

Chemical communication can be direct, such as two dogs sniffing each other's butts as they meet. It can also be indirect. Odors are a way of communicating without being physically present: a dog can leave a pee message to be "read" later, by passersby. Dogs not only leave chemical signals with urine, but also with feces and glandular secretions (e.g., from the anal sacs).

Do dogs use the same signals for communicating with humans as they do for communicating with each other? To some extent, yes. But because of their close and long-term association with humans, dogs have also developed specialized skills for relaying information to us and for reading our cues. For example, some scientists believe that eye contact in dog-human communication is unique. Whereas dogs might avoid eye contact with each other, to avoid communicating a threat, dogs often gaze fixedly at humans—especially those they like—and will use the direction of human gaze as a source of information ("the human is looking over there; maybe that's where the treat is hidden"). Other research has shown that human gestural cues, such as pointing a finger or using a hand signal for a command, may have particular salience. In one study, dogs were given contradictory cues, one verbal command and one gestural. Dogs relied more heavily on the gestural cues.

When it comes to pet dogs, people often wonder whether communication skills vary by breed. And in fact, they may. Certain traits which humans have selected for aesthetic reasons may have the unintended consequence of reducing communicative nuance. *Brachycephalic* breeds, for instance (from Greek *brakhys*, "short" + *kephalē*, "head")—dogs with shortened skull bones

that give the nose and face a distinctive “smushed-in” appearance, such as pugs and French bulldogs—have less flexibility and range in facial expression than dogs with a more wolf-like skull and muzzle, and as a result are likely handicapped in communications involving wrinkling of a nose or raising of eyebrows. Likewise, dogs with very short tails may not be able to communicate mood and intention through tail posture as clearly as their long-tailed kin.

*See also* Allelomimetic behavior; Anal glands; Barking; Ears; Facial expressions; Gazing; Ground scratching; Hackles; Puppy-dog eyes; Olfaction; Scent marking; Tails; Urine; Wagging; Whiskers

### **Companion animal**

“Companion animal” began appearing in the literature in the 1960s, and since then has gained increasing popularity as the favored term to refer to dogs who live within human homes and in close companionable relationships with humans. Often used in concert with “guardian” as alternatives to “pet/owner.”

*See also* Pet; Owner

### **Conservation impact of dogs**

A key text on the conservation impacts of dogs on wildlife, by Matthew Gompper, opens with the story of a blue heeler (Australian cattle dog) mix named Shep who lived with his humans on a ranch in Wyoming. During his daily perambulations, Shep often chased and killed small animals. But one fateful September day in 1981, Shep caught and killed a black-footed ferret. Biologists were shocked because the black-footed ferret

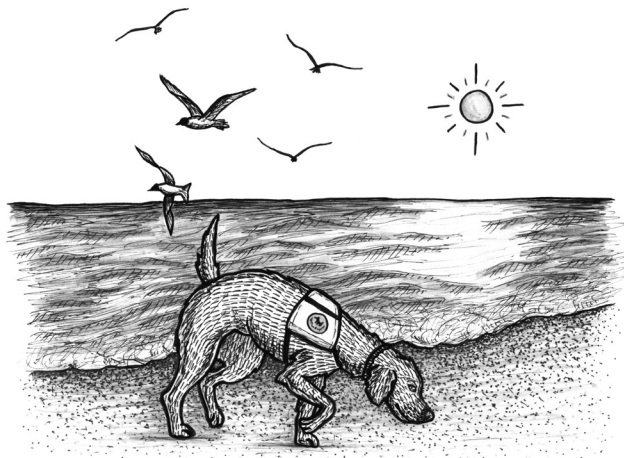
was largely regarded as extinct. Shep had done an enormous service by alerting scientists to the existence of black-footed ferrets; Shep had, at the same time, killed one of what turned out to be a global population of 16 individuals. Shep's story encapsulates the promise and the peril of dogs in relation to wildlife conservation.

The impacts of dogs on wildlife are diverse, complex, and in many ways, still very poorly understood. Because of our commensal relationship, humans and dogs live mainly in the same places; the distribution of dogs mirrors the distribution of humans. This means that dogs are almost everywhere on the planet. And there are a lot of dogs! There are more domestic dogs than all other canids combined. Dogs are referred to by biologists as a "subsidized predator": they receive resource inputs beyond what would be provided by the ecosystem. In other words, because dogs are given targeted human subsidies (we feed them on purpose), they can live in ecosystems at densities beyond what the ecosystem, by itself, could support, and can thus have an outsize impact on other species within that ecosystem.

Consider some of the myriad ways in which dogs can harm wildlife and natural ecosystems. Dogs chase and catch various animals, including small mammals such as rabbits and prairie dogs, birds (especially ground-nesting birds like wild turkeys), lizards, and snakes. Unlike their wild cousins, dogs are inefficient hunters—they often don't catch what they chase. But chase they do. Because pet dogs are well-fed, they have energy reserves to chase as much as they want. Having to flee from dogs uses up precious energy that critters need for other activities like finding food.

The effects of dogs on wildlife are often less visibly obvious than outright chasing of prey, but even more insidious. Dogs are agents of disturbance and create landscapes of fear. Fear alters the physiology, activity patterns, and habitat use of wildlife. Studies have found that wildlife activity is significantly altered by the presence of dogs. Trails used by dogs become corridors of fear within natural areas. One study, for example, found that deer distanced themselves from trails by at least 100 meters. If you consider that a trail might cut through miles of open space, you now have a corridor of space several miles long and 200 meters wide that is unusable by deer. And this, of course, is assuming that all the dogs are on leash.

