger and stronger, and have blacker hair than the domestic kind. The latter have varied in the colour of the hair, and likewise in the size of the horns. The rain-deer liverwort constitutes the chief food of these animals, and seems to contribute greatly, by its nutritive quality, to the growth of the horns, which are proportionally larger in the rain-deer than in any other species. It is, perhaps, the same aliment which, in this climate, produces horns in the head of the hare, as well as in that of the female rain-deer; for, in all other climates, there are no horned hares, nor any animal of which the female carries horns as well as the male.

The elephant is the only quadruped upon which the domestic state has had no influence; because, in this state, he refuses to propagate, and, of course, transmits not to his species the blemishes or defects occasioned by his unnatural condition. In the elephant, there are only slight, and almost individual varieties. His natural colour is black; some of them, however, are red, and others white; but the number of these is exceedingly small. The elephant likewise varies in size, according to the longitude, or rather the latitude

tude of the climate. Under the Torrid Zone, to which he is entirely confined, he rises to fifteen feet high, as in the eastern parts of Africa; while, in the western regions of the same country, he attains not above ten or eleven feet; which is a proof that, though great heat be necessary to the full expansion of his body, excessive heat restrains and reduces it to smaller dimensions. The magnitude of the rhinoceros is more uniform; and he seems to differ from himself only by that singular character which distinguishes him from all other animals, namely, the large horn on his nose. This horn is single in the Asiatic rhinoceros, and double in the African.

I decline mentioning the varieties which happen in every species of carnivorous animals; because they are extremely slight; and, of all quadrupeds, those which feed upon flesh are most independent of man. By means of this nourishment, already concocted by Nature, they receive almost none of the qualities of the soil which they inhabit. Besides, being all endowed with strength and weapons, they have the choice of soil and climate in their own option; and, consequently, the three causes of change or degeneration, formerly assigned, must have very little effect upon them.

After this slight survey of the variations peculiar to each species, let us next attend to the most important change of the species themselves. This is the most ancient degeneration; and it

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seems to have taken place in each family, or in each genus, under which the contiguous species may be comprehended. Of all terrestrial animals, there are only some detached species, which, like that of a man, constitute, at the same time, both genus and species. The elephant, the rhinoceros, the hippopotamus, and the giraffe, form genera, or simple species, which propagate in a direct line only, and have no collateral branches. All the others appear to constitute families, in which a principal and common trunk is generally to be recognised, and from which different branches arise, whose numbers are proportioned to the barrenness or fertility of the individuals in each species.

Under this point of view, the horse, the zebra, and the ass, are all of the same family. If the horse is the principal trunk, the zebra and the ass are collateral branches. The number of their resemblances being infinitely greater than that of their differences, they may be regarded as constituting but one genus, of which the chief characters are apparent, and common to the whole three. They alone are whole-hoofed, without any appearance of toes or claws. Though they form three distinct species, they are not absolutely separated, since the jack-ass produces with the mare, and the horse with the she-ass; and it is probable, that, if the zebra were tamed, he would likewise produce with the mare and ass.

The mule, which has always been considered as a vitiated production, as a monster composed of two natures, and for that reason has been thought incapable of reproduction, is not, however, so deeply injured as has been blindly imagined; for it is not absolutely barren, and its sterility depends on certain external and peculiar circumstances. Mules, it is well known, frequently produce in warm countries; and there are some examples of their producing even in our temperate climates. But we know not whether this generation ever proceeds from the simple union of a male and female mule, or of a mule with a mare, or of a jack-ass with a mule. There are two kinds of mules; the common large mule which proceeds from the junction of a jack-ass with a mare, and the small mule, proceeding from the horse and the she-ass, which we shall distinguish by the name of *bardeau*. Both kinds were known to the ancients: The first they denominated *mulus*, and the second *γῆνος*, *binus*, *burdo*. They assure us, that the *mulus* * produced with the mare an animal likewise called *ginnus*, or *binus* †; that the she-

* *Mulus equa conjunctus mulum procreavit. . . . Mula quoque jam facta gravis est, sed non quoad perficeret atque ederet prolem; Arist. Hist. Animal. lib. vi. cap. 24.*—*Est in analibus nostris mulas peperisse saepe; verum prodigii loco habitum; Plin. Hist. Nat. lib. viii. cap. 44.*

† The word *ginnus* is used by Aristotle in two senses: In the first, it denotes any imperfect animal, an abortion, a dwarf mule, proceeding

she-mule easily conceived, but seldom brought the foetus to maturity; and that, though examples of mules bringing forth were pretty frequent, yet such productions were always regarded as prodigies. But is not a prodigy in Nature only an effect more rare than some others? Thus we see that, in certain circumstances, the mule can generate, and the she-mule conceive and bring forth. Hence nothing but experiments are wanting to discover these circumstances, and to acquire new facts concerning generation by the commixture of species, and, of course, concerning the unity or diversity of each genus. To succeed in these experiments, the he-mule must be joined with a she-mule, with a mare, and with a she-ass: The same process must be observed with regard to the bardeau; and the results of these six copulations ought to be carefully marked. The female ass, mule, and bardeau, should likewise be served with a horse. These experiments, though simple, have never been tried with a view to explain the nature of generation. I regret that it has never been in my power to try them; but I shall hazard the following conjectures on what would probably be their results. I imagine, for example, that, of all these junctions, that of the he-mule and female bardeau, and

proceeding sometimes from the horse and she-ass: In the second, it signifies the particular produce of the mule and mare.

that of the male bardeau and she-mule, would be absolutely abortive; that the junction of the he and she-mule, and that of the male and female bardeau, might perhaps succeed, though rarely; that the he-mule would produce more certainly with the mare than with the she-afs, and the male bardeau, more certainly with the she-afs than with the mare; and, in fine, that the horse and jack-afs might perhaps produce with both the she-mules, but that the afs would be more successful than the horse. These trials should be made in a country as warm, at least, as the south of France; and the mules should be seven, the horses five, and the asses four years old; because these different periods are necessary before the three animals acquire their full vigour.

