1

Where Dogs Came From

'The wolf in your living room' is a powerful image that reminds dog owners that their trusted companion is, under the skin, an animal, not a person. Dogs are indeed wolves, at least as far as their DNA is concerned; the two animals share 99.96 per cent of their genes. Following the same logic, you might just as well say that wolves are dogs – but, surprisingly, no one does. Wolves are generally portrayed as wild, ancestral and primeval, whereas dogs tend to be cast in the role of the wolf's artificial, controlled, subservient derivative. Yet dogs are, in terms of sheer numbers, far more successful in the modern world than wolves. So, what do we gain from knowing that wolves and dogs share a common ancestor? Many books, articles and television programmes about dog behaviour have claimed that understanding the wolf is the key to understanding the domestic dog. I disagree. My view is that the key to understanding the domestic dog is, first and foremost, to understand the domestic dog, and it is a view I share with an increasing number of scientists worldwide. By analysing the dog as its own animal rather than as a lesser version of the wolf, we have the opportunity to understand it – and refine our dealings with it – as never before.

To be sure, it is undeniable that dogs share many of their basic characteristics with other members of the Dog family (the Canidae) of which the wolf is a part. Dogs evolved from canids, and they owe such qualities as their basic anatomy, their refined sense of smell, their ability to retrieve and their capacity to form lasting social bonds to this evolution. To some extent, then, comparing dogs to their wild ancestors can be illuminating – but when the wolf is taken as the only available point of reference, our understanding of dogs suffers.

At the most fundamental level, dogs are unique because, unlike

wolves or other canids, they have adapted to live alongside human beings, the result of the process of domestication. As dogs have been altered by domestication, many of the subtleties and sophistications of wolf behaviour appear to have been stripped away, leaving an animal that is still recognizably a canid, but no longer a wolf. Domestication has altered the dog considerably, more than any other species. It is self-evident that dogs come in a wide range of shapes and sizes; indeed, there is actually more size variation among domestic dogs than in the whole of the rest of the Dog family put together. Yet this is by no means the only profound effect of domestication. Perhaps the most important one, for both us and our dogs, is their ability to bond with us and understand us, to an extent that no other animal can match. Understanding what has happened during domestication is therefore a key element in understanding the dog.

To understand the domestic dog fully, we need to look beyond the process of domestication – beyond even the wolf – to examine the dog's entire history. We need to know where the dog came from and what all its ancestors were like, not just its closest living relative, the wolf. Of course, it is ultimately impossible for us to know precisely how the domestic dog's ancestors behaved, whether we are examining its immediate forebears (wolves that lived more than 10,000 years ago) or its more distant ancestors (social canids, the precursors of the wolf, in the Pliocene era several million years ago). They are all extinct. We can, however, get some idea of how they might have behaved by examining the range of behaviour that is characteristic of today's social canids. Indeed, a detailed examination of the behaviour of those species would not only shed light on to the dog's earliest ancestors, but also help us to work out why it was that, apart from the wolf, none of the canids was successfully and permanently domesticated.

DNA analysis leaves us in no doubt that the dog is descended only (or at least almost entirely) from the grey wolf, *Canis lupus*. The first comprehensive sequencing of the maternal DNA of dogs, wolves, coyotes and jackals, published in 1997, produced no evidence that dogs had ancestors in any species other than the grey wolf.[1] None of the dozens of investigations performed since then have contradicted this; however, there is still a relative lack of data on paternal DNA, which

is more difficult to analyse, so it is still possible that a few types of dog could claim descent from other canids through their paternal line.

Genetically, dogs and wolves have a great deal in common; but the mere fact that two species have considerable overlap in their DNA does not mean that their behaviour will be the same. Indeed, many animals with similar DNA are drastically different from one another, especially in terms of behaviour. We know this thanks to the DNA 'revolution', which has led to the sequencing of the genomes of humans, canines, felines and an increasing number of other species. Many of these sequences exhibit a remarkable degree of similarity. For example, your DNA and your dog's are identical for about 25 per cent of their length, which is perhaps not surprising given that you are both mammals – roughly the same 25 per cent is also found in mice. The other 75 per cent accounts for why dogs, mice and people look – and behave – very differently from one another.

