

## CHAPTER I.

## DOMESTIC DOGS AND CATS.

ANCIENT VARIETIES OF THE DOG—RESEMBLANCE OF DOMESTIC DOGS IN VARIOUS COUNTRIES TO NATIVE CANINE SPECIES—ANIMALS NOT ACQUAINTED WITH MAN AT FIRST FEARLESS—DOGS RESEMBLING WOLVES AND JACKALS—HABIT OF BARKING ACQUIRED AND LOST—FERAL DOGS—TAN-COLOURED EYE-SPOTS—PERIOD OF GESTATION—OFFENSIVE ODOUR—FERTILITY OF THE RACES WHEN CROSSED—DIFFERENCES IN THE SEVERAL RACES IN PART DUE TO DESCENT FROM DISTINCT SPECIES—DIFFERENCES IN THE SKULL AND TEETH—DIFFERENCES IN THE BODY, IN CONSTITUTION—FEW IMPORTANT DIFFERENCES HAVE BEEN FIXED BY SELECTION—DIRECT ACTION OF CLIMATE—WATER-DOGS WITH PALMATED FEET—HISTORY OF THE CHANGES WHICH CERTAIN ENGLISH RACES OF THE DOG HAVE GRADUALLY UNDERGONE THROUGH SELECTION—EXTINCTION OF THE LESS IMPROVED SUB-BREEDS.

CATS, CROSSED WITH SEVERAL SPECIES—DIFFERENT BREEDS FOUND ONLY IN SEPARATED COUNTRIES—DIRECT EFFECTS OF THE CONDITIONS OF LIFE—FERAL CATS—INDIVIDUAL VARIABILITY.

THE first and chief point of interest in this chapter is, whether the numerous domesticated varieties of the dog have descended from a single wild species, or from several. Some authors believe that all have descended from the wolf, or from the jackal, or from an unknown and extinct species. Others again believe, and this of late has been the favourite tenet, that they have descended from several species, extinct and recent, more or less commingled together. We shall probably never be able to ascertain their origin with certainty. Palæontology<sup>1</sup> does not throw much light on the question, owing, on the one hand, to the close similarity of the skulls of extinct as well as living wolves and jackals, and owing, on the other hand, to

<sup>1</sup> Owen, 'British Fossil Mammals,' pp. 123 to 133. Pictet's 'Traité de Pal.,' 1853, tom. i. p. 202. De Blainville, in his 'Ostéographie, Canidæ,' p. 142, has largely discussed the whole subject, and concludes that the extinct parent of all domesticated dogs came nearest to the wolf in organization, and to the jackal in

habits. See also Boyd Dawkins, 'Cave Hunting,' 1874, p. 131, &c., and his other publications. Jettles has discussed in great detail the character of the breeds of pre-historic dogs: 'Die vorgeschichtlichen Alterthümer der Stadt Olmütz,' II. Theil, 1872, p. 44 to end.

the great dissimilarity of the skulls of the several breeds of the domestic dogs. It seems, however, that remains have been found in the later tertiary deposits more like those of a large dog than of a wolf, which favours the belief of De Blainville that our dogs are the descendants of a single extinct species. On the other hand, some authors go so far as to assert that every chief domestic breed must have had its wild prototype. This latter view is extremely improbable: it allows nothing for variation; it passes over the almost monstrous character of some of the breeds; and it almost necessarily assumes that a large number of species have become extinct since man domesticated the dog; whereas we plainly see that wild members of the dog-family are extirpated by human agency with much difficulty; even so recently as 1710 the wolf existed in so small an island as Ireland.

The reasons which have led various authors to infer that our dogs have descended from more than one wild species are as follows.<sup>2</sup> Firstly, the great difference between the several breeds; but this will appear of comparatively little weight, after we shall have seen how great are the differences between the several races of various domesticated animals which certainly have descended from a single parent-form. Secondly, the more important fact, that, at the most anciently known historical periods, several breeds of the dog existed, very unlike each other, and closely resembling or identical with breeds still alive.

We will briefly run back through the historical records.

<sup>2</sup> Pallas, I believe, originated this doctrine in 'Act. Acad. St. Petersburg,' 1780, Part ii. Ehrenberg has advocated it, as may be seen in De Blainville's 'Ostéographie,' p. 79. It has been carried to an extreme extent by Col. Hamilton Smith in the 'Naturalist Library,' vols. ix. and x. Mr. W. C. Martin adopts it in his excellent 'History of the Dog,' 1845; as does Dr. Morton, as well as Nott and Gliddon, in the United States. Prof. Low, in his 'Domesticated Animals,' 1845, p. 666, comes to this same conclusion. No one has argued on this side with more clearness and

force than the late James Wilson, of Edinburgh, in various papers read before the Highland Agricultural and Wernerian Societies. Isidore Geoffroy Saint-Hilaire ('Hist. Nat. Gén.,' 1860, tom. iii. p. 107), though he believes that most dogs have descended from the jackal, yet inclines to the belief that some are descended from the wolf. Prof. Gervais ('Hist. Nat. Mamm.' 1855, tom. ii. p. 69, referring to the view that all the domestic races are the modified descendants of a single species, after a long discussion, says, "Cette opinion est, suivant nous du moins, la moins probable."

The materials are remarkably deficient between the fourteenth century and the Roman classical period.<sup>3</sup> At this latter period various breeds, namely hounds, house-dogs, lap-dogs, &c., existed; but, as Dr. Walther has remarked, it is impossible to recognise the greater number with any certainty. Youatt, however, gives a drawing of a beautiful sculpture of two greyhound puppies from the Villa of Antoninus. On an Assyrian monument, about 640 B.C., an enormous mastiff<sup>4</sup> is figured; and according to Sir H. Rawlinson (as I was informed at the British Museum), similar dogs are still imported into this same country. I have looked through the magnificent works of Lepsius and Rosellini, and on the Egyptian monuments from the fourth to the twelfth dynasties (*i.e.* from about 3400 B.C. to 2100 B.C.) several varieties of the dog are represented; most of them are allied to greyhounds; at the later of these periods a dog resembling a hound is figured, with drooping ears, but with a longer back and more pointed head than in our hounds. There is, also, a turnspit, with short and crooked legs, closely resembling the existing variety; but this kind of monstrosity is so common with various animals, as with the ancon sheep, and even, according to Rengger, with jaguars in Paraguay, that it would be rash to look at the monumental animal as the parent of all our turnspits: Colonel Sykes<sup>5</sup> also has described an Indian pariah dog as presenting the same monstrous character. The most ancient dog represented on the Egyptian monuments is one of the most singular; it resembles a greyhound, but has long pointed ears and a short curled tail: a closely allied variety still exists in Northern

<sup>3</sup> Berjeau, 'The Varieties of the Dog; in old Sculptures and Pictures,' 1863. 'Der Hund,' von Dr. F. L. Walther, Giessen, 1817, s. 48;: this author seems carefully to have studied all classical works on the subject. See also Volz, 'Beiträge zur Kulturgeschichte,' Leipzig, 1852, s. 115 'Youatt on the Dog,' 1845, p. 6. A very full history is given by De Blainville in his 'Ostéographie, Canidæ.'

<sup>4</sup> I have seen drawings of this dog

from the tomb of the son of Esar Haddor, and clay models in the British Museum. Nott and Gliddon, in their 'Types of Mankind,' 1854, p. 393, give a copy of these drawings. This dog has been called a Thibetan mastiff, but Mr. H. A. Oldfield, who is familiar with the so-called Thibet mastiff, and has examined the drawings in the British Museum, informs me that he considers them different.

<sup>5</sup> 'Proc. Zoolog. Soc.,' July 12th, 1831.

Africa; for Mr. E. Vernon Harcourt<sup>6</sup> states that the Arab boar-hound is "an eccentric hieroglyphic animal, such as Cheops once hunted with, somewhat resembling the rough Scotch deer-hound; their tails are curled tight round on their backs, and their ears stick out at right angles." With this most ancient variety a pariah-like dog coexisted.

We thus see that, at a period between four and five thousand years ago, various breeds, viz. pariah dogs, greyhounds, common hounds, mastiffs, house-dogs, lapdogs, and turnspits, existed, more or less closely resembling our present breeds. But there is not sufficient evidence that any of these ancient dogs belonged to the same identical sub-varieties with our present dogs.<sup>7</sup> As long as man was believed to have existed on this earth only about 6000 years, this fact of the great diversity of the breeds at so early a period was an argument of much weight that they had proceeded from several wild sources, for there would not have been sufficient time for their divergence and modification. But now that we know, from the discovery of flint tools embedded with the remains of extinct animals in districts which have since undergone great geographical changes, that man has existed for an incomparably longer period, and bearing in mind that the most barbarous nations possess domestic dogs, the argument from insufficient time falls away greatly in value.

Long before the period of any historical record the dog was domesticated in Europe. In the Danish Middens of the Neolithic or Newer Stone period, bones of a canine animal are imbedded, and Steenstrup ingeniously argues that these belonged to a domestic dog; for a very large proportion of the bones of birds preserved in the refuse consists of long bones, which it was found on trial dogs cannot devour.<sup>8</sup> This ancient

<sup>6</sup> 'Sporting in Algeria,' p. 51.

<sup>7</sup> Berjeau gives fac-similes of the Egyptian drawings. Mr. C. L. Martin in his 'History of the Dog,' 1845, copies several figures from the Egyptian monuments, and speaks with much confidence with respect to their identity with still living dogs. Messrs. Nott and Gliddon ('Types of Mankind,' 1854, p. 388) give still more numerous figures. Mr. Gliddon asserts that a

curl-tailed greyhound, like that represented on the most ancient monuments, is common in Borneo; but the Rajah, Sir J. Brooke, informs me that no such dog exists there.