I now give the analogical reasoning upon which these conjectures are founded. In the common order of nature, it is not the males, but the females, which constitute the unity of species. We know, from the examples of the sheep, which can admit two different males, and be equally fertile with the ram or the he-goat, that the female has much more influence upon the specific qualities of the produce than the male; since, from these two different males, lambs only, or individuals specifically the same with the mother, are propagated. Thus the mule has a greater resemblance to the mare than to the afs, and the bardeau to the she-afs than

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to the horse. Hence *the mule ought to produce more certainly with the mare than with the she-afs, and the bardeau more certainly with the she-afs than with the mare.* In the same manner, the horse and jack-afs *would probably produce with both the she-mules*; because, being females, though vitiated, each retains more specific qualities than the male mules: *But the jack-afs should produce with them more certainly than the horse*; because the jack-afs has been observed to possess stronger prolific powers, even when joined with a mare, than the horse; for the former corrupts or destroys what had been done by the latter. Of this fact we may be assured by first serving mares with a stallion, and next day, or even some days after, with a jack-afs. Mares managed in this manner almost constantly produce mules, and not horses. This fact, every circumstance of which merits attention, seems to indicate that the afs, and not the horse, is the principal stock of this family; since the prolific powers of the afs prevail even with mares, especially as the reverse does not take place when the afs precedes the horse. The latter destroys not the generation of the afs; for the produce is almost always a mule. On the other hand, the same thing does not take place, when the jack-afs precedes the horse with the she-afs; for the latter destroys not the operation of the former. With regard to the copulation of mules among themselves, I have presumed it to be sterile;

ribe; because, from two temperaments, already vitiated in the article of generation, and which, from their union, must be still farther injured, a produce either totally vitiated, or absolute barrenness, is to be expected.

By the mixture of the mule with the mare, of the bardeau with the she-ass, and of the horse and jack-ass with the mules, individuals might be obtained which would ascend toward the original species, and would be only half mules. These, like their parents, would not only possess the power of engendering with those of their primitive species, but perhaps of producing among themselves; because, being only half vitiated, their produce would not be more vitiated than the first mules: And, if these half mules were still barren, or their offspring rare, it is almost certain, that, by making them approach another degree toward their original species, the individuals resulting from their union, being only vitiated one fourth, would produce among themselves, and form a new stem, which would neither be precisely that of the horse, nor that of the ass. Now, as every thing that can happen has been accomplished in time, and either exists or has existed in Nature, I am inclined to think, that the fertile mule mentioned by the ancients, and which, in the days of Aristotle, existed in the territories of Syria, above Phœnicia, might be a race of these half or quarter mules, which had been produced by the commixtures

commixtures we have just now described; for Aristotle says in express terms, that these fertile mules were perfectly similar to the barren kind *. He clearly distinguishes them from the *onagri*, or wild asses, which he mentions in the same chapter; and, consequently, these animals can only be referred to the mules which have suffered little vitiation, and preserved their generative powers. The *csigitbai*, or fertile mule of Tartary, it is probable, was not the onager or wild ass, but this same Phœnician mule, whose race, perhaps, still remains. The first traveller who compares them, will confirm or destroy this conjecture. Even the zebra, which has a greater resemblance to the horse than to the ass, might have a similar origin. The constrained regularity of his colours, which are disposed in alternate bands of black and white, seems to indicate that they proceed from two different species, which, in their mixture, have separated as much as possible; for none of the operations of Nature is so abrupt, and so little shaded, as the

* In terra Syria super Phœnicem mule et cocunt et pariunt; sed id genus diversum quamquam simile; *Arist. Hist. Anim. lib. vi. cap. 26.* — Sunt in Syria quos mulos appellant genus diversum ab eo quod coita equæ et asini procreant: Sed simile facie, quomodo asini sylvestres similitudine quadam nomen urbanorum accipere; et quidem ut asini illi feri sic muli præstant celeritate. Procreant ejusmodi mule suo in genere. Cujus rei argumento illæ sunt quæ tempore Phœnicæ patris Pharnazabim in terram Phrygiam venerunt, quæ adhuc extant. Tres tamen ex novem quos numero olim fuisse aiunt, servantur hoc tempore; *Idem, cap. 36.*

coat of the zebra, where she passes quickly and alternately from white to black, and from black to white, without any intermediate step, through the whole extent of the animal's body.

However this matter stands, it is certain, from what is above remarked, that mules, in general, which have uniformly been accused of sterility, are neither really nor universally barren; and that this sterility is particularly apparent only in the mule which proceeds from the ass and horse; for the mule produced by the he-goat and the ewe is equally fertile as its parents; and most of the mules produced by different species of birds are not barren. It is, therefore, in the particular nature of the horse and ass that we must search for the cause of the sterility of the mules which proceed from their union; and instead of supposing barrenness to be a general and necessary defect common to all mules, it should be limited to the mule produced by the ass and horse; and even this limitation ought to be restricted, as these same mules, in certain circumstances, become fertile, particularly when brought a degree nearer their original species.

