

The methods dogs use to communicate with their own species

For humans communication tends to be verbal. For dogs, communication relies on sound signals, through scent, and visually through movement of their facial and body posture. Humans typically use verbal language to communicate to dogs, so it is a credit to dogs' intelligence that they generally understand what we are asking of them. As Brenda Aloff comments, "while humans are constantly trying to communicate to dogs as if they are people, simultaneously, dogs are trying to talk to humans as if they are dogs." In order for us to better understand dogs, we must learn how to communicate effectively with them. To learn how to 'speak dog' involves watching, listening and understanding how dogs use various forms of signals to communicate with one another.

Sounds signals

Dogs can convey information, express their needs and emotional state through a set of sounds signals. Domestication of dogs by humans has perhaps accentuated dogs' use of sounds signals more than any other communication tool. Dogs are significantly more vocal than their relative, the wolf, which uses only four to nine types of vocalizations. To the right, is a table of the typical vocal signals in domestic dogs and their behavioural contexts as collated by Professor Seong Chan Yeon at Gyeongsang National University, Korea.¹

Whining and yelping is typically heard in new born pups to denote stress, such as separation from the mother or being lifted by the scruff of the neck. Neonates also use a combination of grunts and clicking sounds to indicate pleasure and relief, or contact with its littermates and mother or warmth.² Sounds can elicit physiological effects also. For example, the sound of a puppy crying can trigger a release of the hormone oxytocin which affects the bitch's mammary glands causing them to lactate.³

Table Vocal signals in domestic dogs	
Name or Type of Vocalisation	Behavioural contexts
Bark	Alert/warning Territorial defense/rivalry/defense Individual identity Social facilitation Play solicitation
Howl	Greeting, call for attention Territorial maintenance Locate group members Individual recognition Coordinate social activities/hunting Attract others
Growl	Reactive (in response to sirens, etc.) Offensive and defensive threatening Play
Whine	Defence Warning Threat Greeting Frustration Active Submission
Yelp	Attention seeking
Snore	Pain, great stress
Groan	Nasal sound, related with bark
Grunt	Acute distress Pleasure

¹ Journal: Yeon, Seong Chan (July/August 2007) The vocal communication of canines, Journal of Veterinary Behaviour, Elsevier, volume 2, no. 4, page 142.

² Beaver, Bonnie (2009) Canine Behaviour, Saunders Elsevier, chapter 3, page 108.

³ Book: Fogle, Bruce (1990) A Dog's Mind, Pelham Books, chapter 5, page 63.

Walk the Dog

Hanne Grice

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Puppies will typically emit yelp-like barks during play fighting with littermates, and groans may occur to denote acute distress such as physical discomfort, which causes an instant reaction from the mother. Whine and whimper sounds are also made by adult dogs. Interestingly, whining is not typically directed at other dogs, but rather at humans. This indicates that domestication has exaggerated sound communication such as whining and whimpering in domestic dogs and as it typically elicits a reaction from us, this type of behaviour and communication has become a learnt response for dogs.⁴ Research has shown that whines are not typically heard under conditions that can be termed 'pleasurable' or during 'active submission'.

The most common sound associated with domestic dogs is barking and dogs seem to rely on barking more than other species of canid. Barking can communicate a number of emotions from warning, hunting, excitement and inviting play or as a way of getting attention.⁵ Barking, particularly alarm barking, is exhibited much more in domestic dogs than in other canines such as the wolf, which have two types of bark; the first being the alarm bark (short and typically followed by silence) and the other is a threatening or challenging bark (which occurs at the approach of intruders). According to archaeological and mitochondrial DNA findings, dogs were domesticated from wolf-like ancestors between 14,000 and 135,000 years ago. As domestic dogs have a higher propensity to bark (and some dog breeds have a tendency to bark more than others) it follows that humans may have specially selected dogs that barked more, for example, as an alert function or barking could have increased through indirect selection. The disparity in bark frequency and context between domestic dogs and wolves has led some researchers to believe that barking in domestic dog is non-functional.⁶ However, studies by Yin and McCowan in 2004 at the University of California, indicated that barking might be a more efficient communication system between humans and dogs for revealing the emotional or motivation state of the animal. The scientists recorded barking from 10 adult dogs of six breeds in three different situations. The first was a stranger ringing the door bell, in the second situation the dog was locked outside or in a room isolated from its owner, and the third was a play situation either with two dogs or a human and dog playing together. Using spectrographic analysis (*a spectrometer is a device that measures wavelengths and intensities, which converts the data into a spectral pattern called a spectrograph*⁷), the results indicated that harsh, low frequency, un-modulated barks were associated with disturbance situations and indicated hostility, whereas the more tonal, higher-pitch, modulated barks were the typical response in isolation and play situations, indicating either fear or friendliness. Therefore, different pitches and the modulation of barking indicate different situations and the emotionality of the dog. Moreover, studies made by Péter Pongrácz, professor of animal behaviour at the Eötvös Loránd University in Budapest, has provided the first concrete evidence that the emotion in a dog's bark may not only be clear to dog owners but also to other dogs. The study has produced evidence that dogs can perceive the difference between barks arising from different situations.