Species that are much more closely related to one another than we are to dogs can share almost their entire DNA sequences, and it is tempting to assume that they must therefore be restricted to the same range of behaviour. But DNA does not control behaviour directly; rather, it specifies the structure of proteins and other constituents of cells, and a tiny change in DNA can lead to a huge change in behaviour. For example, there is no 'blueprint' for the brain; each nerve cell in the brain emerges out of interactions between thousands of DNA sequences. A change in one 'letter' in those sequences could have an enormous effect on the way the brain functions, or none at all – we simply do not know enough yet about how DNA and behaviour interact. Take two closely related apes: the chimpanzee and the bonobo. Common chimps share 99.6 per cent of their DNA with bonobos, and yet the social behaviour of these two kinds of great ape could not be more different. Common chimps are omnivorous, often hunting other kinds of monkey, and their social groups are based on coalitions between males, which are highly aggressive to outsiders and may even murder them if they get the chance. Bonobos, on the other hand, are vegetarian, live in societies centred on groups of related females, rarely show aggression, and have never been seen to murder in the wild. Genetically almost identical, the two species are vastly different in behaviour.

Like bonobos and chimpanzees, dogs and grey wolves share most of

their DNA – but there seems little reason to presume that, based on this fact, they must inevitably share the same social systems as well. In fact, domestication appears to have dissolved away much of the detail of wolf-specific behaviour in dogs, leaving them with a behavioural repertoire that has much in common with that of slightly more distantly related species, such as the coyote *Canis latrans*, and even some more distant relatives in the same family, such as the golden jackal *Canis aureus*.

Even to early biologists, the differences between dogs' behaviour and that of wolves were obvious. Many of these differences are manifested socially: dogs, for instance, are clearly not pack animals (even when they form groups these do not behave in a coherent way), and they are much more adept than wolves are at forming relationships with people. Over the years, many eminent biologists, including Nobel Prize-winner Konrad Lorenz and even Charles Darwin himself, have been struck by the flexibility of the dog's behaviour, as well as by the enormous size difference between the smallest and largest breeds. Both suggested that domestic dogs must be some kind of hybrid between two or even several of the canids. Lorenz, in his charming book *Man Meets Dog*, was convinced that wolves were far too independent in nature to explain the indiscriminate friendliness shown by many dogs, and proposed that most of the breeds that had originated in Europe were predominantly jackal in origin. He later retracted this idea, having realized that there was no evidence for spontaneous cross-breeding between dogs and jackals (as readily happens between dogs and wolves), and that the details of jackal behaviour did not fit that of the dogs (the jackal's howl, for example, is nothing like any dog's).

Despite these scientists' best efforts to determine why dogs are so different from wolves in their behaviour, the puzzle was not resolved, and remains largely unanswered to this day. Yet perhaps some clues can be gathered if we look further back in evolutionary time, thinking of our domestic dog as a product not of one species, the grey wolf, but of a whole family, the Canidae (also referred to as the Dog family, but they will be 'canids' here to avoid confusion with the domestic dog). Many of the canid species have sophisticated social lives, which – when they overlap with those of dogs – can potentially shed light on the origins of dog behaviour; coyotes, for instance, are more promiscuous than wolves, a characteristic shared with dogs. Although the behavioural

traits of other canids are not as well understood or well publicized as those of the grey wolf, they nevertheless have a great deal to tell us about when – and how – dog behaviour may have originated.

Tracing the canids back to their origins reveals that their social intelligence was probably one of the early traits that set dogs' ancient ancestors apart. Canids probably first evolved some 6 million years ago in North America, where they eventually replaced another type of dog-like mammal, the borophagine. This was a large, hyena-like animal that specialized in scavenging and had massive bone-crushing jaws to match. The original canids, which probably looked more like foxes than dogs, must have been little Davids to the cumbersome borophagine Goliaths, out-competing them in speed, cunning and intelligence, and ultimately helping to drive them to extinction. If we then fast-forward a mere 1.5 million years, we find that the surviving canids had spread all over the world, and split into several types, one of which was the ancestor of today's dogs, wolves and jackals – collectively referred to as *Canis*.[2] Subsequently, further diversification produced three strands of evolution, any one of which could potentially have culminated in a domestic animal, for there is nothing in the behaviour of any of the canid lineages to suggest that they could not have produced an animal that was suitable for domestication. Indeed it is likely that at least two of the three did produce domestic animals, and entirely possible that the wolf was not the only species in its lineage to be domesticated.