<sup>8</sup> These, and the following facts on the Danish remains, are taken from M. Morlot's most interesting memoir in 'Soc. Vaudoise des Sc. Nat.' tom. vi., 1860, pp. 281, 299, 320.

dog was succeeded in Denmark during the Bronze period by a larger kind, presenting certain differences, and this again during the Iron period, by a still larger kind. In Switzerland, we hear from Prof. Rütimeyer,<sup>9</sup> that during the Neolithic period a domesticated dog of middle size existed, which in its skull was about equally remote from the wolf and jackal, and partook of the characters of our hounds and setters or spaniels (*Jagdhund und Wachtelhund*). Rütimeyer insists strongly on the constancy of form during a very long period of time of this the most ancient known dog. During the Bronze period a larger dog appeared, and this closely resembled in its jaw a dog of the same age in Denmark. Remains of two notably distinct varieties of the dog were found by Schmerling in a cave;<sup>10</sup> but their age cannot be positively determined.

The existence of a single race, remarkably constant in form during the whole Neolithic period, is an interesting fact in contrast with what we see of the changes which the races underwent during the period of the successive Egyptian monuments, and in contrast with our existing dogs. The character of this animal during the Neolithic period, as given by Rütimeyer, supports De Blainville's view that our varieties have descended from an unknown and extinct form. But we should not forget that we know nothing with respect to the antiquity of man in the warmer parts of the world. The succession of the different kinds of dogs in Switzerland and Denmark is thought to be due to the immigration of conquering tribes bringing with them their dogs; and this view accords with the belief that different wild canine animals were domesticated in different regions. Independently of the immigration of new races of man, we know from the wide-spread presence of bronze, composed of an alloy of tin, how much commerce there must have been throughout Europe at an extremely remote period, and dogs would then probably have been bartered. At the present time, amongst the savages of the interior of Guiana, the Taruma Indians

<sup>9</sup> 'Die Fauna der Pfahlbauten,' 1861, s. 117, 162.

<sup>10</sup> De Blainville, 'Ostéographie, Canidæ.'

are considered the best trainers of dogs, and possess a large breed which they barter at a high price with other tribes.<sup>11</sup>

The main argument in favour of the several breeds of the dog being the descendants of distinct wild stocks, is their resemblance in various countries to distinct species still existing there. It must, however, be admitted that the comparison between the wild and domesticated animal has been made but in few cases with sufficient exactness. Before entering on details, it will be well to show that there is no *à priori* difficulty in the belief that several canine species have been domesticated. Members of the dog family inhabit nearly the whole world; and several species agree pretty closely in habits and structure with our several domesticated dogs. Mr. Galton has shown<sup>12</sup> how fond savages are of keeping and taming animals of all kinds. Social animals are the most easily subjugated by man, and several species of *Canidæ* hunt in packs. It deserves notice, as bearing on other animals as well as on the dog, that at an extremely ancient period, when man first entered any country, the animals living there would have felt no instinctive or inherited fear of him, and would consequently have been tamed far more easily than at present. For instance, when the Falkland Islands were first visited by man, the large wolf-like dog (*Canis antarcticus*) fearlessly came to meet Byron's sailors, who, mistaking this ignorant curiosity for ferocity, ran into the water to avoid them: even recently a man, by holding a piece of meat in one hand and a knife in the other, could sometimes stick them at night. On an island in the Sea of Aral, when first discovered by Butakoff, the saigak antelopes, which are "generally very timid and watchful, did not fly from us, but on the contrary looked at us with a sort of curiosity." So, again, on the shores of the Mauritius, the manatee was not at first in the least afraid of man, and thus it has been in several quarters of the world with seals and the morse. I have elsewhere

<sup>11</sup> Sir R. Schomburgk has given me information on this head. See also 'Journal of R. Geograph. Soc.' vol.

xiii., 1843, p. 65.

<sup>12</sup> 'Domestication of Animals:' Ethnological Soc., Dec. 22nd, 1863.

shown<sup>13</sup> how slowly the native birds of several islands have acquired and inherited a salutary dread of man: at the Galapagos Archipelago I pushed with the muzzle of my gun hawks from a branch, and held out a pitcher of water for other birds to alight on and drink. Quadrupeds and birds which have seldom been disturbed by man, dread him no more than do our English birds, the cows, or horses grazing in the fields.

It is a more important consideration that several canine species evince (as will be shown in a future chapter) no strong repugnance or inability to breed under confinement; and the incapacity to breed under confinement is one of the commonest bars to domestication. Lastly, savages set the highest value, as we shall see in the chapter on Selection, on dogs: even half-tamed animals are highly useful to them: the Indians of North America cross their half-wild dogs with wolves, and thus render them even wilder than before, but bolder: the savages of Guiana catch and partially tame and use the whelps of two wild species of *Canis*, as do the savages of Australia those of the wild Dingo. Mr. Philip King informs me that he once trained a wild Dingo puppy to drive cattle, and found it very useful. From these several considerations we see that there is no difficulty in believing that man might have domesticated various canine species in different countries. It would indeed have been a strange fact if one species alone had been domesticated throughout the world.

We will now enter into details. The accurate and sagacious Richardson says, "The resemblance between the Northern American wolves (*Canis lupus*, var. *occidentalis*) and the domestic dogs of the Indians is so great that the size and strength of the wolf seems to be the only difference. I have more than once mistaken a band of wolves for the dogs of a party of Indians; and the howl of the animals of both species is prolonged so exactly in the same key that even the

<sup>13</sup> 'Journal of Researches,' &c., 1845, p. 393. With respect to *Canis antarcticus*, see p. 193. For the case

of the antelope, see 'Journal Royal Geograph. Soc.,' vol. xxiii. p. 94.

practised ear of the Indian fails at times to discriminate them." He adds that the more northern Esquimaux dogs are not only extremely like the grey wolves of the Arctic circle in form and colour, but also nearly equal them in size. Dr. Kane has often seen in his teams of sledge-dogs the oblique eye (a character on which some naturalists lay great stress), the drooping tail, and scared look of the wolf. In disposition the Esquimaux dogs differ little from wolves, and, according to Dr. Hayes, they are capable of no attachment to man, and are so savage that when hungry they will attack even their masters. According to Kane they readily become feral. Their affinity is so close with wolves that they frequently cross with them, and the Indians take the whelps of wolves "to improve the breed of their dogs." The half-bred wolves sometimes (Lamare-Picquot) cannot be tamed, "though this case is rare;" but they do not become thoroughly well broken in till the second or third generation. These facts show that there can be but little, if any, sterility between the Esquimaux dog and the wolf, for otherwise they would not be used to improve the breed. As Dr. Hayes says of these dogs, "reclaimed wolves they doubtless are."<sup>14</sup>

North America is inhabited by a second kind of wolf, the prairie-wolf (*Canis latrans*), which is now looked at by all naturalists as specifically distinct from the common wolf; and is, according to Mr. J. K. Lord, in some respects intermediate in habits between a wolf and a fox. Sir J. Richardson, after describing the Hare Indian dog, which differs in many respects from the Esquimaux dog, says, "It bears the same relation to the prairie-wolf that the Esquimaux dog does to the great

<sup>14</sup> The authorities for the foregoing statements are as follow:—Richardson, in 'Fauna Boreali-Americana,' 1829, pp. 64, 75; Dr. Kane, 'Arctic Explorations,' 1856, vol. i. pp. 398, 455; Dr. Hayes, 'Arctic Boat Journey,' 1860, p. 167. Franklin's 'Narrative,' vol. i. p. 269, gives the case of three whelps of a black wolf being carried away by the Indians. Parry, Richardson, and others, give accounts of wolves and dogs naturally

crossing in the eastern parts of North America. Seeman, in his 'Voyage of H.M.S. *Herald*, 1853, vol. ii. p. 26, says the wolf is often caught by the Esquimaux for the purpose of crossing with their dogs, and thus adding to their size and strength. M. Lamare-Picquot, in 'Bull. de la Soc. d'Acclimat.' tom. vii., 1860, p. 148, gives a good account of the half-bred Esquimaux dogs.



grey wolf." He could, in fact, detect no marked difference between them; and Messrs. Nott and Gliddon give additional details showing their close resemblance. The dogs derived from the above two aboriginal sources cross together and with the wild wolves, at least with the *C. occidentalis*, and with European dogs. In Florida, according to Bartram, the black wolf-dog of the Indians differs in nothing from the wolves of that country except in barking.<sup>15</sup>

Turning to the southern parts of the new world, Columbus found two kinds of dogs in the West Indies; and Fernandez<sup>16</sup> describes three in Mexico: some of these native dogs were dumb—that is, did not bark. In Guiana it has been known since the time of Buffon that the natives cross their dogs with an aboriginal species, apparently the *Canis cancrivorus*. Sir R. Schomburgk, who has so carefully explored these regions, writes to me, "I have been repeatedly told by the Arawaak Indians, who reside near the coast, that they cross their dogs with a wild species to improve the breed, and individual dogs have been shown to me which certainly resembled the *C. cancrivorus* much more than the common breed. It is but seldom that the Indians keep the *C. cancrivorus* for domestic purposes, nor is the Ai, another species of wild dog, and which I consider to be identical with the *Dusicyon silvestris* of H. Smith, now much used by the Arecunas for the purpose of hunting. The dogs of the Taruma Indians are quite distinct, and resemble Buffon's St. Domingo greyhound." It thus appears that the natives of Guiana have partially domesticated two aboriginal species, and still cross their dogs with them; these two species belong to a quite different type from the North American and European wolves. A

<sup>15</sup> 'Fauna Boreali-Americana,' 1829, pp. 73, 78, 80. Nott and Gliddon, 'Types of Mankind,' p. 383. The naturalist and traveller Bartram is quoted by Hamilton Smith, in 'Naturalist Lib.,' vol. x. p. 156. A Mexican domestic dog seems also to resemble a wild dog of the same country; but this may be the prairie-wolf. Another capable judge, Mr. J. K. Lord ('The Naturalist in Vancouver Island,' 1866,

vol. ii. p. 218), says that the Indian dog of the Spokans, near the Rocky Mountains, "is beyond all question nothing more than a tamed Cayote or prairie-wolf," or *Canis latrans*.