⁴ Book: Fogle, Bruce (1990) *A Dog's Mind*, Pelham Books, chapter 5, page 62.

⁵ Book: Fogle, Bruce (1990) *A Dog's Mind*, Pelham Books, chapter 5, page 63.

⁶ Journal: Yin, S (2002) *A new perspective on barking in dogs*, *Journal of Comparative Psychology*, American Psychological Association Inc, volume 2, no.2, page 189.

⁷ Internet: Wikipedia, 'Spectrometer'. Website: <http://en.wikipedia.org/wiki/Spectrometer>

A number of dogs of varying breed were selected to be 'listening dogs' and the scientists made recording of Hungarian mudis (herding dogs) barking in two different situations. One set of recordings was made when a stranger entered the property where a given dog lived. The second set was made when the dogs were tethered to a tree and left alone. Two types of mechanical noise, an electric drill and a refrigerator, were control sounds. The scientists fitted each of the listening dogs with a heart rate monitor. While the sound of all dog barks caused a listening dog's heart rate to jump, hearing a certain type of bark consistently over time stabilised the heart rate. However, even though the listening dogs would get used to the distress barks, they always showed a jump in heart rate when the researchers switched from one type of recorded bark to the other. This change shows that not all barks sound the same to other dogs, and have led the researchers to suggest that dogs understand the different contexts producing the barks they hear.

Barking and howling are more repetitive and louder than any other vocalization. Although barking and howling composes of changes in pitch that rise and fall, it makes sense that both these functions are louder than other vocalizations as they are typically used to communicate over greater distance. The advantage of using sounds signals like howling is that they can travel long distances, still be interpretable and the sender can convey its message from a hidden place. This allows the sender to remain concealed, therefore avoiding any potential predator or potential prey seeing the sender. Typically wolves howl to recruit other pack members before a hunt or to seek social contact from other wolves for mating or territory maintenance.

Commonly, dogs in separation distress are more likely to bark try to re-establish some sort of social contact denied to them by isolation. Some dogs when left alone will bark or howl in an attempt to reunite the pack. The noise level of alert barking or the long string of solitary barking is typically heard by a dog that has either been aroused by a noise (alert barking) or distressed and/or isolated (solitary barking). These types of barks are often the cause of complaints to local councils, as repetitive barking is classed as noise pollution. For example, the Borough Council of Ballymena in Ireland, received 225 complaints related to noise pollution during 2007. Barking dogs were the main cause of complaints with 130 of the 225 complaints attributed to animal noise. This has led to some councils, such as Stockport, to make available to the public anti-barking collars in an attempt to tackle the issue.

Another vocal signal of the dog is growling. This may occur as part of an aggressive display or during play accompanied with barking. Aggressive growls can be heard during displays of territorial aggression as a way of communicating a warning such as "back off" to an individual, or as part of a dominance display. Interestingly, studies made by Eugene Morgan, a naturalist working at the National Zoological Park, analysed the sounds of 56 species of birds and mammals, and found they all used pitch (as well as duration and frequency/repetition of the sound) to communicate similar emotions. Morgan noted that rats, elephants and pelicans, like dogs, used low-pitched rumbling growls to seemingly mean "keep back", "you're annoying me" or "stop that". Stanley Coren suggests that dogs' using a high pitched growl indicates insecurity or fear, and the more frequent the pitch and steadiness of the growl may vary and change, the more unsure the dog is.

Dogs will also use a play-growl type sound when playing for example, 'tug of war' with a toy and its owner or when playfully chasing another dog. This type of growl is always accompanied by other signs of play, such as a play bow, relaxed facial and body posture and fast movement.