The first evolutionary break within the *Canis* genus occurred in North America, and eventually (about 1 million years ago) gave rise to today's coyote, still confined to that continent. Another group emerged in South America, where they live to this day, and are classified as *Dusicyon* rather than *Canis*. Rather misleadingly, they are collectively known as South American foxes, though they are only distantly related to the much better known red fox of hunting fame. The other six species of *Canis* all evolved in the Old World, most likely in Eurasia, although some possibly in Africa. Four of these are jackals, although one of these, the Simien jackal, is sometimes confusingly referred to as the Ethiopian wolf; they include the golden jackal that Lorenz thought might have been the origin of some breeds of dog. Another is the grey wolf *Canis lupus*, the ancestor of our domestic

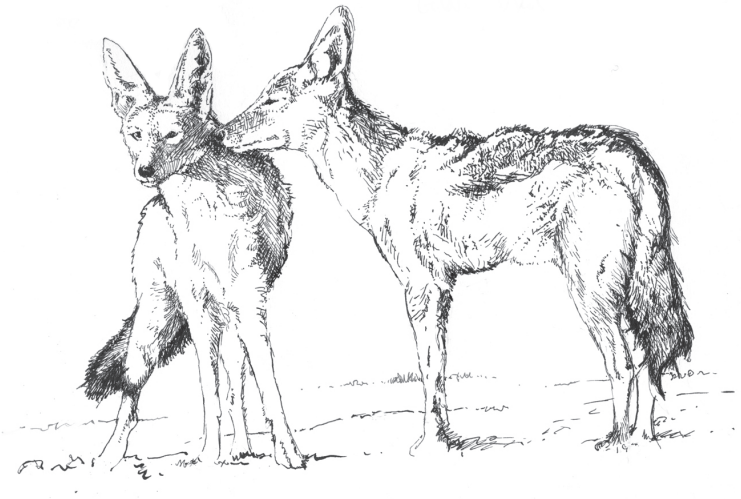
dogs. Of the Eurasian canids, only the grey wolf reached North America, migrating across the Bering land bridge some 100,000 years ago during one of the periods when Alaska was joined to Asia.

Many of these species superficially seem to be potential candidates for domestication, thanks to a number of social tools that they share with the domestic dog. All can, when conditions are favourable, live in family groups or 'packs'. All seem to be able to adapt their lifestyles – specifically, whether they live alone or in small or large groups – to the circumstances they find themselves in.[3] (Nowadays, the most important such 'circumstance' is often the activities of our own species, whether direct persecution, or incidental provision of food at rubbish-dumps.) The current consensus is that the canid genome is rather like a Swiss Army knife,[4] a social toolkit that has remained resistant to evolutionary change and which can be used to cope with a wide variety of circumstances, ranging from solitary living when times are hard, to complex societies when food is plentiful and persecution is at a minimum. The success of the domestic dog in adapting so successfully to life with humans can therefore be seen not as a specific set of changes that began only with the grey wolf, but rather as a new use for this ancient canid social toolkit – one that allowed the dog to socialize not just with other members of the same species, but also with members of ours.

While we are now certain that the grey wolf is the domestic dog's one and only direct ancestor, the dog shares its earlier ancestors with many other still-living relatives, each of whom may offer us a new perspective on these ancient forebears. The dog's lineage, after all, goes back much further than that of the grey wolf, to canids that are now extinct, but were themselves the ancestors of all of today's living canids Each of the latter has something to tell us about the ways that canids can adapt to fit different circumstances – that is, how they construct their social groups – and therefore each provides a different set of clues as to what the canid 'toolkit' may have looked like, as it emerged some 5 million years ago. As all of these canids carry the same 'toolkit', the fact that none apart from the wolf has been permanently domesticated will also need to be accounted for.

The golden jackal, *Canis aureus*, is one of the dog's most social relatives, and therefore a seemingly ideal candidate for domestication. It is the only jackal to be found in the Fertile Crescent, the cradle of

civilization, where many other domestications, including sheep, goats and cattle, occurred; all the other jackals are restricted to Africa. Like many of the other canids, the golden jackal shows considerable flexibility in its social arrangements. A few hunt alone, but most live in male-female pairs, often bonding for life, which in practice can be six to eight years. If one partner dies, the other rarely finds a new mate. Very often, some of the first litter that a pair produces will stay with their parents until the next litter is born the following year, and will then help to bring them up, before leaving to find their own mates a few months later. They protect the young at the den while their parents are off hunting or, if they catch something themselves, will often bring it back to share with the cubs. Cubs are more likely to survive if their elder brothers and sisters stay on to help, so their contribution is valuable. Jackals often hunt in pairs, enabling them to tackle larger prey than they could alone, and sometimes the helpers may hunt with them to make up a pack of three or four. The family members have a rich vocabulary for communicating with one another, just as wolves do. Based on its wealth of social skills, there seems little reason why the golden jackal could not have become domesticated as the grey wolf did.



Golden jackals