The mules produced by the horse and ass have their organs of generation as complete as other animals. Nothing seems to be defective either in the male or female. The seminal fluid of the male is copious; and, as he is not permitted to copulate, he is often so pressed for a discharge, that he lies down on his belly, in order

order to produce a collision on his fore-legs, which are folded under his breast. These animals, therefore, are furnished with every thing necessary to the act of generation. They are even extremely ardent, and, consequently, very indifferent in their choice. The males have nearly the same vehemence of desire for the female mule, the she-ass, and the mare. Hence there is no difficulty of procuring copulations; but, to render these prolific, particular attentions are necessary. Too much ardour, especially in the females, is generally followed with sterility; and the female mule is at least as ardent as the she-ass. Now, we know that the latter rejects the seminal fluid of the male, and that, to make her retain it and conceive, she must have blows, or water thrown on her crupper, in order to calm the convulsive emotions of desire which subsist after copulation, and are the cause of this rejection. The she-ass and female mule, therefore, by their too great ardour, have both a tendency to barrenness. This tendency is increased by another cause: As these animals are originally natives of warm climates, cold is an obstacle to their propagation; and, for this reason, they are allowed to copulate in summer only. When their union is permitted at any other time, and particularly in winter, it seldom produces impregnation. The season necessary to the success of their generation, is equally so to the preservation of their young. The colt must be

be brought forth when the season is warm, otherwise it either languishes or dies: And, as the she-ass goes one year with young, she brings forth in the same season that she conceives. This is a sufficient proof that heat is necessary not only to the fecundity of these animals, but to the vigour of their bodies. On account of the great ardour of the female, she is served with a male almost immediately after she brings forth. She is not allowed above seven or eight days of repose between delivery and copulation. Weakened by the birth, she is then less ardent, the parts have not had time sufficient to resume their former tension; and, of course, conception is more certain than when she is in full vigour and ardour. In this species, as in that of the cat, the temperament of the female is said to be much more ardent than that of the male. The jack-ass, however, is remarkable for vigour. He can cover females several times a-day successively. He has been known to go to such excess, without any other incitement than natural appetite, as to die on the spot, after eleven or twelve efforts, repeated almost without interval; and, to support this great waste, he took nothing but a few draughts of water. This flame which consumes him is too vivid to be durable: An ass stallion is soon unfit either for propagation or service; and this, perhaps, is the reason why the female has been said to have more strength, and to live longer than the male.

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It is certain, that, with the management formerly recommended, she can live thirty years, and bring forth annually during her whole life. But the male, when not restrained from females, abuses his strength to such a degree, that, in a few years, he loses the power of engendering.

Hence both the male and female asses have a tendency to sterility by common, and likewise by different qualities. The horse and mare have the same tendency. The stallion may be given to the mare nine or ten days after she has brought forth, and she can produce five or six years in succession; but, after that period, she becomes barren. To support her fecundity, she should be allowed an interval of a year between each birth, and treated differently from the she-ass. Instead of giving her the stallion soon after delivery, she should be restrained from him till the following year, and till her ardour is manifested by the external signs. Even with these precautions, she seldom retains her fertility beyond the age of twenty-five years. On the other hand, the horse, though less ardent and more delicate than the jack-ass, preserves the faculty of propagating much longer. I have known old horses, who were unable to mount the mare without the aid of the groom, resume their vigour when properly placed, and engender at the age of thirty years. In the horse, the seminal fluid is not only less abundant, but less stimu-

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lant than in the jack-ass; for the horse often copulates without ejection, especially when the mare is presented to him before he discovers any inclination. After enjoyment, he appears to be melancholy; and a considerable interval is necessary for resuming his ardour. Besides, his most vigorous efforts are not always successful. Some mares are naturally barren, and a greater number of them possess very little fertility. There are likewise stallions, which, though apparently vigorous, have very little power. To these particular reasons, we can add a more evident and a more general proof of the small degree of fertility in the horse and ass: Of all domestic animals, though most attention is bestowed on them, they are the least numerous. In the ox, the sheep, the goat, and particularly the hog, the dog, and the cat, the individuals are ten, and perhaps a hundred times more numerous than those of the horse and ass. Thus their defectiveness in fecundity is proved by the facts; and to all these causes, the sterility of mules, which are produced by the union of those naturally unprolific species, ought to be ascribed. In those species, on the contrary, which, like the sheep and goat, are numerous, and consequently prolific, the mules proceeding from their intermixture are not barren, but ascend to the original species in the first generation. But it would require two, three, and perhaps four generations,

to

to enable the mule produced by the union of the horse and ass to arrive at the same degree of re-establishment of its nature.

Another kind of mule has been said to have resulted from the copulation of the bull and mare. I believe it is first mentioned by Columella. Gesner quotes him, and adds, that these mules are found near Grenoble, and are called, in French, *jumars*. I had one of these jumars brought to me from Dauphiny, and another from the Pyrenees; and I discovered, both from inspecting their external figure, and dissecting their internal parts, that they were nothing but bardeaus, or mules produced between the horse and she-ass. Hence I am led to conclude, both from this experiment, and from analogy, that this kind of mule has no existence, and that the word *jumar* is a chimerical name, without any real object. The nature of the bull is too remote from that of the mare to permit their producing together; the one having four stomachs, horns, cloven feet, &c. and the other being whole-hoofed, hornless, and having but one stomach. The organs of generation are likewise so very different, both in size and proportions, that there is no reason for supposing that they could unite either with pleasure or success. If the bull were to produce with any other species than his own, it would be with the buffalo, which resembles him in structure as well as in natural habits; yet we have never heard of mules produced by these

two

two animals, though they are often found in the same places, either in a domestic or a free state. What is related concerning the fertile intercourse of the stag and cow, appears to be equally suspicious as the history of the jumars, though the stag, by his conformation, is not so far removed from the nature of the cow as the bull from that of the mare.

The deer-kind, who have *wood* instead of horns, and though they chew the cud, and have the same internal structure with those animals which have horns, seem to constitute a separate family, of which the elk is the largest stem, and the rain-deer, the stag, the axis, the fallow-deer, and the roebuck, are smaller and collateral branches; for there are only six species of quadrupeds, whose head is armed with branched horns, which fall off and are renewed every year: Independent of this generic character, which is common to the whole, they resemble each other still more in structure and natural habits. We should, therefore, rather expect mules from a commixture of the stag or fallow-deer with the axis or rain-deer, than from that of the stag with the cow.