Visual signals

Visual signals through body language are an important means of communicating for dogs. Most dog owners are familiar with their dogs general facial expressions, tail movement and posture, yet some visual signals are so subtle these may be completely lost to the human, such as blinking or yawning. "Emotions can usually be accurately identified from facial and body signals but not always."⁸ This may be because humans have, through the process of selective breeding, physically modified breeds, altering the dog's ability to successfully communicate. For example, my dog Howard is a Basset Hound; he has short legs so he naturally has to carry his tail high. A high tail carriage would typically communicate alertness, aggressiveness, dominance or confidence. So, when Howard meets other dogs he will use other signals including visual ones to communicate he is friendly and approachable, such as sitting down, going into a play bow and wagging his tail.

Visual communication is instantaneous, easy to produce, and is silent yet can be interpreted from afar, therefore visual signals have some survival benefits. Visual signals are also be modified to carry various types of information. For example, a dog may raise its hackles on the back of its neck in warning when a potential enemy approaches, and then lower them if the approaching animal or human appears friendly. While visual signals can be momentary in the dog, for some animals visual displays can be permanent; the scarlet and purple facial markings of a male mandrill enhance his facial expressions.

Visual signals also enable the dog to communicate its social status. For example, every time a dog meets another, they adopt postures to communicate social status. The dog's tail is typically a good indicator of how he compares himself to the other. The dog raising the base of its tail is the more dominant dog. Other body postures that demonstrate social status and dominance are more subtle, such as the body leaning forward, or the dog standing straighter than the other. Other visual signals that may be given as part of the greeting ceremony may be an enthusiastic tail wag, coupled with a low body posture, licking of the other's face, and a dip of the front paws/body into a play bow. Submissive behaviour demonstrated with nuzzling and licking the face of the more dominant individual is seen in the wild, as puppies direct their licking and nuzzling towards other pack members to elicit a regurgitation response. I will discuss licking in more detail shortly.

There are a number of visual signals used by dogs to communicate their emotional state. Dogs are similar to their wolfish ancestor in that they will use their features or elements of the face (ears, eyes, lips, teeth, nose and forehead), their body (posture and hair), and the tail. It is presumed that variation in each element expresses a variation in the dog's underlying motivation along a continuum of aggressive/confident to dominant/submissive. Roger Abrantes classified the postures shown by wolves into these two primary dimensions.

⁸ Book: Fogle, Bruce (1990) *The dog's mind*, Pelham Books, chapter 5, page 66.

An aggressive, dominant wolf will display an upright posture with its hackles, head and tail raised, pricked ears and curled lips, displaying its teeth. The stiff legs and slow movement is deliberate, indicating its readiness to attack, coupled with the other visual signals. By contrast a subordinate will hold its body low, ears will be flattened against the dog's head, and it will avoid direct eye contact, holding its tail low. However, dogs that have been physically modified through the breeding process are harder to interpret and dogs are not 100 per cent offensive nor defensive. A fearful dog may also crouch, tucking its tail under the body and may lift its hind leg to expose part of the inguinal region; the overall impression that is created is that of a smaller animal. Animals' ability to make themselves appear smaller or bigger when under threat was observed by Charles Darwin in 1872 with the "principle of antithesis". A dog making itself appear smaller is an indicator that there is an element of fear, however, the dog could also be communicating appeasement. If the dog's eyes are stretched in conjunction with making itself smaller then it is likely that something in the environment is making the dog afraid. Therefore, one should not over interpret a single body part.

Continuing with the emotion of fear or appeasement displayed in visual displays, some dogs may roll over exposing its inguinal region and even urinate. The elimination action mimics the behaviour more typical of a young puppy, to communicate to the other individual "I am not a threat" or "please don't hurt me". A calm and relaxed dog may demonstrate its emotional state with a relaxed tail and ear position, the muscles around the dog's eyes will be relaxed (giving the appearance of 'soft' eyes) and the mouth will be relaxed, and may even be slightly open exposing the lower teeth. However, if there was a stimulus such as a loud noise which caught the dog's attention, sending him into 'alert-mode', the dog might tilt its head (orientating himself towards the stimulus), his ears may flatten back (if he is wary of the sound) or the ears prick up (if he is interested). Some dogs may raise one paw, the tail may rise up and the muscles around the eyes may appear tenser, and the pupils may begin to dilate if they are wary or something has caught the dog's attention.