<sup>16</sup> I quote this from Mr. R. Hill's excellent account of the Alco or domestic dog of Mexico, in Gosse's 'Naturalist's Sojourn in Jamaica,' 1851, p. 329.

careful observer, Rengger,<sup>17</sup> gives reasons for believing that a hairless dog was domesticated when America was first visited by Europeans: some of these dogs in Paraguay are still dumb, and Tschudi<sup>18</sup> states that they suffer from cold in the Cordillera. This naked dog is, however, quite distinct from that found preserved in the ancient Peruvian burial-places, and described by Tschudi, under the name of *Canis ingæ*, as withstanding cold well and as barking. It is not known whether these two distinct kinds of dog are the descendants of native species, and it might be argued that when man first migrated into America he brought with him from the Asiatic continent dogs which had not learned to bark; but this view does not seem probable, as the natives along the line of their march from the north reclaimed, as we have seen, at least two N. American species of Canidæ.

Turning to the Old World, some European dogs closely resemble the wolf; thus the shepherd dog of the plains of Hungary is white or reddish-brown, has a sharp nose, short, erect ears, shaggy coat, and bushy tail, and so much resembles a wolf that Mr. Paget, who gives this description, says he has known a Hungarian mistake a wolf for one of his own dogs. Jeitteles, also, remarks on the close similarity of the Hungarian dog and wolf. Shepherd dogs in Italy must anciently have closely resembled wolves, for Columella (vii. 12) advises that white dogs be kept, adding, "pastor album probat, ne pro lupo canem feriat." Several accounts have been given of dogs and wolves crossing naturally; and Pliny asserts that the Gauls tied their female dogs in the woods that they might cross with wolves.<sup>19</sup> The European wolf differs slightly from that of North America, and has been ranked by many naturalists as a distinct species. The common wolf of India is also by some esteemed as a third species, and here again we find a

<sup>17</sup> 'Naturgeschichte der Säugthiere von Paraguay,' 1830, s. 151.

<sup>18</sup> Quoted in Humboldt's 'Aspects of Nature' (Eng. trans.), vol. i. p. 108.

<sup>19</sup> Paget's 'Travels in Hungary and Transylvania,' vol. i. p. 501. Jeitteles, 'Fauna Hungariæ Superioris,' 1862, s. 13. See Pliny, 'Hist. of the World'

(Eng. transl.), 8th book, ch. xl., about the Gauls crossing their dogs. See also Aristotle, 'Hist. Animal.' lib. viii. c. 28. For good evidence about wolves and dogs naturally crossing near the Pyrenees, see M. Mauduyt, 'Du Loup et de ses Races,' Poitiers, 1851; also Pallas, in 'Acta Acad. St. Petersburg,' 1780, part ii. p. 94.

marked resemblance between the pariah dogs of certain districts of India and the Indian wolf.<sup>20</sup>

With respect to Jackals, Isidore Geoffroy Saint-Hilaire<sup>21</sup> says that not one constant difference can be pointed out between their structure and that of the smaller races of dogs. They agree closely in habits: jackals, when tamed and called by their master, wag their tails, lick his hands, crouch, and throw themselves on their backs; they smell at the tails of other dogs, and void their urine sideways; they roll on carrion or on animals which they have killed; and, lastly, when in high spirits, they run round in circles or in a figure of eight, with their tails between their legs.<sup>22</sup> A number of excellent naturalists, from the time of Gùldenstàdt to that of Ehrenberg, Hemprich, and Cretzschmar, have expressed themselves in the strongest terms with respect to the resemblance of the half-domestic dogs of Asia and Egypt to jackals. M. Nordmann, for instance, says, "Les chiens d'Awhasie ressemblent étonnamment à des chacals." Ehrenberg<sup>23</sup> asserts that the domestic dogs of Lower Egypt, and certain mummied dogs, have for their wild type a species of wolf (*C. lupaster*) of the country; whereas the domestic dogs of Nubia and certain other mummied dogs have the closest relation to a wild species of the same country, viz. *C. sabbar*, which is only a form of the common jackal. Pallas asserts that jackals and dogs sometimes naturally cross in the East; and a case is on record in Algeria.<sup>24</sup> The greater number of naturalists divide the jackals of Asia and Africa into several species, but some few rank them all as one.

<sup>20</sup> I give this on excellent authority, namely, Mr. Blyth (under the signature of Zoophilus), in the 'Indian Sporting Review,' Oct. 1856, p. 134. Mr. Blyth states that he was struck with the resemblance between a brush-tailed race of pariah-dogs, north-west of Cawnpore, and the Indian wolf. He gives corroborative evidence with respect to the dogs of the valley of the Nerbudda.

<sup>21</sup> For numerous and interesting details on the resemblance of dogs and jackals, see Isid. Geoffroy St.-Hilaire, 'Hist. Nat. Gén.,' 1860, tom. iii. p. 101.

See also, 'Hist. Nat. des Mammifères, par Prof. Gervais, 1855, tom. ii. p. 60.

<sup>22</sup> Also Gùldenstàdt, 'Nov. Comment. Acad. Petrop.,' tom. xx., pro anno 1775, p. 449. Also Salvin, in 'Land and Water,' Oct. 1869.

<sup>23</sup> Quoted by De Blainville in his 'Ostéographie, Canidæ,' pp. 79, 98.

<sup>24</sup> See Pallas, in 'Act. Acad. St. Petersburg,' 1780, part ii. p. 91. For Algeria, see Isid. Geoffroy St.-Hilaire, 'Hist. Nat. Gén.,' tom. iii. p. 177. In both countries it is the male jackal which pairs with female domestic dogs.

I may add that the domestic dogs on the coast of Guinea are fox-like animals, and are dumb.<sup>25</sup> On the east coast of Africa, between lat. 4° and 6° south, and about ten days' journey in the interior, a semi-domestic dog, as the Rev. S. Erhardt informs me, is kept, which the natives assert is derived from a similar wild animal. Lichtenstein<sup>26</sup> says that the dogs of the Bosjemans present a striking resemblance even in colour (excepting the black stripe down the back) with the *C. mesomelas* of South Africa. Mr. E. Layard informs me that he has seen a Caffre dog which closely resembled an Esquimaux dog. In Australia the Dingo is both domesticated and wild; though this animal may have been introduced aboriginally by man, yet it must be considered as almost an endemic form, for its remains have been found in a similar state of preservation and associated with extinct mammals, so that its introduction must have been ancient.<sup>27</sup>

From this resemblance of the half-domesticated dogs in several countries to the wild species still living there,—from the facility with which they can often be crossed together,—from even half-tamed animals being so much valued by savages,—and from the other circumstances previously remarked on which favour their domestication, it is highly probable that the domestic dogs of the world are descended from two well-defined species of wolf (viz. *C. lupus* and *C. latrans*), and from two or three other doubtful species (namely, the European, Indian, and North African wolves); from at least one or two South American canine species; from several races or species of jackal; and perhaps from one or more extinct species. Although it is possible or even probable that domesticated dogs, introduced into any country and bred there for many generations, might acquire some of the characters proper to the aboriginal Canidæ of the country, we can hardly thus account for introduced dogs having given

<sup>25</sup> John Barbut's 'Description of the Coast of Guinea in 1746.'

<sup>26</sup> 'Travels in South Africa,' vol. ii. p. 272.

<sup>27</sup> Selwyn, *Geology of Victoria*; 'Journal of Geolog. Soc.,' vol. xiv., 1858, p. 536, and vol. xvi., 1860, p. 148; and Prof. McCoy, in 'Annals and

Mag. of Nat. Hist.' (3rd series), vol. ix., 1862, p. 147. The Dingo differs from the dogs of the central Polynesian islands. Dieffenbach remarks ('Travels,' vol. ii. p. 45) that the native New Zealand dog also differs from the Dingo.

rise to two breeds in the same country, resembling two of its aboriginal species, as in the above-given cases of Guiana and of North America.<sup>28</sup>

It cannot be objected to the view of several canine species having been anciently domesticated, that these animals are tamed with difficulty: facts have been already given on this head, but I may add that the young of the *Canis primævus* of India were tamed by Mr. Hodgson,<sup>29</sup> and became as sensible of caresses, and manifested as much intelligence, as any sporting dog of the same age. There is not much difference, as we have already shown and shall further see, in habits between the domestic dogs of the North American Indians and the wolves of that country, or between the Eastern pariah dogs and jackals, or between the dogs which have run wild in various countries and the several natural species of the family. The habit of barking, however, which is almost universal with domesticated dogs, forms an exception, as it does not characterise a single natural species of the family, though I am assured that the *Canis latrans* of North America utters a noise which closely approaches a bark. But this habit is soon lost by dogs when they become feral and is soon reacquired when they are again domesticated. The case of the wild dogs on the island of Juan Fernandez having become dumb has often been quoted, and there is reason to believe<sup>30</sup> that the dumbness ensued in the course of thirty-three years; on the other hand, dogs taken from this island by Ulloa slowly reacquired the habit of barking. The Mackenzie-river dogs, of the *Canis latrans* type, when brought to England, never learned to bark properly; but one born in the Zoological Gardens<sup>31</sup> “made his voice sound as loudly as any other dog of the same age and size.” According to Professor

<sup>28</sup> These latter remarks afford, I think, a sufficient answer to some criticisms by Mr. Wallace, on the multiple origin of dogs, given in Lyell's ‘Principles of Geology,’ 1872, vol. ii. p. 295.

<sup>29</sup> ‘Proceedings Zoolog. Soc.,’ 1833, p. 112. See, also, on the taming of the common wolf, L. Lloyd, ‘Scandi-

navian Adventures,’ 1854, vol. i. p. 460. With respect to the jackal, see Prof. Gervais, ‘Hist. Nat. Mamm.’ tom. ii. p. 61. With respect to the aguara of Paraguay, see Rengger's work.

<sup>30</sup> Roulin, in ‘Mém. présent. par divers Savans,’ tom. vi. p. 341.

<sup>31</sup> Martin, ‘History of the Dog,’ p. 14.