We have still greater reason to regard all the sheep and all the goats as constituting the same family; because they produce together mules, which ascend directly, and in the first generation, to the species of the sheep. To this numerous family of sheep and goats, we might add those

those of the gazelles and bubalus, which are no less numerous. In this genus, which comprehends more than thirty species, it appears that the mouflon, the wild goat, the chamois goat, the antelope, the bubalus, the condoma, &c. are principal stems, and that the others are only accessory branches, who have retained the chief characters of the stocks from which they issued; but, at the same time, they have been prodigiously varied by the influence of climate, food, and a state of servitude, to which man has reduced most of these animals.

The dog, the wolf, the fox, the jackal, and the *ilatis*, form another genus, the different species of which are so similar, particularly in their internal structure and the organs of generation, that it is difficult to conceive why they do not intermix. From the experiments I made, with regard to the union of the dog with the wolf and fox, the repugnance to copulation seemed to proceed rather from the wolf than the dog, that is, from the wild, and not from the domestic animal; for the bitches which I put to the trial would have willingly permitted the fox and wolf; but the she-wolf and female fox would never suffer the approaches of the dog. The domestic state seems to render animals less faithful to their species. It likewise makes them more ardent and more fertile: The bitch generally produces twice in a year: But the she-
wolf

wolf and the female fox produce only once in the same period: And it is probable, that the dogs who have become wild and have multiplied in the island of Juan Fernandes, and in the mountains of St. Domingo, produce but once a-year, like the fox and wolf. Were this fact ascertained, it would fully establish the unity of genus in these three animals, who resemble each other so much in structure, that their repugnance to intermixing must be solely ascribed to some external circumstances.

The dog seems to be an intermediate species between the fox and wolf. The ancients affirm, that, in certain circumstances, and in particular countries, the dog produces with the wolf and fox*. I endeavoured to ascertain this fact; and, though I did not succeed, we must not conclude it to be impossible; for my experiments were confined to captive animals; and it is well known, that, in some species, captivity alone is sufficient to extinguish the desire, and to create a repugnance to copulation, even with their equals. This state of restraint, therefore, ought to have a still greater effect in preventing their union with individuals of a different spe-

* In Cyrenensi agro lupi cum canibus coeunt, et Laenici canes ex vulpe et cane generantur: *Arist. Hist. Anim. lib. viii. cap. xxviii.* . . . Coeunt animalia generis ejusdem secundum naturam, sed ea etiam quorundam genus diversum quidem, sed natura non multum distat; si modo par magnitudo sit et tempora sequent graviditatis, raro id fit, sed tamen id fieri et in canibus et in vulpibus, et in lupis, certum est; *Idem, de Generat. Anim. lib. ii. cap. v.*

cies.

cies. But I am persuaded, that the dog, when at liberty and deprived of his own female, would intermix with the wolf and fox, especially after he had become wild, lost the odour of a domestic state, and approached these animals in their natural manner and habits. I believe not, however, that the fox and wolf ever unite, since they both live in the same climates, without attempting to intermix. If ever, therefore, they belonged to the same species, their degeneration must be referred to a period beyond the records of history. This is the reason why I asserted, that the dog was an intermediate species between the fox and wolf: His species is also common, since he is capable of uniting with both. And, if any circumstance could shew that these three animals proceeded originally from the same stock, it is the common relation between the dog and the fox and wolf, which brings the species nearer each other than all the similarities in their figure and organization. To reduce the fox and wolf, therefore, to one species, we must ascend to a state of nature in a very remote period of antiquity. But, in their actual condition, the wolf and fox must be regarded as the chief stems in the genus of the five animals under consideration. The dog, the jackal, and the isatis, are only lateral branches situated between the two first. The jackal participates of the dog and wolf, and the isatis of the jackal and fox. It likewise appears, from a great number of autho-

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rities,

rities, that the jackal and dog easily produce together; and we perceive, from the description and history of the isatis, that he resembles the fox almost entirely in figure and temperament; that they equally frequent cold countries; but that he, at the same time, has the natural dispositions of the jackal, the continual barking, the clamorous voice, and the habit of going always in packs.

The shepherd's dog, which I consider as the original stem of all dogs, makes, at the same time, the nearest approach to the fox in figure. His size is the same, and, like the fox, he has erect ears, a pointed muzzle, and a straight, trailing tail. He likewise resembles the fox in voice, sagacity, and subtlety of instinct. Hence this dog may have originally proceeded from the fox, if not in a direct, at least in a collateral line. The dog that Aristotle calls *canis laconicus*, and which he assures us is produced from a mixture of the fox and dog, may be the same with the shepherd's dog; or, at least, it has a greater affinity to him than to any other dog. It is natural to imagine, that the epithet *laconicus*, which Aristotle does not explain, was given to this dog, because he was found in Laconia, a province of Greece. But, if we attend to the origin of this *laconic* dog, we will perceive, that the race was not limited to the country of Laconia alone, but must have been equally common in all countries inhabited by foxes. This circumstance

stance induces me to think, that Aristotle employed the epithet *laconicus* to express the brevity and acuteness of the animal's voice; because he did not bark like other dogs, but yelped like a fox. Now, our shepherd's dog is best entitled to the denomination of *laconic*; for, of all dogs, his voice is sharpest and most seldom employed. Besides, the characters ascribed by Aristotle to this *laconic* dog correspond very well with those of the shepherd's dog; and this circumstance contributes still farther to convince me that they were the same. That the reader may judge whether my conjecture is properly founded, I have inserted the entire passage of Aristotle in the margin*.