Pupil dilation is harder to spot on a dog that has darker eyes. A dominant dog may appear to have larger eyes and may give a more intense stare, while the eyes of a more submissive and fearful dog are more narrowed or slitted, appearing less wide open. As direct eye contact may be interpreted as a challenge, a dog will communicate by turning away or avoiding direct eye contact to signal "I don't want any trouble" or "I accept you're more confident than me."

Some dogs may blink as a sign of submission. While the blinking action causes fluid to sweep over the dog's eyes, keeping them clean and moist, the rate at which dogs, like humans, blink and the situations in which they blink can be indicators of the dog's emotional state. For dogs, the blinking action breaks the dominance state and may communicate "please don't hurt me" or "I accept your leadership".

Another change that may be seen in the dog's eyes is when there is a threat, sometimes the whites of the dog's eyes becomes visible. This is called 'whale eye' and is also referred to as an oblique threat; this is an artefact of how dogs guard resources. This visual signal may occur, for example, when the dog has something of value such as a bone and its owner approaches.

The dog may freeze, and maintain his orientation at the resource (bone), while he directs his gaze towards the threat (the owner) which causes the whites of the eyes to be seen. If the threat continues to approach, the dog may place a paw onto the resource it is guarding as a visual signal of intent and warning to "back off". Jean Donaldson refers to this action as 'contact intention'. The mouth of the dog is also a good indicator of its emotional state. Stanley Coren believes "the mouth is probably the dog's single most important means of expression." The mouth can be divided into two axes; a horizontal line (running along the side of the mouth) and the vertical axis (running up and down the muzzle). If the horizontal axis of the lips is retracted, so the mouth appears elongated and stretched, this is generally considered to be a visual signal of appeasement or fear. Warning signals involve a retraction of the vertical axis; where the mouth is stretched exposing the teeth and gums, this is a classic threat signal given by a dog. This communicates to the receiver that there will be negative consequences if the warning is not heeded. This gives the receiver the opportunity to either, leave, back down or return this warning with a pacifying gesture.

A retraction on the vertical plane (where the teeth are exposed and there is some wrinkling of the muzzle) occurs when the dog snarls or for some dogs if they smile. If this signal then escalates to all the teeth and gums being exposed and there are clear visible wrinkles above the nose, this is a last warning to "back off, or I will bite." Some dogs may display a 'twitch' around their whisker bed (upper muzzle area), before the dog increases the warning/threat signal given with a snarl. The twitch is a warning message. A dog smiling is not a typical behaviour, however, some breeds are more likely to smile than others such as Dalmatians; it is generally considered that this behaviour is directed towards humans.

A closed mouth, with no teeth or tongue visible is usually associated with a dog looking in a particular direction (if coupled with ears pricked up and head leaning forward). This is an indication of attention or interest. If the lips curl up to expose some teeth, but the mouth is still mostly closed, this may indicate the first sign of annoyance. This signal might occur if a young puppy pesters its mother and she wants to communicate "leave me alone" or perhaps "not now."

Yawning is another visual signal used by dogs. Like humans, dogs will yawn when they are tired as the yawning action enables the intake of additional oxygen to the brain, which helps keep the dog or human awake. But yawning may also be used to signal contentment, or to pacify an opponent. For example, a dog may yawn if an owner scolds it, or might yawn when it feels insecure. Yawning may also occur when a dominant dog is showing friendliness to a submissive, for example, if during the mating ceremony the female snarls at the advancing male, he may yawn. Dogs also yawn when they are aroused, such as when the dog is about to go out for a walk.

Dogs will also lick and licking behaviours can occur in different situations and may mean many different things. Dogs may lick the face of a familiar dog when greeting, but they will also sniff any areas where odours are strongest, usually around the face, nose, anal regions, and genital areas. These sniffs may then turn into licking as the dog tries to find out more information about the other dog. Licking may also be seen as part of the mating ceremony; the male may lick the female's genitals prior to mounting.