Nillson,<sup>32</sup> a wolf-whelp reared by a bitch barks. I. Geoffroy Saint-Hilaire exhibited a jackal which barked with the same tone as any common dog.<sup>33</sup> An interesting account has been given by Mr. G. Clarke<sup>34</sup> of some dogs run wild on Juan de Nova, in the Indian Ocean; "they had entirely lost the faculty of barking; they had no inclination for the company of other dogs, nor did they acquire their voice," during a captivity of several months. On the island they "congregate in vast packs, and catch sea-birds with as much address as foxes could display." The feral dogs of La Plata have not become dumb; they are of large size, hunt singly or in packs, and burrow holes for their young.<sup>35</sup> In these habits the feral dogs of La Plata resemble wolves and jackals; both of which hunt either singly or in packs, and burrow holes.<sup>36</sup> These feral dogs have not become uniform in colour on Juan Fernandez, Juan de Nova, or La Plata.<sup>37</sup> In Cuba the feral dogs are described by Poeppig as nearly all mouse-coloured, with short ears and light-blue eyes. In St. Domingo, Col. Ham. Smith says<sup>38</sup> that the feral dogs are very large, like greyhounds, of a uniform pale blue-ash, with small ears, and large light-brown eyes. Even the wild Dingo, though so anciently naturalised in Australia, "varies considerably in colour," as I am informed by Mr. P. P. King: a half-bred Dingo reared in England<sup>39</sup> showed signs of wishing to burrow.

From the several foregoing facts we see that reversion in the feral state gives no indication of the colour or size of the aboriginal

<sup>32</sup> Quoted by L. Lloyd in 'Field Sports of North of Europe,' vol. i. p. 387.

<sup>33</sup> Quatrefages, 'Soc. d'Acclimat.,' May 11th, 1863, p. 7.

<sup>34</sup> 'Annals and Mag. of Nat. Hist.' vol. xv., 1845, p. 140.

<sup>35</sup> Azara, 'Voyages dans l'Amér. Mérid.,' tom. i. p. 381; his account is fully confirmed by Rengger. Quatrefages gives an account of a bitch brought from Jerusalem to France which burrowed a hole and littered in it. See 'Discours, Exposition des Races Canines,' 1865, p. 3.

<sup>36</sup> With respect to wolves burrowing holes, see Richardson, 'Fauna Boreali-Americana,' p. 64; and Bechstein, 'Naturgeschichte Deutschlands,' b. i. s. 617.

<sup>37</sup> See Poeppig, 'Reise in Chile,' B. i. s. 290; Mr. G. Clarke, as above; and Rengger, s. 155.

<sup>38</sup> Dogs, 'Nat. Library,' vol. x. p. 121; an endemic South American dog seems also to have become feral in this island. See Gosse's 'Jamaica,' p. 340.

<sup>39</sup> Low, 'Domesticated Animals,' p. 650.

parent-species. One fact, however, with respect to the colouring of domestic dogs, I at one time hoped might have thrown some light on their origin; and it is worth giving, as showing how colouring follows laws, even in so anciently and thoroughly domesticated an animal as the dog. Black dogs with tan-coloured feet, whatever breed they may belong to, almost invariably have a tan-coloured spot on the upper and inner corners of each eye, and their lips are generally thus coloured. I have seen only two exceptions to this rule, namely, in a spaniel and terrier. Dogs of a light-brown colour often have a lighter, yellowish-brown spot over the eyes; sometimes the spot is white, and in a mongrel terrier the spot was black. Mr. Waring kindly examined for me a stud of fifteen greyhounds in Suffolk: eleven of them were black, or black and white, or brindled, and these had no eye-spots; but three were red and one slaty-blue, and these four had dark-coloured spots over their eyes. Although the spots thus sometimes differ in colour, they strongly tend to be tan-coloured; this is proved by my having seen four spaniels, a setter, two Yorkshire shepherd dogs, a large mongrel, and some fox-hounds, coloured black and white, with not a trace of tan-colour, excepting the spots over the eyes, and sometimes a little on the feet. These latter cases, and many others, show plainly that the colour of the feet and the eye-spots are in some way correlated. I have noticed, in various breeds, every gradation, from the whole face being tan-coloured, to a complete ring round the eyes, to a minute spot over the inner and upper corners. The spots occur in various sub-breeds of terriers and spaniels; in setters; in hounds of various kinds, including the turnspit-like German badger-hound; in shepherd dogs; in a mongrel, of which neither parent had the spots; in one pure bulldog, though the spots were in this case almost white; and in greyhounds,—but true black-and-tan greyhounds are excessively rare; nevertheless I have been assured by Mr. Warwick, that one ran at the Caledonian Champion meeting of April 1860, and was “marked precisely like a black-and-tan terrier.” This dog, or another exactly the same colour, ran at the Scottish National Club on the 21st of March, 1865; and I hear from Mr. C. M. Browne, that “there was no reason either on the sire or dam side for the appearance of this unusual colour.” Mr. Swinhoe at my request looked at the dogs in China, at Amoy, and he soon noticed a brown dog with yellow spots over the eyes. Colonel H. Smith<sup>40</sup> figures the magnificent black mastiff of Thibet with a tan-coloured stripe over the eyes, feet, and chaps; and what is more singular, he figures the Alco, or native domestic dog of Mexico, as black and white, with narrow tan-coloured rings round the eyes; at the Exhibition of dogs in London, May 1863, a so-called forest dog from North-West Mexico was shown, which had pale tan-coloured spots over the eyes. The occurrence of these tan-coloured spots in dogs of such extremely

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<sup>40</sup> ‘Th. Naturalist Library,’ Dogs, v. l. x. pp 4 19.

different breeds, living in various parts of the world, makes the fact highly remarkable.

We shall hereafter see, especially in the chapter on Pigeons, that coloured marks are strongly inherited, and that they often aid us in discovering the primitive forms of our domestic races. Hence, if any wild canine species had distinctly exhibited the tan-coloured spots over the eyes, it might have been argued that this was the parent-form of nearly all our domestic races. But after looking at many coloured plates, and through the whole collection of skins in the British Museum, I can find no species thus marked. It is no doubt possible that some extinct species was thus coloured. On the other hand, in looking at the various species, there seems to be a tolerably plain correlation between tan-coloured legs and face; and less frequently between black legs and a black face; and this general rule of colouring explains to a certain extent the above-given cases of correlation between the eye-spots and the colour of the feet. Moreover, some jackals and foxes have a trace of a white ring round their eyes, as in *C. mesomelas*, *C. aureus*, and (judging from Colonel H. Smith's drawing) in *C. alopec*, and *C. thaleb*. Other species have a trace of a black line over the corners of the eyes, as in *C. variegatus*, *cinereo-variegatus*, and *fulvus*, and the wild Dingo. Hence I am inclined to conclude that a tendency for tan-coloured spots to appear over the eyes in the various breeds of dogs, is analogous to the case observed by Desmarest, namely, that when any white appears on a dog the tip of the tail is always white, "de manière à rappeler la tache terminale de même couleur, qui caractérise la plupart des Canidés sauvages."<sup>41</sup> This rule, however, as I am assured by Mr. Jesse, does not invariably hold good.

It has been objected that our domestic dogs cannot be descended from wolves or jackals, because their periods of gestation are different. The supposed difference rests on statements made by Buffon, Gilibert, Bechstein, and others; but these are now known to be erroneous; and the period is found to agree in the wolf, jackal, and dog, as closely as could be expected, for it is often in some degree variable.<sup>42</sup> Tessier,

<sup>41</sup> Quoted by Prof. Gervais, 'Hist. Nat. Mamm.,' tom. ii. p. 66.

<sup>42</sup> J. Hunter shows that the long period of seventy-three days given by Buffon is easily explained by the bitch having received the dog many times during a period of sixteen days ('Phil. Transact.,' 1787, p. 353). Hunter found that the gestation of a mongrel from wolf and dog ('Phil. Transact.,' 1789, p. 160) apparently was sixty-

three days, for she received the dog more than once. The period of a mongrel dog and jackal was fifty-nine days. Fred. Cuvier found the period of gestation of the wolf to be ('Dict. Class. d'Hist. Nat.' tom. iv. p. 8) two months and a few days, which agrees with the dog. Isid. G. St.-Hilaire, who has discussed the whole subject, and from whom I quote Bellingeri, states ('Hist. Nat. Gén.,' tom. iii. p.



who has closely attended to this subject, allows a difference of four days in the gestation of the dog. The Rev. W. D. Fox has given me three carefully recorded cases of retrievers, in which the bitch was put only once to the dog; and not counting this day, but counting that of parturition, the periods were fifty-nine, sixty-two, and sixty-seven days. The average period is sixty-three days; but Bellingeri states that this applies only to large dogs; and that for small races it is from sixty to sixty-three days; Mr. Eyton of Eyton, who has had much experience with dogs, also informs me that the time is apt to be longer with large than with small dogs.

F. Cuvier has objected that the jackal would not have been domesticated on account of its offensive smell; but savages are not sensitive in this respect. The degree of odour, also, differs in the different kinds of jackal;<sup>43</sup> and Colonel H. Smith makes a sectional division of the group with one character dependent on not being offensive. On the other hand, dogs—for instance, rough and smooth terriers—differ much in this respect; and M. Godron states that the hairless so-called Turkish dog is more odoriferous than other dogs. Isidore Geoffroy<sup>44</sup> gave to a dog the same odour as that from a jackal by feeding it on raw flesh.

The belief that our dogs are descended from wolves, jackals; South American Canidæ, and other species, suggests a far more important difficulty. These animals in their undomesticated state, judging from a widely-spread analogy, would have been in some degree sterile if intercrossed; and such sterility will be admitted as almost certain by all those who believe that the lessened fertility of crossed forms is an infallible criterion of specific distinctness. Anyhow these animals keep distinct in the countries which they inhabit in common. On the other hand, all domestic dogs, which are here supposed to be descended from several distinct species, are, as far as is

112) that in the Jardin des Plantes the period of the jackal has been found to be from sixty to sixty-three days, exactly as with the dog.

<sup>43</sup> See Isid. Geoffroy St.-Hilaire,

'Hist. Nat. Gén.,' tom. iii. p. 112, on the odour of jackals. Col. Ham. Smith, in 'Nat. Lib.,' vol. x. p. 289.