The

* *Laconici canes ex Vulpe et Cane generantur; Hist. Anim. lib. viii. cap. xxviii.* — Canum genera plura sunt. Cuius Laconicum mense suæ ætatis octavo, et cras jam circa id tempus attollentes nonnulli urinam reddunt. — Gerunt Laconice canes uterum parte sexta anni, hoc est, sexagenis diebus, aut uno vel altero plus minuse. Catelli cæci pignuntur, nec ante duodecim diem visum accipiunt. Coeunt canes postquam puerunt sexto mense, nec citius. Sunt qui parte quinta anni uterum ferant, hoc est, duobus et septuaginta diebus, quorum catelli duodecim diebus luce carent: Nonnullæ quarta parte anni, hoc est, tribus mensibus, ferunt, quarum catelli diebus decem et septem luce carent. Lac ante diebus quinque, quam pariant, habent canes magna ex parte; verum nonnulli etiam septem aut quatuor diebus anticipat: Utile statim ut pepererint est: genus laconicum post coitum diebus triginta habere lac incipit. — Parie canis duodecim complurimum, sed magna ex parte quinque aut sex.

The genus of cruel and rapacious animals is one of the most numerous and most diversified.

Evil

Unum etiam aliquam peperisse certum est: Laconice magna ex parte octo pariunt. Coeunt quandiu vivunt et mares et feminae. Peculiare generis laconici est, ut cum laborant coire melius quam per otium possint; vivit in hoc eodem genere mas ad annos decem, femina ad duodecim: Ceteri canes maxima quidem ex parte ad annos quatuordecim: Sed nonnulli vel ad viginti protrahunt vitam.—Laconici sane generis feminas, quin minus laborant quam mares, vivaciores maribus sunt: At fero in ceteris, et si non late admodum constat, tamen mares vivaciores sunt; *Idem, lib. vi. cap. xx* —Feminam et marem natura dislinxit moribus; sunt enim feminas moribus mollioribus, mitefcent celerius, et manum facillius patiuntur. Discunt etiam imitanturque ingeniosius, ut in genere canum laconico feminas esse sagaciores quam mares apertum est. Moloticum etiam genus venaticum nihilo a ceteris discrepat, at pecuarium longe et magnitudinis et fortitudinis contra belluas praestat: Insignes vero animo et industria qui ex utroque moloticum dico et laconicum prodierint; *Idem, lib. ix. cap. i.*

By the word *genus* Aristotle means *race*. He distinguishes three races of dogs, the *Laconicus*, the *Moloticus*, and the *Pecuarinus*. The *Moloticus*, which he likewise calls *Venaticus*, is probably our grey-hound, which in Greece and Asia Minor is the common hunting-dog. The *Pecuarinus*, which he says greatly exceeds all other dogs in magnitude, is unquestionably the mastiff, and is used for defending the cattle from ferocious animals. The *Laconicus*, to which he assigns no employment, and only remarks, that it is a dog of great industry and labour; and that it is smaller than the *Pecuarinus*, can be nothing else than the shepherd's dog, which is very laborious in arranging, restraining, and conducting the sheep, and is more industrious and attentive than any other dog. But the greatest difficulty in these passages quoted from Aristotle consists in the different periods of gestation which he ascribes to the different races of dogs. Some of them, he says, go with young two months, others two months and a half,

Evil here, as well as elsewhere, assumes every kind of form. The lion and the tiger, being detached species, hold the first rank. All the others, as the panther, the ounce, the leopard, the lynx, the caracal, the jaguar, the cougar, the ocelot, the serval, the margai, and the cat, constitute but one sanguinary family, the different branches of which are more or less extended and diversified, according to the difference of climates. All these animals, though very different in magnitude and figure, resemble each other in their natural dispositions. They all have fiery eyes, short muzzles, and sharp, crooked, and retractile claws. They are all destructive, ferocious, and untameable. The cat, which is the least and smallest species, though reduced to slavery, is neither less perfidious, nor more obedient. The wild cat has preserved the character of the family. He is equally cruel, mischievous, and depredatory, as his larger kindred. They are all equally carnivorous, and enemies to the other animals. Man, with all his powers, has never been able to annihilate them. He has at all times employed against

half, and others three months; for all our dogs, of whatever race, go with young about nine weeks, or from sixty-one to sixty-three days; and I know not if ever a greater difference in the time of gestation has been observed than three or four days. But Aristotle might be more skilled in this subject than we are: And, if the facts he advances be true, certain dogs must have a greater affinity with the wolf than others; for we are assured by the hunters, that the wolf goes with young three months, or three months and a half.

them fire, steel, poison, and snares. But, as all the individuals are very prolific, and the species numerous, the efforts of man have been limited to banishing them, and confining them in the deserts, from which they never issue without marking their paths with terror and with blood. A single tiger escaping from the forest alarms a whole people, and obliges them to take up arms: How dreadful would be the consequences, if these sanguinary animals went in troops, and, like the wild dogs and jackals, extended their plans of depredation! Nature has bestowed this intelligence upon timid animals; but has happily denied it to the bold and solitary tribes. They always travel alone, and confide solely in their courage and strength. It had not escaped the observation of Aristotle, that no animal possessed of crooked and retractile claws was social, or went in troops*. This remark, which then applied to four or five species only, which alone were known in his time, is now found to be true, and to extend to ten or twelve species that have since been discovered. The other carnivorous animals, as the wolf, the fox, the dog, the jackal, and the *istatis*, whose claws are straight, go always in troops, and are all timid, and even daftardly.