Walk the Dog

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While these examples seem to parallel aspects of communication with kissing in humans, dogs may also lick to communicate information about its emotional state, intentions or dominance. For example, some dogs when frightened or showing appeasement will adopt juvenile behaviour to 'soften' the mood of the threatening individual. Part of this behaviour may include licking. Dogs first experience licking by their mother immediately after they have been born. The licking stimulates the pup's breathing and thereafter, licking from the mother helps stimulate the urinary and defecation action in the pup. As the puppy and its littermates grow, they may begin to lick one another. It is believed that this not only serves as a grooming function but also to create a social bond. Having weaned off the mother's milk, puppies in the wild, will lick around the mouths of the adult dogs to stimulate regurgitation. This regurgitation response is less common in domestic dogs as humans provide the dog with food, however this behaviour is hard-wired, which is why many puppies lick at the face of their human owners. As the dog matures, the licking behaviour may still be a request for food, but as discussed, it can also communicate appeasement or submission as well as signs of respect and friendliness. The hair of the dog is also a visual indicator of the dog's emotional state. The hair on its shoulders and rump also referred to as 'hackles' and its tail, may rise when the dog is in a heightened state; such as excited, fearful or aggressive.

The hackles will typically rise in-conjunction with other body language. For example, if a dominant dog feels threatened his mouth will retract exposing his teeth, ears will prick up and remain forward and the tail may also slowly begin to wag. These visual signals may be seen when two unfamiliar dogs meet. During a submissive approach the dogs hackles may still rise as they 'suss' out the approachability of the other, but they will typically curve their bodies (communicating this is not a direct challenge) and they may wiggle their bodies towards the more dominant dog. If the more dominant dog begins to stiffen in its posture, this is a good indicator that the initially friendly greeting could turn into an attack. In this instance the hair on the tip of the tail may also rise along with the overall height of the tail rising.

I have discussed some examples of situations which will cause the dog's tail to move into a particular position. But, very often tail wagging and positions can be miss read by humans, for example, when I was a child I was often told that "a dog that wags his tail at you, is a friendly dog". Now, with a better understanding of dogs, I appreciate that a wagging tail is a signal of a heightened state, therefore a dog that wags his tail at me, may still bite.

Tail language has three different channels of information – position, shape and movement. The tail is an important visual signal; in the wild, wolves can communicate from a distance using their bushy tails. Interestingly, puppies are not born with the ability to wag their tail. Typically, tail wagging in puppies fully is not established in puppies until around 49 days of age. It is suggested that the reason for this is that puppies do not need to use their tails for social communication when they are very young, as their primary behaviours are sleeping and eating. But by approximately six weeks, puppies are typically interacting with one another through play, and it is through playing, that the puppies learn about social communication. Usually, a tail that is horizontal in position, pointing away from the dog but relaxed is displayed when the dog is alert. If the tail begins to stiffen this indicates that the situation is changing and the dog's emotions are beginning to change also.

A stiffened tail can contain an element of warning or aggression; this may be seen when a dog meets someone new. If the tail is up between the horizontal and vertical position this may be a signal of the dog's intention to assert his dominance over an individual nearby, or may be a signal of confidence. Some dogs may curve their tail right over their back, this is believed to communicate the dog's confidence and it can also be seen in the wild, when wolves reunite after the hunt or are preparing for the hunt and the pack leader carries his tail very high. This has led to the suggestion that the high tail carriage is acting almost like a battle flag, and this signal can also be seen when the pack leader approaches an unfamiliar animal or a possibly threatening situation. I have also mentioned previously, when a dog is signalling fear its tail position can fall between its hind legs and even tuck under. But a tail held in the down position by the hind legs can differ in meaning depending on the corresponding body language. Dogs that are unwell or experiencing pain may swing their tail back and forth slowly in this position or Stanley Coren suggests it could be translated as "I'm a bit depressed". But, if the rest of the body begins to slope down towards the back end the meaning is changed to signal something more like "I'm feeling uneasy" and a more wary or fearful posture is displayed.

A dog's tail moves in various ways too; in general a fast tail wag communicates excitement or tension. While a slight tail wag may be seen when two unfamiliar dogs meet one another, and they begin to 'suss out' how approachable or friendly is the other. The tail wag I am typically greeted with by my dog when I come home is a broad tail wag with a bit of a body wiggle too. I like to think this signals that my dog is pleased and happy to see me!

Some dogs may display a number of visual signals all at once, which can be confusing to understand. An example of this is an approach avoidance conflict; where the dog sees something that catches its attention, goes towards it looking interested and alert (pricked ears, tail up, eyes and mouth relaxed), but as the dog approaches it becomes unsure of what it is ("is this harmful to me?") it may withdraw, displaying signs of wariness, fear or even submission (ears flattened, lowering its body, tail down or tucked under, pupils dilated and so on). Therefore, visual signals are not only instant, but they can change within a split second and may convey conflicting information all at the same time!