<sup>44</sup> Quoted by Quatrefages in 'Bull. Soc. d'Acclimat.,' May 11th, 1863.

known, mutually fertile together. But, as Broca has well remarked,<sup>45</sup> the fertility of successive generations of mongrel dogs has never been scrutinised with that care which is thought indispensable when species are crossed. The few facts leading to the conclusion that the sexual feelings and reproductive powers differ in the several races of the dog when crossed are (passing over mere size as rendering propagation difficult) as follows: the Mexican Alco<sup>46</sup> apparently dislikes dogs of other kinds, but this perhaps is not strictly a sexual feeling; the hairless endemic dog of Paraguay, according to Rengger, mixes less with the European races than these do with each other; the Spitz dog in Germany is said to receive the fox more readily than do other breeds; and Dr. Hodgkin states that a female Dingo in England attracted the male wild foxes. If these latter statements can be trusted, they prove some degree of sexual difference in the breeds of the dog. But the fact remains that our domestic dogs, differing so widely as they do in external structure, are far more fertile together than we have reason to believe their supposed wild parents would have been, Pallas assumes<sup>47</sup> that a long course of domestication eliminates that sterility which the parent-species would have exhibited if only lately captured; no distinct facts are recorded in support of this hypothesis; but the evidence seems to me so strong (independently of the evidence derived from other domesticated animals) in favour of our domestic dogs having descended from several wild stocks, that I am inclined to admit the truth of this hypothesis.

There is another and closely allied difficulty consequent on the doctrine of the descent of our domestic dogs from several wild species, namely, that they do not seem to be perfectly fertile with their supposed parents. But the experiment has not been quite fairly tried; the Hungarian dog, for instance,

<sup>45</sup> 'Journal de la Physiologie,' tom. ii. p. 385.

<sup>46</sup> See Mr. R. Hill's excellent account of this breed in Gosse's 'Jamaica,' p. 338; Rengger's 'Säugethiere von Paraguay,' s. 153. With respect to Spitz dogs, see Bechstein's

'Naturgesch. Deutschlands,' 1801, B. i. s. 638. With respect to Dr. Hodgkin's statement made before Brit. Assoc., see 'The Zoologist,' vol. iv., for 1845-46, p. 1097.

<sup>47</sup> 'Acta Acad. St. Petersburgh,' 1780, part ii. pp. 84, 100.

which in external appearance so closely resembles the European wolf, ought to be crossed with this wolf: and the pariah dogs of India with Indian wolves and jackals; and so in other cases. That the sterility is very slight between certain dogs and wolves and other Canidæ is shown by savages taking the trouble to cross them. Buffon got four successive generations from the wolf and dog, and the mongrels were perfectly fertile together.<sup>48</sup> But more lately M. Flourens states positively as the result of his numerous experiments that hybrids from the wolf and dog, crossed *inter se*, become sterile at the third generation, and those from the jackal and dog at the fourth generation.<sup>49</sup> But these animals were closely confined; and many wild animals, as we shall see in a future chapter, are rendered by confinement in some degree or even utterly sterile. The Dingo, which breeds freely in Australia with our imported dogs, would not breed though repeatedly crossed in the Jardin des Plantes.<sup>50</sup> Some hounds from Central Africa, brought home by Major Denham, never bred in the Tower of London;<sup>51</sup> and a similar tendency to sterility might be transmitted to the hybrid offspring of a wild animal. Moreover, it appears that in M. Flourens' experiments the hybrids were closely bred in and in for three or four generations; and this circumstance, would most certainly increase the tendency to sterility. Several years ago I saw confined in the Zoological Gardens of London a female hybrid from an English dog and jackal, which even in this the first generation was so sterile that, as I was assured by her keeper, she did not fully

<sup>48</sup> M. Broca has shown ('Journal de Physiologie,' tom. ii. p. 353) that Buffon's experiments have been often misrepresented. Broca has collected (pp. 390-395) many facts on the fertility of crossed dogs, wolves, and jackals.

<sup>49</sup> 'De la Longévitè Humaine,' par M. Flourens, 1855, p. 143. Mr. Blyth says ('Indian Sporting Review,' vol. ii. p. 137) that he has seen in India several hybrids from the pariah-dog and jackal; and between one of these hybrids and a terrier. The experiments of Hunter on the jackal are

well-known. See also Isid. Geoffroy St.-Hilaire, 'Hist. Nat. Gén.,' tom. iii. p. 217, who speaks of the hybrid offspring of the jackal as perfectly fertile for three generations.

<sup>50</sup> On authority of F. Cuvier, quoted in Bronn's 'Geschichte der Natur,' B. ii. s. 164.

<sup>51</sup> W. C. L. Martin, 'History of the Dog,' 1845, p. 203. Mr. Philip P. King, after ample opportunities of observation, informs me that the Dingo and European dogs often cross in Australia.

exhibit her proper periods; but this case was certainly exceptional, as numerous instances have occurred of fertile hybrids from these two animals. In almost all experiments on the crossing of animals there are so many causes of doubt, that it is extremely difficult to come to any positive conclusion. It would, however, appear, that those who believe that our dogs are descended from several species will have not only to admit that their offspring after a long course of domestication generally lose all tendency to sterility when crossed together; but that between certain breeds of dogs and some of their supposed aboriginal parents a certain degree of sterility has been retained or possibly even acquired.

Notwithstanding the difficulties in regard to fertility given in the last two paragraphs, when we reflect on the inherent improbability of man having domesticated throughout the world one single species alone of so widely distributed, so easily tamed, and so useful a group as the *Canidæ*; when we reflect on the extreme antiquity of the different breeds; and especially when we reflect on the close similarity, both in external structure and habits, between the domestic dogs of various countries and the wild species still inhabiting these same countries, the balance of evidence is strongly in favour of the multiple origin of our dogs.

*Differences between the several Breeds of the Dog.*—If the several breeds have descended from several wild stocks, their difference can obviously in part be explained by that of their parent species. For instance, the form of the greyhound may be partly accounted for by descent from some such animal as the slim Abyssinian *Canis simensis*,<sup>52</sup> with its elongated muzzle; that of the larger dogs from the larger wolves, and the smaller and slighter dogs from the jackals: and thus perhaps we may account for certain constitutional and climatal differences. But it would be a great error to suppose that there has not been in addition<sup>53</sup> a large

<sup>52</sup> Rüppel, 'Neue Wirbelthiere von Abyssinien,' 1835-40; 'Mammif.,' s. 39, pl. xiv. There is a specimen of this fine animal in the British

Museum.

<sup>53</sup> Even Pallas admits this; see 'Act. Acad. St. Petersburg,' 1780, p. 93.

amount of variation. The intercrossing of the several aboriginal wild stocks, and of the subsequently formed races, has probably increased the total number of breeds, and, as we shall presently see, has greatly modified some of them. But we cannot explain by crossing the origin of such extreme forms as thoroughbred greyhounds, bloodhounds, bulldogs, Blenheim spaniels, terriers, pugs, &c., unless we believe that forms equally or more strongly characterised in these different respects once existed in nature. But hardly any one has been bold enough to suppose that such unnatural forms ever did or could exist in a wild state. When compared with all known members of the family of *Canidæ* they betray a distinct and abnormal origin. No instance is on record of such dogs as bloodhounds, spaniels, true greyhounds having been kept by savages: they are the product of long-continued civilization.

The number of breeds and sub-breeds of the dog is great; Youatt for instance, describes twelve kinds of greyhounds. I will not attempt to enumerate or describe the varieties, for we cannot discriminate how much of their difference is due to variation, and how much to descent from different aboriginal stocks. But it may be worth while briefly to mention some points. Commencing with the skull, Cuvier has admitted<sup>54</sup> that in form the differences are "plus fortes que celles d'aucunes espèces sauvages d'un même genre naturel." The proportions of the different bones; the curvature of the lower jaw, the position of the condyles with respect to the plane of the teeth (on which F. Cuvier founded his classification), and in mastiffs the shape of its posterior branch; the shape of the zygomatic arch, and of the temporal fossæ; the position of the occiput—all vary considerably.<sup>55</sup> The difference in size between the brains of dogs belonging to large and small breeds "is something prodigious." "Some dogs' brains are high and rounded, while others are low, long, and narrow in front." In the latter, "the olfactory lobes are visible for about half their extent, when the brain is seen from above, but they are wholly concealed by the hemispheres in other breeds."<sup>56</sup> The dog has properly six pairs of molar teeth in the upper jaw, and seven in the lower; but several

<sup>54</sup> Quoted by I. Geoffroy, 'Hist. Nat. Gén.,' tom. iii. p. 453.

<sup>55</sup> F. Cuvier, in 'Annales du Muséum,' tom. xviii. p. 337; Godron, 'De l'Espèce,' tom. i. p. 342; and Col. H. Smith, in 'Nat. Library,' vol. ix. p. 101. See also some

observations on the degeneracy of the skull in certain breeds, by Prof. Bianconi, 'La Théorie Darwinienne,' 1874, p. 279.

<sup>56</sup> Dr. Burt Wilder, 'American Assoc. Advancement of Science,' 1873, pp. 236, 239.

naturalists have seen not rarely an additional pair in the upper jaw;<sup>57</sup> and Professor Gervais says that there are dogs "qui ont sept paires de dents supérieures et huit inférieures." De Blainville<sup>58</sup> has given full particulars on the frequency of these deviations in the number of the teeth, and has shown that it is not always the same tooth which is supernumerary. In short-muzzled races, according to H. Müller,<sup>59</sup> the molar teeth stand obliquely, whilst in long-muzzled races they are placed longitudinally, with open spaces between them. The naked, so-called Egyptian or Turkish dog is extremely deficient in its teeth,<sup>60</sup>—sometimes having none except one molar on each side; but this, though characteristic of the breed, must be considered as a monstrosity. M. Girard,<sup>61</sup> who seems to have attended closely to the subject, says that the period of the appearance of the permanent teeth differs in different dogs, being earlier in large dogs; thus the mastiff assumes its adult teeth in four or five months, whilst in the spaniel the period is sometimes more than seven or eight months. On the other hand small dogs are mature, and the females have arrived at the best age for breeding, when one year old, whereas large dogs "are still in their puppyhood at this time, and take fully twice as long to develop their proportions."<sup>62</sup>

With respect to minor differences little need be said. Isidore Geoffroy has shown<sup>63</sup> that in size some dogs are six times as long (the tail being excluded) as others; and that the height relatively to the length of the body varies from between one to two, and one to nearly four. In the Scotch deer-hound there is a striking and remarkable difference in the size of the male and female.<sup>64</sup> Every one knows how the ears vary in size in different breeds, and with their great development their muscles become atrophied. Certain breeds of dogs are described as having a deep furrow between the nostrils and lips. The caudal vertebræ, according to F. Cuvier, on whose authority the two last statements rest, vary in number; and the tail in English cattle and some shepherd dogs is almost absent. The mammæ vary from seven to ten in number; Daubenton, having examined twenty-one dogs, found eight with five mammæ on each side; eight with four on each side; and the others

<sup>57</sup> Isid. Geoffroy Saint-Hilaire, 'Hist. des Anomalies,' 1832, tom. i. p. 660, Gervais, 'Hist. Nat. des Mammifères,' tom. ii., 1855, p. 66. De Blainville ('Ostéographie, Canidæ,' p. 137) has also seen an extra molar on both sides.