By comparing, in this manner, all the quadrupeds, and ranking each under its own ge-

* Nullum animal, cui ungues adanci, gregatilis esse perpendimus; *Arist. Hist. Anim. lib. 1. cap. 1.*

nus,

nus, we shall find, that the two hundred species, whose history we have given, may be reduced to a small number of families or principal stems, from which all the others have probably derived their origin.

All the animals common to both continents, and all those which are peculiar to the Old World, may be reduced to fifteen genera, and nine solitary or detached species. These genera are, 1. The whole-hoofed genus properly so called, which comprehends the horse, the zebra, and the ass, together with the fertile and infertile mules. 2. The large cloven-hoofed, with hollow horns, as the ox and the buffalo, with all their varieties. 3. The small cloven-hoofed, with hollow horns, as the sheep, the goat, the gazelle, the antelope, and all the other species which participate of their nature. 4. The cloven-hoofed, with solid horns, which fall off and are renewed every year. This family comprehends the elk, the rein-deer, the stag, the fallow-deer, the axis, and the roebuck. 5. The ambiguous cloven-hoofed, which is composed of the wild boar, and all the other varieties of the hog, as the hog of Siam with a pendulous belly; that of Guiney, with long pointed ears lying on the back; that of the Canaries, with long, thick tusks, &c. 6. The extensive genus of digitated carnivorous animals, with crooked and retractile claws, in which are comprehended the panther, leopard, ounce, serval, and cat, with

all their varieties. 7. Digitated carnivorous animals with straight and fixed claws, under which are comprehended the wolf, fox, jackal, isatis, and dog, with all their varieties. 8. Digitated carnivorous animals with fixed claws, and a pouch under the tail. This genus is composed of the hyæna, civet, zibet, genet, badger, &c. 9. Digitated carnivorous animals, with a very long body, five toes on each foot, and the thumb separated from the other toes. This genus comprehends the martin, polecat, fable, ferret, ichneumon, weasel, vansire, &c. 10. The numerous family of digitated quadrupeds, which have two large cutting teeth in each jaw, and no prickles on the body. This genus contains the hare, the rabbit, and all the species of squirrels, dormice, marmots, and rats. 11. Digitated quadrupeds with prickles on their body, as the porcupines and hedge-hog. 12. Digitated animals covered with scales, as the long-tailed and short-tailed manis, or scaly lizards. 13. The amphibious digitated genus, comprehending the otter, beaver, musk-rats, walrus, and seals. 14. The four-handed genus, which includes the apes, baboons, monkeys, makis, loris, &c. 15. Lastly, the winged quadrupeds, comprehending bats of all kinds.—The nine detached species are, the elephant, rhinoceros, hippopotamus, giraffe, camel, lion, tiger, bear, and mole, which are all subject to a greater or smaller number of varieties.

Of these fifteen genera and nine detached species, seven genera and two species are common to both Continents. The two species are the bear and mole. The seven genera are, 1. The large cloven-hoofed, with hollow horns; for the ox is found in America under the form of the bison. 2. The cloven-hoofed, with solid horns; for the elk exists in Canada under the name of *original*, the rain-deer under that of *caribou*; and stags, fallow-deer, and roebucks, are found in almost every province of North America. 3. The digitated carnivorous quadrupeds with fixed claws; for the wolf and fox are found in the New as well as in the Old World. 4. The digitated long-bodied genus; for the pine weasel, martin, and polecat, are found in America. 5. A part of the digitated genus with two large cutting teeth in each jaw, as the squirrels, marmots, rats, &c. are likewise found in America. 6. The digitated amphibious genus, as the walrus, seal, beaver, and otter, exists in the northern regions of the New Continent. 7. The digitated winged genus likewise exists in America; as the bat and vampire.

There remains, therefore, only eight genera and five detached species, which are peculiar to the Old World: 1. The whole-hoofed genus properly so called; for neither horses, nor asses, nor zebras, nor mules, were found in America. 2. The small cloven-hoofed genus with hollow horns;

horns; for sheep, goats, gazelles, and antilopes, had no existence in the New World. 3. The hog genus; for the species of the wild boar exists not in America; and, though the pecari and its varieties are related to this family, they differ in characters so remarkable as to justify their separation. 4. The same remark is applicable to the carnivorous animals with retractile claws; and, though the jaguar, cougar, ocelot, and margai, appear to belong to this family, none of these species of the New World are found in the Old, and none of those of the Ancient Continent are found in the New. 5. The same remark is applicable to the digitated quadrupeds, whose bodies are covered with prickles; for, though the coendou and Canada porcupine make a near approach to this genus, they differ widely from the hedge-hogs and porcupines. 6. The digitated carnivorous genus, with fixed claws; for the hyæna, the civets, and the badgers, have no existence in America. 7. The four-handed genus; for, in America, there are no apes, baboons, monkeys, nor makis. The sapajous, the sagoins, the opossums, &c. though likewise four-handed, differ essentially from those of the Old Continent. 8. The digitated genus whose bodies are covered with scales; for none of the scaly lizards are found in America; and the ant-eaters, to which the former may be compared, are covered with hair, and differ too much

much from the scaly lizards to be admitted into the same family.

Of the nine detached species, seven, namely, the elephant, rhinoceros, hippopotamus, giraffe, camel, lion, and tiger, are found only in the Old World; and two, to wit, the bear and mole, are common to both Continents.

If we make a similar enumeration of the animals peculiar to the New World, we shall find, that there are about fifteen different species, which may be reduced to ten genera, and four detached species. These four species are the tapir, the cabiai, the lama, and the pecari: But the tapir is properly the only species which is absolutely detached; for that of the pecari has varieties; and the pacos may be united with the lama, and the Guiney-pig with the cabiai. The ten genera are, 1. Eight species of sapajous. 2. Six species of sagoins. 3. The opossums, phalangiers, the tarsiers, &c. 4. The jaguars, cougars, ocelots, margais, &c. 5. Three or four species of coatis. 6. Four or five species of mouffettes, or stinking weasels. 7. The genus of agouti, comprehending the acouchi, the paca, the aperea, and the tapeti, or Brazilian hare. 8. That of the armadillos, which consists of seven or eight species. 9. Two or three species of ant-eaters. 10. Two species of sloths.