Scent signals

The average dog has around 220 million scent receptors in its nose, compared to a human who has around five million. Therefore dogs' olfactory system is a highly sophisticated instrument, and scent signals are another way dogs convey information to one another. Bruce Fogle suggests that communication through scent is probably "the major means of communication for a dog".⁹ In 1959, Karlson and Weschler identified the existence of volatile substances which were produced by animals and these substances conveyed information to other animals of the same species. The type of information conveyed by these volatile substances they called 'pheromones', were physiological from the way they particularly affected the hormone system of the animal which received them. Pheromones not only influence the onset of puberty for dogs, but they give sexual and social information as different hormones are secreted when an animal is angry, frightened or confident. Pheromones are secreted in a number of ways; through urination, anal sac secretion,

⁹ Book: Fogle, Bruce (1990) *The dog's mind*, Pelham Books, chapter 5, page 66.

preputial secretions (exocrine glands that are located around the genital area), defecation and the rubbing of certain body areas against a chosen object or individual. Pheromones are also present in the dog's saliva, and in their dorsal tail glands, and scents released from these secretions, together with the marking and scraping of earth action is used for communication.

The most important scenting part of the dog is its anal glands. When a dog defecates the faeces are coated with mucus from glands within its large intestine. Secretions are then added from the anal sac and perianal glands. According to Bruce Fogle, very little research has been carried out on canine anal gland secretions but the red fox, which has similar glands, contains at least twelve components that are 'smelt'; these components include carboxylic acids, and it is these chemicals that can change which may enable a dog to identify the other's sexual status and emotional state. The scents in urine, faeces and anal sac secretions are as unique as the fingerprints of a human. The deposition of these secretions around the dog's environment communicates; the identity of an individual, ownership of an area, the frequency of its use, and how recently another animal passed through that environment. Scent signals also have an advantage over other forms of communication, in that they last longer. Therefore, messages can still be 'read' long after the depositor has left. This is particularly useful in the wild, where an animal entering a territory for the first time, may run the risk of meeting with a hostile reception. Evidence suggests that urine marks within a wolf packs territory deters other wolves from travelling into that area. Scent marking behaviour is a method used by dogs to mark a particular object, territory, or individual[s]. The purpose of scent marking and the type of mark used may vary from each situation. Bonnie Beaver says "scent marking originated as a way of familiarizing and reassuring an animal when entering a strange area...over time, this [scent marking] became a way of bringing sexual partners together, possessing a territory and maintaining a territory".¹⁰

Urine marks are typically placed at nose level, to provide maximum 'sniffing' opportunity for information to be conveyed to the reader. Stimuli that elicits a scent marking response can vary, from marking familiar and conspicuous objects such as lamp posts or post boxes to 'novel things', such as a new dog or rug. It is suggested that when urination occurs on another dog or a person, the message is one of dominance or possession. In the wild, wolves may mark prominent rock formations as a way of staking a claim for the surrounding territory. The advantage for dogs marking objects that are vertical is that firstly, the scent is nose level and secondly, having the scent above the ground allows air to carry it further. It is suggested that the height of the scent mark is also important in conveying information about the size and social status or dominance of a dog. Some dogs try very hard to make their marks as high as possible. For example, some African wild dogs have been seen to run towards a tree and somersault up it, urinating in a steady flow as the dog turns and runs back down the tree.¹¹ Obviously, this leaves a very high scent mark but perhaps this signals to other dogs be aware, there is a gigantic sized dog living in the area!

¹⁰ Book: Beaver, Bonnie (2009) *Canine Behaviour*, Saunders Elsevier, chapter 3, page 121.

¹¹ Book: Coren, Stanley (2000) *How to speak dog*, Pocket Books, chapter 16, page 253.

Scent marking in dogs may also occur when a dog is motivated towards aggression and is likely to attack. There is evidence to suggest that if there is an attack, the dog that marked is more likely to win the fight. And, although uncommon, when a dog is highly distressed, scent marking by way of anal sac secretion may occur.