<sup>58</sup> 'Ostéographie, Canidæ,' p. 137.

<sup>59</sup> Würzburger, 'Medecin. Zeitschrift,' 1860, B. i. s. 265.

<sup>60</sup> Mr. Yarrell, in 'Proc. Zoolog. Soc.,' Oct. 8th, 1833. Mr. Waterhouse showed me a skull of one of

these dogs, which had only a single molar on each side and some imperfect incisors.

<sup>61</sup> Quoted in 'The Veterinary,' London, vol. viii. p. 415.

<sup>62</sup> This is quoted from Stonehenge, a great authority, 'The Dog,' 1867, p. 187.

<sup>63</sup> 'Hist. Nat. Général,' tom. iii. p. 448.

<sup>64</sup> W. Scrope, 'Art of Deer-Stalking,' p. 354.

with an unequal number on the two sides.<sup>65</sup> Dogs have properly five toes in front and four behind, but a fifth toe is often added; and F. Cuvier states that, when a fifth toe is present, a fourth cuneiform bone is developed; and, in this case, sometimes the great cuneiform bone is raised, and gives on its inner side a large articular surface to the astragalus; so that even the relative connection of the bones, the most constant of all characters, varies. These modifications, however, in the feet of dogs are not important, because they ought to be ranked, as De Blainville has shown,<sup>66</sup> as monstrosities. Nevertheless they are interesting from being correlated with the size of the body, for they occur much more frequently with mastiffs and other large breeds than with small dogs. Closely allied varieties, however, sometimes differ in this respect; thus Mr. Hodgson states that the black-and-tan Lassa variety of the Thibet mastiff has the fifth digit, whilst the Mustang sub-variety is not thus characterised. The extent to which the skin is developed between the toes varies much; but we shall return to this point. The degree to which the various breeds differ in the perfection of their senses, dispositions, and inherited habits is notorious to every one. The breeds present some constitutional differences: the pulse, says Youatt,<sup>67</sup> "varies materially according to the breed, as well as to the size of the animal." Different breeds of dogs are subject in different degrees to various diseases. They certainly become adapted to different climates under which they have long existed. It is notorious that most of our best European breeds deteriorate in India.<sup>68</sup> The Rev R. Everest<sup>69</sup> believes that no one has succeeded in keeping the Newfoundland dog long alive in India; so it is, according to Lichtenstein,<sup>70</sup> even at the Cape of Good Hope. The Thibet mastiff degenerates on the plains of India, and can live only on the mountains.<sup>71</sup> Lloyd<sup>72</sup> asserts that our bloodhounds and bulldogs have been tried, and cannot withstand the cold of the northern European forests.

Seeing in how many characters the races of the dog differ

<sup>65</sup> Quoted by Col. Ham. Smith in 'Nat. Lib.,' vol. x. p. 79.

<sup>66</sup> De Blainville, 'Ostéographie, Canidæ,' p. 134. F. Cuvier, 'Annales du Muséum,' tom. xviii. p. 342. In regard to mastiffs, see Col. H. Smith, 'Nat. Lib.,' vol. x. p. 218. For the Thibet mastiff, see Mr. Hodgson in 'Journal of As. Soc. of Bengal,' vol. i., 1832, p. 342.

<sup>67</sup> 'The Dog,' 1845, p. 186. With respect to diseases, Youatt asserts (p. 167) that the Italian greyhound is "strongly subject" to polypi in the matrix or vagina. The spaniel and pug (p. 182) are most liable to bron-

chocele. The liability to distemper (p. 232) is extremely different in different breeds. On the distemper, see also Col. Hutchinson on 'Dog Breaking,' 1850, p. 279.

<sup>68</sup> See Youatt on the Dog, p. 15; 'The Veterinary,' London, vol. xi. p. 235.

<sup>69</sup> 'Journal of As. Soc. of Bengal,' vol. iii. p. 19.

<sup>70</sup> 'Travels,' vol. ii. p. 15.

<sup>71</sup> Hodgson, in 'Journal of As. Soc. of Bengal,' vol. i. p. 342.

<sup>72</sup> 'Field Sports of the North of Europe,' vol. ii. p. 165.

from each other, and remembering Cuvier's admission that their skulls differ more than do those of the species of any natural genus, and bearing in mind how closely the bones of wolves, jackals, foxes, and other *Canidæ* agree, it is remarkable that we meet with the statement, repeated over and over again, that the races of the dog differ in no important characters. A highly competent judge, Prof. Gervais,<sup>73</sup> admits "si l'on prenait sans contrôle les alterations dont chacun de ces organes est susceptible, on pourrait croire qu'il y a entre les chiens domestiques des différences plus grandes que celles qui séparent ailleurs les espèces, quelquefois même les genres." Some of the differences above enumerated are in one respect of comparatively little value, for they are not characteristic of distinct breeds: no one pretends that such is the case with the additional molar teeth or with the number of *mammæ*; the additional digit is generally present with mastiffs, and some of the more important differences in the skull and lower jaw are more or less characteristic of various breeds. But we must not forget that the predominant power of selection has not been applied in any of these cases; we have variability in important parts, but the differences have not been fixed by selection. Man cares for the form and fleetness of his greyhounds, for the size of his mastiffs, and formerly for the strength of the jaw in his bulldogs, &c.; but he cares nothing about the number of their molar teeth or *mammæ* or digits; nor do we know that differences in these organs are correlated with, or owe their development to, differences in other parts of the body about which man does care. Those who have attended to the subject of selection will admit that, nature having given variability, man, if he so chose, could fix five toes to the hinder feet of certain breeds of dogs, as certainly as to the feet of his Dorking fowls: he could probably fix, but with much more difficulty, an additional pair of molar teeth in either jaw, in the same way as he has given additional horns to certain breeds of sheep; if he wished to produce a toothless breed of dogs, having the so-called Turkish dog with its imperfect

<sup>73</sup> 'Hist. Nat. des Mammif.,' 1855, tom. ii. pp. 66, 67.



teeth to work on, he could probably do so, for he has succeeded in making hornless breeds of cattle and sheep.

With respect to the precise causes and steps by which the several races of dogs have come to differ so greatly from each other, we are, as in most other cases, profoundly ignorant. We may attribute part of the difference in external form and constitution to inheritance from distinct wild stocks, that is to changes effected under nature before domestication. We must attribute something to the crossing of the several domestic and natural races. I shall, however, soon recur to the crossing of races. We have already seen how often savages cross their dogs with wild native species; and Pennant gives a curious account<sup>74</sup> of the manner in which Fochabers, in Scotland, was stocked "with a multitude of curs of a most wolfish aspect" from a single hybrid-wolf brought into that district.

It would appear that climate to a certain extent directly modifies the forms of dogs. We have lately seen that several of our English breeds cannot live in India, and it is positively asserted that when bred there for a few generations they degenerate not only in their mental faculties, but in form. Captain Williamson,<sup>75</sup> who carefully attended to this subject, states that "hounds are the most rapid in their decline;" "greyhounds and pointers, also, rapidly decline." But spaniels, after eight or nine generations, and without a cross from Europe, are as good as their ancestors. Dr. Falconer informs me that bulldogs, which have been known, when first brought into the country, to pin down even an elephant by its trunk, not only fall off after two or three generations in pluck and ferocity, but lose the under-hung character of their lower jaws; their muzzles become finer and their bodies lighter. English dogs imported into India are so valuable that probably due care has been taken to prevent their crossing with native dogs; so that the deterioration cannot be thus accounted for. The Rev. R. Everest informs me that he obtained a pair of setters, born in India, which perfectly resembled their Scotch parents: he raised several litters from them in Delhi, taking the most stringent

<sup>74</sup> 'History of Quadrupeds,' 1793, vol. i. p. 238.

<sup>75</sup> 'Oriental Field Sports,' quoted by Youatt, 'The Dog,' p. 15.

precautions to prevent a cross, but he never succeeded, though this was only the second generation in India, in obtaining a single young dog like its parents in size or make; their nostrils were more contracted, their noses more pointed, their size inferior, and their limbs more slender. So again on the coast of Guinea, dogs, according to Bosman, "alter strangely; their ears grow long and stiff like those of foxes, to which colour they also incline, so that in three or four years, they degenerate into very ugly creatures; and in three or four broods their barking turns into a howl."<sup>76</sup> This remarkable tendency to rapid deterioration in European dogs subjected to the climate of India and Africa, may be largely accounted for by reversion to a primordial condition which many animals exhibit, as we shall hereafter see, when their constitutions are in any way disturbed.