These ten genera and four detached species, to which the animals peculiar to the New World may be reduced, though they differ from those

of the Old Continent, have remote relations which seem to indicate something common in their formation, and lead us to causes of degeneration more ancient, perhaps, than all the others. We formerly made the general remark, that all the animals of the New World were much smaller than those of the Old. This great diminution in magnitude, whatever be the cause of it, is a primary kind of degeneration, which could not happen without having a considerable influence on the figure of all these animals; and, in comparing them, we must not lose sight of this first effect.

The largest is the tapir, which, as he exceeds not the size of an ass, cannot be compared to the elephant, rhinoceros, or hippopotamus. In the New Continent, he is the largest animal, as the elephant is in the Old. Like the rhinoceros, his upper lip is muscular and prominent; and, like the hippopotamus, he frequents the water. He alone represents, in some degree, these three animals; and his figure, which resembles the ass more than that of any other quadruped, seems to be as much degraded as his stature is diminished. The horse, the ass, the zebra, the elephant, the rhinoceros, and the hippopotamus, had no existence in America: Neither was there, in this New World, any animal which could be compared with them either for magnitude or figure. The tapir seems to be the least remote from the whole of these animals: But, at the same

same time, he is so mixed, and approaches so little to any one of them, that it is impossible to attribute his origin to any particular species: And, notwithstanding the slight relations he has to the rhinoceros, the hippopotamus, and the ass, he ought to be regarded not only as a peculiar species, but even as a singular genus.

Hence the tapir is not even remotely allied to any species of the Old Continent, and has hardly any characters which make him approach those animals to which we have been comparing him. In the same manner, the cabiai has no external relation to any other animal, and he approaches the Guiney-pig, which belongs to the same Continent, in his internal parts only, and both species are absolutely different from all those of the Old World.

The lama and paco seem to possess more perceptible marks of their ancient lineage, the first with the camel, and the second with the sheep. The lama, like the camel, has long legs, a very long neck, a light head, and the upper lip divided. He likewise resembles the camel in mildness of disposition, servility of spirit, sobriety, and aptness for labour. Among the Americans, he was the first and the most useful of their domestic animals. He was employed, as the Arabs use the camel, for carrying burdens. To these conformities in the nature of the two animals, we may add the permanent marks of labour; for, though the back of the lama be not deformed

ed with bunches, like that of the camel, he has natural callosities on his breast, because he has the same habit of reposing on that part of the body. Notwithstanding all these relations, the species of the lama is very different from that of the camel. The lama exceeds not in magnitude one-fourth or one-third of that of the camel. The figure of his body, the quality and colour of his hair, are also very different: His temperament is phlegmatic, and he delights in the mountains only. But the temperament of the camel is adust, and he lives spontaneously among burning sands. In fine, there are more specific differences, perhaps, between the camel and lama, than between the camel and giraffe. These three animals possess several common characters, by which they might be united into one genus. But, at the same time, they differ so much in other characters, that they cannot be supposed to have sprung from one another: They are neighbours, but not relations. The giraffe is almost double the height of the camel, and the camel is double that of the lama. The two first belong to the Old Continent, and form distinct species: Of course, the species of the lama, which is peculiar to the New World, is remote from both.

The same remark is not applicable to the pecari: Though of a different species from the hog, he belongs to the same genus. In figure, and almost every external relation, he resembles the hog; and differs from that animal only in some minute

minute characters, such as the aperture on his back, the figure of the stomach and intestines, &c. We might therefore be led to think, that the pecari had sprung from the same stem with the hog, and that he had formerly passed from the Old to the New World, where, by the influence of the soil, he had degenerated so greatly as now to form a distinct species.

With regard to the pacos, though it seems to have some relations to the sheep by its wool and habit of body, it differs so much in every other article, that they cannot be considered as allied species. The pacos is rather a small kind of lama, and appears not, from any character, to have ever passed from the one Continent to the other. Hence, of the four detached species peculiar to the New World, three, namely, the tapir, the cabiai, and the lama and pacos, appear to have been at all times proper to this Continent. But the pecari, which is the fourth, seems to be only a degenerated species of hog, and to have formerly derived its origin from the Old Continent.

From a similar examination and comparison of the ten genera, to which we have reduced the other animals peculiar to South America, we shall find not only singular relations in their nature, but marks of their ancient origin and degeneration. The sapajous and sagouis have so great a resemblance to the monkeys, that they have obtained the common name of ape. We have

have proved, however, that their species, and even their genera, are different. Besides, it would be difficult to conceive how the monkeys of the Old World could assume, in America, a different figure of face, a long, muscular, and prehensile tail, a large partition between the nostrils, and other characters both specific and generic, by which we have distinguished and separated them from the sapajous. But, as the apes, the baboons, and the monkeys, are peculiar to the Old World, the sapajous and sagoins should be regarded as their representatives in the New; for these animals have nearly the same form, both external and internal, and, in their manners and dispositions, they possess many things in common. In the same manner, there are no makis in America, and yet they are represented by the opossums, or four-handed animals with sharp muzzles, which are very numerous in the New Continent, but exist not in the Old. It must be remarked, however, that there is a much greater difference between the nature and form of the makis and these four-handed American animals, than between the monkeys and sapajous; and that the interval between an opossum and a maki is so great, that we cannot think they ever proceeded from each other, without supposing that degeneration is capable of producing effects equal to those of a new nature; for most of these American four-handed species have a pouch under the belly, ten cutting teeth in each jaw,

jaw, and a prehensile tail; while the makis have no pouch under their belly, a flaccid tail, and only four cutting teeth in the upper, and six in the under jaw. Hence, though these animals have their hands and fingers constructed in the same manner, and likewise resemble each other in the length of the muzzle, their species, and even their genera, are so different, that it is impossible to imagine they ever proceeded from one another, or that such great and general disparities could be produced by degeneration.