Over marking with urine is frequently seen when I am out dog walking my clients' dogs. Typically same gender packs over mark more, for example, a female will often stand near another female that is urinating and when that dog moves away, the other will scent mark on the same spot. Male dogs will typically over mark too, when they detect urine left by a previous passing male. Sometimes backward ground scratching with the hind legs also occurs after the dog has eliminated. It is suggested that the disruption of the earth around the marked spot not only spreads the scent, but it serves as a visual signal also. Furthermore, the ground scratching may also leave additional scent signals from the dog through the glands in between its toes referred to as the 'interdigital glands', and on the glands on the foot pads called 'the merocrine glands'. Having smelt the faeces of another dog, some dogs may scratch the earth around the faeces perhaps in an attempt to disrupt the scent deposited or as a way of over marking that scent. Like, ground scratching can be a visual signal, so can the action of urination. Sometimes, if a dog is fearful it may produce some urine when it feels threatened, or as a sign of submission to indicate that the dog is not going to challenge the approaching individual.

Sniffing is a major part of the greeting ceremony for dogs. Typically, when dogs greet one another they may introduce themselves by firstly sniffing each other's faces, then they will then sniff one another's behind. As Bruce Fogle neatly puts it, "sniffing the anal region is simply the canine equivalent of shaking hands." This provides the dog with vital information such as the dog's age, state of health, emotional state, whether the dog is neutered or intact, its sex and sexual receptivity of potential mates, and perhaps even social status.

Dogs will gather all this information very quickly through their olfactory sense and this helps enable them to determine what their relationship to that other dog will be. For example, a female dog in heat will give release different pheromones than when she is out of season. Pheromones released through scent marking, saliva and the preputial glands signal the female's sexual status and invite the advances of potential mates. Interestingly, these pheromones will be secreted long before the female is actually prepared to accept the male dogs' advances. Consequently, male dogs may become highly aroused having detected the pheromones but they may be rejected by the female on finding her. According to Desmond Morris, this advanced invitation yet rejection is the female's way of maximising the probability of finding a mate. This example also demonstrates how it is probable that the pheromones secreted through urination and vaginal secretion can create an unconscious response from the reader. Bruce Fogle states that other scent carrying secretions such as saliva, ear gland secretions and anal pheromones probably act as hidden persuaders that influence behaviour by evoking mood shifts, or more long lasting physiological changes to the central nervous or endocrine systems.

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It is suggested that pheromones help dogs detect their owner's emotional state too. Micheal Bright suggests that dogs may be detecting radiations, ranging from heat to the electrical activity of our muscles, as well as pheromones, to detect the human's emotional state.¹² I also believe that subtle changes in our pheromones, as well as our physiological state, may well provide dogs with the information to understand when we are unwell. This belief is based on medical studies made over recent years which has indicated that dogs' sense of smell may help alert us to diseases such as cancer, as tumours can produce volatile compounds that have distinctive odours. Furthermore, in a study by Roger Reep of 77 epileptic dog owners, 10 per cent of those surveyed felt their dog sensed when they were going to have a seizure, despite not being a trained 'seizure dog'. Reep suggests that when the human is going to have a seizure, chemical changes occur within the human's body which produces a particular odour, and this odour may be the reason for dogs sensing impending danger.¹³

Another important function of scent signals is that they aid in kin recognition, meaning they enable dogs to recognise their own pack or littermates. For example, Peter Hepper conducted a study which demonstrated puppies recognise littermates and prefer contact with them over non littermates. Hepper suggested that visual cues are most important at a distance, but chemical cues are used at closer range. And, it is this combination of olfactory and visual information that "mediates such kin recognition and contact preference".¹⁴

Another advantage of using scent signals is that even if a dog loses or is born without vision or hearing, that dog can still find out important information about its environment through its powerful olfactory sense.

In summary, dogs convey a wealth of information to one another through a number of sound, visual and scent signals, and it is these signals that help the dog to communicate information such as its social status, emotional and physiological states, age, sex, sexual receptivity and genetic relationship to another. Although, humans lack the superior sense of smell that our dogs have, I believe we can still learn how to interpret what dogs are telling us by carefully listening with our eyes, as well as our ears, and note the context these signals are being given, in order to have a better understanding of how to 'speak dog'.

¹² Book: *Shaping the Wolf Within Your Dog*, Nathan B Childs, page 69, chapter 9, Trafford Publishing (2004)

¹³ Website: *All About Seizure Dogs (2001)*, Newsroom, Epilepsy Foundation of America. Website: <http://www.epilepsyfoundation.org/epilepsyusa/aboutseizuredogs.cfm>

¹⁴ Book: Lindsay, Stephen R (2000) *Handbook of applied dog behaviour and training; adaptation and le earning*, Wiley-Blackwell, volume 1, chapter 4, page 140.