Some of the peculiarities characteristic of the several breeds of the dog have probably arisen suddenly, and, though strictly inherited, may be called monstrosities; for instance, the shape of the legs and body in the turnspit of Europe and India; the shape of the head and the under-hanging jaw in the bull-and pug-dog, so alike in this one respect and so unlike in all others. A peculiarity suddenly arising, and therefore in one sense deserving to be called a monstrosity, may, however, be increased and fixed by man's selection. We can hardly doubt that long-continued training, as with the greyhound in coursing hares, as with water-dogs in swimming—and the want of exercise, in the case of lapdogs—must have produced some direct effect on their structure and instincts. But we shall immediately see that the most potent cause of change has probably been the selection, both methodical and unconscious, of slight individual differences,—the latter kind of selection resulting from the occasional preservation, during hundreds of generations, of those individual dogs which were the most useful to man for certain purposes and under certain conditions of life. In a future chapter on Selection I shall show that even barbarians attend closely to the qualities of their dogs. This unconscious selection by man would be aided

<sup>76</sup> A. Murray gives this passage in his 'Geographical Distribution of Mammals,' 4to, 1866, p. 8.

by a kind of natural selection; for the dogs of savages have partly to gain their own subsistence: for instance, in Australia, as we hear from Mr. Nind,<sup>77</sup> the dogs are sometimes compelled by want to leave their masters and provide for themselves; but in a few days they generally return. And we may infer that dogs of different shapes, sizes, and habits, would have the best chance of surviving under different circumstances,—on open sterile plains, where they have to run down their own prey,—on rocky coasts, where they have to feed on crabs and fish left in the tidal pools, as in the case of New Guinea and Tierra del Fuego. In this latter country, as I am informed by Mr. Bridges, the Catechist to the Mission, the dogs turn over the stones on the shore to catch the crustaceans which lie beneath, and they “are clever enough to knock off the shell-fish at a first blow;” for if this be not done, shell-fish are well known to have an almost invincible power of adhesion.

It has already been remarked that dogs differ in the degree to which their feet are webbed. In dogs of the Newfoundland breed, which are eminently aquatic in their habits, the skin, according to Isidore Geoffroy,<sup>78</sup> extends to the third phalanges whilst in ordinary dogs it extends only to the second. In two Newfoundland dogs which I examined, when the toes were stretched apart and viewed on the under side, the skin extended in a nearly straight line between the outer margins of the balls of the toes; whereas, in two terriers of distinct sub-breeds, the skin viewed in the same manner was deeply scooped out. In Canada there is a dog which is peculiar to the country and common there, and this has “half-webbed feet and is fond of the water.”<sup>79</sup> *English otter-hounds* are said to have webbed feet: a friend examined for me the feet of two, in comparison with the feet of some harriers and bloodhounds; he found the skin variable in extent in all, but more developed in the otter-hounds than in the others.<sup>80</sup> As

<sup>77</sup> Quoted by Mr. Galton, ‘Domestication of Animals,’ p. 13.

<sup>78</sup> ‘Hist. Nat. Gén.,’ tom. iii. p. 450.

<sup>79</sup> Mr. Greenhow on the Canadian Dog, in Loudon’s ‘Mag. of Nat. H.st.’

vol. vi., 1833, p. 511.

<sup>80</sup> See Mr. C. O. Groom-Napier on the webbing of the hind feet of Otter-hounds, in ‘Land and Water,’ Oct. 13th, 1866, p. 270.

aquatic animals which belong to quite different orders have webbed feet, there can be no doubt that this structure would be serviceable to dogs that frequent the water. We may confidently infer that no man ever selected his water-dogs by the extent to which the skin was developed between their toes; but what he does, is to preserve and breed from those individuals which hunt best in the water, or best retrieve wounded game, and thus he unconsciously selects dogs with feet slightly better webbed. The effects of use from the frequent stretching apart of the toes will likewise aid in the result. Man thus closely imitates Natural Selection. We have an excellent illustration of this same process in North America, where, according to Sir J. Richardson,<sup>81</sup> all the wolves, foxes, and aboriginal domestic dogs have their feet broader than in the corresponding species of the Old World, and "well calculated for running on the snow." Now, in these Arctic regions, the life or death of every animal will often depend on its success in hunting over the snow when soft; and this will in part depend on the feet being broad; yet they must not be so broad as to interfere with the activity of the animal when the ground is sticky, or with its power of burrowing holes, or with other necessary habits of life.

As changes in domestic breeds which take place so slowly are not to be noticed at any one period, whether due to the selection of individual variations or of differences resulting from crosses, are most important in understanding the origin of our domestic productions, and likewise in throwing indirect light on the changes effected under nature, I will give in detail such cases as I have been able to collect. Lawrence,<sup>82</sup> who paid particular attention to the history of the foxhound, writing in 1829, says that between eighty and ninety years before "an entirely new foxhound was raised through the breeder's art," the ears of the old southern hound being reduced, the bone and bulk lightened, the waist increased in length, and the stature somewhat added to. It is believed that this was effected by a cross with a greyhound. With

<sup>81</sup> 'Fauna Boreali-Americana,'  
1829, p. 62.

<sup>82</sup> 'The Horse in all his Varieties,'  
&c., 1829, pp. 230, 234.

respect to this latter dog, Youatt,<sup>83</sup> who is generally cautious in his statements, says that the greyhound within the last fifty years, that is before the commencement of the present century, "assumed a somewhat different character from that which he once possessed. He is now distinguished by a beautiful symmetry of form, of which he could not once boast, and he has even superior speed to that which he formerly exhibited. He is no longer used to struggle with deer, but contends with his fellows over a shorter and speedier course." An able writer<sup>84</sup> believes that our English greyhounds are the descendants, *progressively improved*, of the large rough greyhounds which existed in Scotland so early as the third century. A cross at some former period with the Italian greyhound has been suspected; but this seems hardly probable, considering the feebleness of this latter breed. Lord Orford, as is well known, crossed his famous greyhounds, which failed in courage, with a bulldog—this breed being chosen from being erroneously supposed to be deficient in the power of scent; "after the sixth or seventh generation," says Youatt, "there was not a vestige left of the form of the bulldog, but his courage and indomitable perseverance remained."

Youatt infers, from a comparison of an old picture of King Charles's spaniels with the living dog, that "the breed of the present day is materially altered for the worse:" the muzzle has become shorter, the forehead more prominent, and the eyes larger; the changes in this case have probably been due to simple selection. The setter, as this author remarks in another place, "is evidently the large spaniel improved to his present peculiar size and beauty, and taught another way of marking his game. If the form of the dog were not sufficiently satisfactory on this point, we might have recourse to history:" he then refers to a document dated 1685 bearing on this subject, and adds that the pure Irish setter shows no signs of a cross with the pointer, which some authors suspect has been the case with the English setter. The bulldog is an

<sup>83</sup> 'The Dog,' 1845, pp. 31, 35; with respect to King Charles's spaniel, p. 45; for the setter, p. 90.

<sup>84</sup> In the 'Encyclop. of Rural Sports,' p. 557.

English breed, and as I hear from Mr. G. R. Jesse,<sup>85</sup> seems to have originated from the mastiff since the time of Shakspeare; but certainly existed in 1631, as shown by Prestwick Eaton's letters. There can be no doubt that the fancy bulldogs of the present day, now that they are not used for bull-baiting, have become greatly reduced in size, without any express intention on the part of the breeder. Our pointers are certainly descended from a Spanish breed, as even their present names, Don, Ponto, Carlos, &c., show; it is said that they were not known in England before the Revolution in 1688;<sup>86</sup> but the breed since its introduction has been much modified, for Mr. Borrow, who is a sportsman and knows Spain intimately well, informs me that he has not seen in that country any breed "corresponding in figure with the English pointer; but there are genuine pointers near Xeres which have been imported by English gentlemen." A nearly parallel case is offered by the Newfoundland dog, which was certainly brought into England from that country, but which has since been so much modified that, as several writers have observed, it does not now closely resemble any existing native dog in Newfoundland.<sup>87</sup>

These several cases of slow and gradual changes in our English dogs possess some interest; for though the changes have generally, but not invariably, been caused by one or two crosses with a distinct breed, yet we may feel sure, from the well-known extreme variability of crossed breeds, that rigorous and long-continued selection must have been practised, in order to improve them in a definite manner. As soon as any strain or family became slightly improved or better adapted to alter circumstances, it would tend to supplant the older and less improved strains. For instance, as soon as the old foxhound was improved by a cross with the greyhound, or by simple selection, and assumed its present

<sup>85</sup> Author of 'Researches into the History of the British Dog.

<sup>86</sup> See Col. Hamilton Smith on the antiquity of the Pointer, in 'Nat. Lib.' vol. x. p. 196.

<sup>87</sup> The Newfoundland dog is believed to have originated from a cross

between the Esquimaux dog and a large French hound. See Dr. Hodgkin, 'Brit. Assoc.,' 1844; Bechstein's 'Naturgesch. Deutschland,' Band. i. s. 574; 'Nat. Lib.,' vol. x. p. 132; also Mr. Jukes' 'Excursion in and about Newfoundland.'

character—and the change was probably desired owing to the increased fleetness of our hunters—it rapidly spread throughout the country, and is now everywhere nearly uniform. But the process of improvement is still going on for every one tries to improve his strain by occasionally procuring dogs from the best kennels. Through this process of gradual substitution the old English hound has been lost; and so it has been with the Irish wolf-dog, the old English bulldog, and several other breeds, such as the alaunt, as I am informed by Mr. Jesse. But the extinction of former breeds is apparently aided by another cause; for whenever a breed is kept in scanty numbers, as at present with the bloodhound, it is reared with some difficulty, apparently from the evil effects of long-continued close interbreeding. As several breeds of the dog have been slightly but sensibly modified within so short a period as the last one or two centuries, by the selection of the best individuals, modified in many cases by crosses with other breeds; and as we shall hereafter see that the breeding of dogs was attended to in ancient times, as it still is by savages, we may conclude that we have in selection, even if only occasionally practised, a potent means of modification.