On the other hand, the American tigers, which we have treated of under the appellation of jaguars, cougars, ocelots, and margais, though different in species from the panther, leopard, ounce, and several of the Old Continent, unquestionably belong to the same genus. All these animals resemble each other greatly, both externally and internally. They have also the same natural dispositions, the same ferocity, the same vehement thirst for blood; and, what makes them approach still nearer in genus, those of the same Continent differ more from each other, than from those of the other Continent. For example, the African panther differs less from the Brazilian jaguar, than the latter differs from the cougar, though they belong to the same country. In the same manner, the Asiatic serval and the margai of Guiana differ less from one another than from the species peculiar to their own continents. We may, therefore, conclude,

clude, that these animals have had a common origin, and that they have formerly passed from the one Continent to the other. Their actual differences have proceeded solely from the long continued influence of their new situation.

The mouffettes, or stinking weasels of America, and the European polecat, seem to belong to the same genus. In general, when a genus is common to both Continents, the species of which it is composed are more numerous in the Old than in the New. In this instance, however, the contrary takes place: In America, there are four or five species of polecats, while we have but one, whose nature seems to be inferior to that of all the others; so that the New World, in its turn, appears to have representatives in the Old; and, if we judged only from the fact, we should be led to think, that these animals had taken a contrary route, and passed from America into Europe. The same remark is applicable to some other species. The roebucks and the fallow-deer, as well as the mouffettes, are more numerous and likewise stronger in the New than in the Old Continent. We might, therefore, imagine that they are original natives of America. But, as we know that all animals were created in the Old Continent, we must necessarily admit their migration from the Old to the New World, and at the same time suppose, that, instead of degenerating, like all the other Ameri-

can species, they have improved by the influ-

ences of the soil and climate.

The ant-eaters, which are singular creatures, and of which there are three or four species in the New World, appear also to have their representatives in the Old. The scaly lizards resemble the ant-eaters in the peculiar character of having no teeth, and of being obliged to stretch out their tongue and feed upon ants. But, if we assign them a common origin, it is strange that, instead of scales, which they have in Asia, they are covered with hair in America.

With regard to the agoutis, pacos, and other animals which constitute the seventh genus peculiar to the New Continent, they can only be compared with the hare and rabbit, from which, however, they all differ in species. It is difficult to assign them a common origin; because the hare is diffused almost over every climate of the Old Continent, without undergoing any other change than in the colour of his hair. It is by no means probable, therefore, that the climate of America should have so far changed the nature of our hares, as to make them tapetis and apereas, which have no tail; or agoutis with a sharp muzzle, and short round ears; or pacos with a large head, short ears, and coarse hair with white bands.

In fine, the coaitis, the armadillos, and the sloths, differ so much not only in species, but in genus, from all the animals in the Old World,

that they can be compared to none of them, and that it is impossible to refer them to any common origin, or to ascribe to the effects of degeneration the prodigious differences in their nature from that of any other animal.

Thus, of ten genera and four detached species, to which we have endeavoured to reduce all the animals peculiar to the New World, there are only two, namely, the genus of jaguars, ocelots, &c. and the species of the pecari, with their varieties, which can, with any degree of probability, be referred to the animals of the Old World. The jaguars and ocelots may be regarded as a species of the leopard or panther, and the pecari as a species of hog. There are also five genera and one detached species, namely, the species of the lama, the genera of sapajous, sagoins, mouffettes, agoutis, and ant-eaters, which may be compared, though in an equivocal and very distant manner, with the camel, the monkeys, the polecat, the hare, and the scaly lizards: And, in fine, there remain four genera and two detached species, namely, the opossums, the coatis, the armadillos, the sloths, the tapir, and cabiai, which can neither be referred nor compared to any genera or species in the Old Continent. This seems to be a sufficient proof, that the origin of these animals peculiar to the New World cannot be attributed to degeneration alone: However powerful we may suppose the effects of degeneration, we can never suppose, with any appear-

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ance of reason, that these animals were originally the same with those of the Old Continent. It is more probable, that the two Continents were formerly united, and that the species which inhabited the New World, because the soil and climate were most agreeable to their nature, were separated from the others by the irruption of the waters, when they divided Africa from America. This is a natural cause; and similar causes might be conceived which would produce the same effect. For example, if the sea should make an irruption into Asia from east to west, and separate the southern regions of Africa and Asia from the rest of the Continent, all the animals peculiar to these countries, as the elephant, the rhinoceros, the giraffe, the zebra, the orang-outang, &c. would be in the same situation with those of South America. They would be entirely separated from those of the temperate regions, and could not be referred to an origin common to any of the species or genera which inhabit these countries, solely because some imperfect resemblances might be discovered between them.

Hence, to discover the origin of these animals, we must have recourse to the period when the two Continents were united, and trace the first changes which have happened on the surface of the earth. We must, at the same time, consider the two hundred species of quadrupeds as constituting thirty-eight families: And, though this is by no means the present state of nature, but,

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on the contrary, a state of much greater antiquity, which we can reach only by inductions and relations almost equally fugitive as time, that seems to have effaced their traces; we shall, however, endeavour to ascend, by facts and monuments still existing, to those first ages of Nature, and to exhibit those epochas which shall appear to be most clearly indicated.

END OF THE SEVENTH VOLUME.