#### DOMESTIC CATS.

CATS have been domesticated in the East from an ancient period; Mr. Blyth informs me that they are mentioned in a Sanskrit writing 2000 years old, and in Egypt their antiquity is known to be even greater, as shown by monumental drawings and their mummied bodies. These mummies, according to De Blainville,<sup>88</sup> who has particularly studied the subject, belong to no less than three species, namely, *F. caligulata*, *bubastes*, and *chaus*. The two former species are said to be still found, both wild and domesticated, in parts of Egypt. *F. caligulata* presents a difference in the first inferior milk molar tooth, as compared with the domestic cats of Europe, which makes De Blainville conclude that it is not one of the

<sup>88</sup> De Blainville, 'Ostéographie, Felis,' p. 65, on the character of *F. caligulata*; pp. 85, 89, 90, 175, on the

other mummied species. He quotes Ehrenburg on *F. maniculata* being mummied.

parent-forms of our cats. Several naturalists, as Pallas, Temminck, Blyth, believe that domestic cats are the descendants of several species commingled: it is certain that cats cross readily with various wild species, and it would appear that the character of the domestic breeds has, at least in some cases, been thus affected. Sir W. Jardine has no doubt that, "in the north of Scotland, there has been occasional crossing with our native species (*F. sylvestris*), and that the result of these crosses has been kept in our houses. I have seen," he adds, "many cats very closely resembling the wild cat, and one or two that could scarcely be distinguished from it." Mr. Blyth<sup>89</sup> remarks on this passage, "but such cats are never seen in the southern parts of England; still, as compared with any Indian tame cat, the affinity of the ordinary British cat to *F. sylvestris* is manifest; and due I suspect to frequent intermixture at a time when the tame cat was first introduced into Britain and continued rare, while the wild species was far more abundant than at present." In Hungary, Jeitteles<sup>90</sup> was assured on trustworthy authority that a wild male cat crossed with a female domestic cat, and that the hybrids long lived in a domesticated state. In Algiers the domestic cat has crossed with the wild cat (*F. lybica*) of that country.<sup>91</sup> In South Africa as Mr. E. Layard informs me, the domestic cat intermingles freely with the wild *F. caffra*; he has seen a pair of hybrids which were quite tame and particularly attached to the lady who brought them up; and Mr. Fry has found that these hybrids are fertile. In India the domestic cat, according to Mr. Blyth, has crossed with four Indian species. With respect to one of these species, *F. chaus*, an excellent observer, Sir W. Elliot, informs me that he once killed, near Madras, a wild brood, which were evidently hybrids from the domestic cat; these young animals had a thick lynx-like tail and the broad brown bar on the inside of the forearm characteristic of *F. chaus*. Sir W. Elliot adds that he

<sup>89</sup> Asiatic Soc. of Calcutta; Curator's Report, Aug. 1856. The passage from Sir W. Jardine is quoted from this Report. Mr. Blyth, who has especially attended to the wild and domestic cats of India, has given in

this Report a very interesting discussion on their origin.

<sup>90</sup> 'Fauna Hungariæ Sup.,' 1862, s. 12.

<sup>91</sup> Isid. Geoffroy Saint-Hilaire, 'Hist. Nat. Gén.,' tom. iii. p. 177.



has often observed this same mark on the forearms of domestic cats in India. Mr. Blyth states that domestic cats coloured nearly like *F. chaus*, but not resembling that species in shape, abound in Bengal; he adds, "such a colouration is utterly unknown in European cats, and the proper tabby markings (pale streaks on a black ground, peculiarly and symmetrically disposed), so common in English cats, are never seen in those of India." Dr. D. Short has assured Mr. Blyth<sup>92</sup> that, at Hansi, hybrids between the common cat and *F. ornata* (or *torquata*) occur, "and that many of the domestic cats of that part of India were undistinguishable from the wild *F. ornata*." Azara states, but only on the authority of the inhabitants, that in Paraguay the cat has crossed with two native species. From these several cases we see that in Europe, Asia, Africa, and America, the common cat, which lives a freer life than most other domesticated animals, has crossed with various wild species; and that in some instances the crossing has been sufficiently frequent to affect the character of the breed.

Whether domestic cats have descended from several distinct species, or have only been modified by occasional crosses, their fertility, as far as is known, is unimpaired. The large Angora or Persian cat is the most distinct in structure and habits of all the domestic breeds; and is believed by Pallas, but on no distinct evidence, to be descended from the *F. manul* of middle Asia; and I am assured by Mr. Blyth that the Angora cat breeds freely with Indian cats, which, as we have already seen, have apparently been much crossed with *F. chaus*. In England half-bred Angora cats are perfectly fertile with one another.

Within the same country we do not meet with distinct races of the cat, as we do of dogs and of most other domestic animals; though the cats of the same country present a considerable amount of fluctuating variability. The explanation obviously is that, from their nocturnal and rambling habits, judicious crossing cannot without much trouble be prevented. Selection cannot be brought into play to produce distinct breeds, or to keep those distinct which have been

<sup>92</sup> 'Proc. Zoolog. Soc.,' 1863, p. 184.

imported from foreign lands. On the other hand, in islands and in countries completely separated from each other, we meet with breeds more or less distinct; and these cases are worth giving, showing that the scarcity of distinct races in the same country is not caused by a deficiency of variability in the animal. The tailless cats of the Isle of Man are said to differ from common cats not only in the want of a tail, but in the greater length of their hind legs, in the size of their heads, and in habits. The Creole cat of Antigua, as I am informed by Mr. Nicholson, is smaller, and has a more elongated head, than the British cat. In Ceylon, as Mr. Thwaites writes to me, every one at first notices the different appearance of the native cat from the English animal; it is of small size, with closely lying hairs; its head is small, with a receding forehead; but the ears are large and sharp; altogether it has what is there called a "low-caste" appearance. Rengger<sup>93</sup> says that the domestic cat, which has been bred for 300 years in Paraguay, presents a striking difference from the European cat; it is smaller by a fourth, has a more lanky body, its hair is short, shining, scanty, and lies close, especially on the tail: he adds that the change has been less at Ascension, the capital of Paraguay, owing to the continual crossing with newly imported cats; and this fact well illustrates the importance of separation. The conditions of life in Paraguay appear not to be highly favourable to the cat, for, though they have run half-wild, they do not become thoroughly feral, like so many other European animals. In another part of South America, according to Roulin,<sup>94</sup> the introduced cat has lost the habit of uttering its hideous nocturnal howl. The Rev. W. D. Fox purchased a cat in Portsmouth, which he was told came from the coast of Guinea; its skin was black and wrinkled, fur bluish-grey and short, its ears rather bare, legs long, and whole aspect peculiar. This "negro" cat was fertile with common cats. On the opposite coast of Africa, at Mombas, Captain Owen,

<sup>93</sup> 'Säugethiere von Paraguay,' 1830, s. 212.

<sup>94</sup> 'Mem. présentés par divers

Savans: Acad. Roy. des Sciences,' tom. vi. p. 346. Gomara first noticed this fact in 1554.

R.N.,<sup>95</sup> states that all the cats are covered with short stiff hair instead of fur: he gives a curious account of a cat from Algoa Bay, which had been kept for some time on board and could be identified with certainty; this animal was left for only eight weeks at Mombas, but during that short period it "underwent a complete metamorphosis, having parted with its sandy-coloured fur." A cat from the Cape of Good Hope has been described by Desmarest as remarkable from a red stripe extending along the whole length of its back. Throughout an immense area, namely, the Malayan archipelago, Siam, Pegu, and Burmah, all the cats have truncated tails about half the proper length,<sup>96</sup> often with a sort of knot at the end. In the Caroline archipelago the cats have very long legs, and are of a reddish-yellow colour.<sup>97</sup> In China a breed has drooping ears. At Tobolsk, according to Gmelin, there is a red-coloured breed. In Asia, also, we find the well-known Angora or Persian breed.

The domestic cat has run wild in several countries, and everywhere assumes, as far as can be judged by the short recorded descriptions, a uniform character. Near Maldonado, in La Plata, I shot one which seemed perfectly wild; it was carefully examined by Mr. Waterhouse,<sup>98</sup> who found nothing remarkable in it, excepting its great size. In New Zealand according to Dieffenbach, the feral cats assume a streaky grey colour like that of wild cats; and this is the case with the half-wild cats of the Scotch Highlands.

We have seen that distant countries possess distinct domestic races of the cat. The differences may be in part due to descent from several aboriginal species, or at least to crosses with them. In some cases, as in Paraguay, Mombas, and Antigua, the differences seem due to the direct action of different conditions of life. In other cases some slight effect may possibly be attributed to natural selection, as cats in

<sup>95</sup> 'Narrative of Voyages,' vol. ii. p. 180.

<sup>96</sup> J. Crawford, 'Descript. Dict. of the Indian Islands,' p. 255. The Madagascar cat is said to have a twisted tail; see Desmarest, in 'Encyclop. Nat. Mamm.,' 1820, p. 233, for some of the other breeds.

<sup>97</sup> Admiral Lutke's Voyage, vol. iii. p. 308.

<sup>98</sup> 'Zoology of the Voyage of the Beagle, Mammalia,' p. 20. Dieffenbach, 'Travels in New Zealand, vol. ii. p. 185. Ch. St. John, 'Wild Sports of the Highlands,' 1846, p. 40.

many cases have largely to support themselves and to escape diverse dangers. But man, owing to the difficulty of pairing cats, has done nothing by methodical selection ; and probably very little by unintentional selection ; though in each litter he generally saves the prettiest, and values most a good breed of mouse- or rat-catchers. Those cats which have a strong tendency to prowl after game, generally get destroyed by traps. As cats are so much petted, a breed bearing the same relation to other cats, that lapdogs bear to larger dogs, would have been much valued ; and if selection could have been applied, we should certainly have had many breeds in each long-civilized country, for there is plenty of variability to work upon.

We see in this country considerable diversity in size, some in the proportions of the body, and extreme variability in colouring. I have only lately attended to this subject, but have already heard of some singular cases of variation ; one of a cat born in the West Indies toothless, and remaining so all its life. Mr. Tegetmeier has shown me the skull of a female cat with its canines so much developed that they protruded uncovered beyond the lips ; the tooth with the fang being  $\cdot 95$ , and the part projecting from the gum  $\cdot 6$  of an inch in length. I have heard of several families of six-toed cats, in one of which the peculiarity had been transmitted for at least three generations. The tail varies greatly in length ; I have seen a cat which always carried its tail flat on its back when pleased. The ears vary in shape, and certain strains, in England, inherit a pencil-like tuft of hairs, above a quarter of an inch in length, on the tips of their ears ; and this same peculiarity, according to Mr. Blyth, characterises some cats in India. The great variability in the length of the tail and the lynx-like tufts of hairs on the ears are apparently analogous to differences in certain wild species of the genus. A much more important difference, according to Daubenton,<sup>99</sup> is that the intestines of domestic cats are wider, and a third longer, than in wild cats of the same size ; and this apparently has been by their less strictly carnivorous diet.

<sup>99</sup> Quoted by Isid. Geoffroy, 'Hist. Nat. Gén., tom iii. p. 427.