We must, in fairness to dogs, also mention the expanding and exciting beneficial role of dogs in conservation efforts. Because dogs can maneuver through dense undergrowth more quickly and efficiently than human biologists and have superior olfactory skills, dogs can help biologists locate and conduct population surveys of endangered animals. Dogs can be trained to detect the scat of a particular species and have been used to locate scat of giant armadillos and giant anteaters in Brazil, grizzly bears in Canada, a rare species of kit fox in the U.S., and kiwi birds in Australia. Dogs also assist humans in projects to control or eradicate invasive species. In Wales, a cocker spaniel named Jinx has been trained to help protect seabirds. The coastline of Wales is critical breeding ground for many species of seabird, including the Manx shearwater, which nest underground in burrows on the islands along the coast. Jinx is called a “biosecurity dog”: he has been trained



to sniff out brown rats, who are proliferating on the islands and who feast on seabird eggs, chicks, and even adult birds.

*See also* Hybrids; Olfaction; Working

### **Co-pilot**

Like so many things dog-related, bumper stickers tell us a lot more about people than they do about dogs. Dog-themed stickers can be expressions of humor, often with a jab: “My dog is smarter than your honor student,” “Wife and Dog Missing. Reward for Dog,” and the ever-popular “Honk If You Can See My Wiener.” Stickers express advocacy: “Adopt don’t shop.” “Who rescued who?” (a formulation irksome to grammarians). They repurpose religious sentiment or offer an irreverent play on words: “Dog is my co-pilot.” And sometimes

we bring our dogs into human politics: “My dog ate Mike Pence. You’re welcome.”

### **Coprophagy**

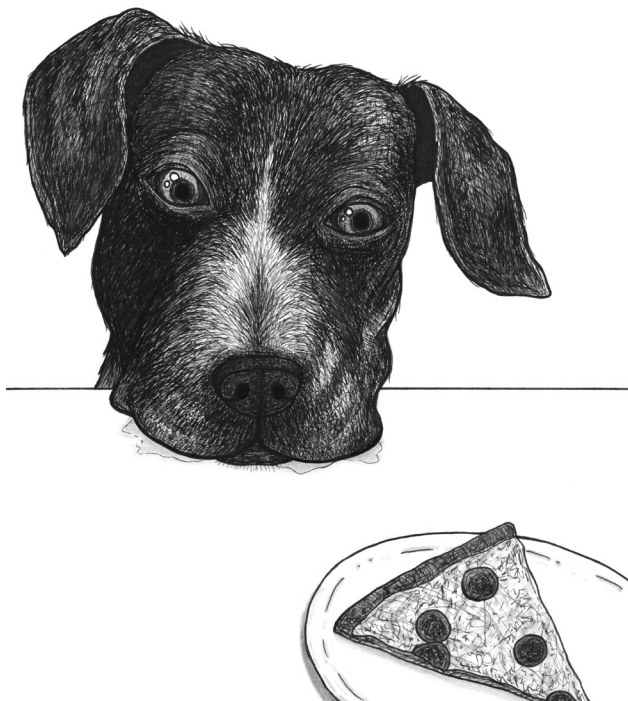
*Coprophagy* is the scientific term for eating poop. As a veterinary diagnosis, a dog who spends too much time eating his own poop or the poop of other dogs may be suffering from “coprophagia.” Excessive poop eating can be a sign of physical or mental illness, and guardians of highly poop-obsessed dogs should seek professional help. Admittedly, it can be hard to draw a line between normal canine behaviors and behavioral pathologies. Even normal snacking on poop is considered repellent by some dog guardians, and tolerance for the behavior can be low. Yet some poop-eating, of course, is part of the normal behavioral repertoire of dogs. The consumption by dogs of human feces is part of our shared evolutionary background and is natural, if somewhat disgusting when performed by a pet dog with whom we share ice cream cones.

Among free-roaming dogs, eating human feces is often an important source of nutrition. A study of dogs living in rural Zimbabwe found that human poop was their fourth most common food. Human feces are consistently available and provide a relatively high-quality source of protein—better, for example, than the *sazda* (maize porridge) that many free-roaming dogs are fed.

*See also* Diet; Food resources

### **Counter surfing**

Circa late 1990s, early 2000s. Precise origin of the term is uncertain. “Counter surfing” describes a particular



form of canine food acquisition behavior that occurs within the human home and involves quickly snatching edible items from kitchen surfaces using snout, paws, or whatever body part is available. In some cases, a counter-surfing dog will perform incredible feats of athleticism, launching the entire body onto high counters for food retrieval. The behavior is usually surreptitious and involves some planning on the part of the dog—a dog waits until all humans have left the area or until an

unsuspecting human has turned their back for a moment. Counter surfing is one among many words and phrases used by humans to moralize the behavior of pet dogs, and to circumscribe the nature of our shared ecosystem: all food within the human home belongs to the human, unless directly earmarked, by the human, as intended for the dog. Dogs must only eat food labeled by humans as “dog food.” A dog trying to access food resources within the house is “stealing.”

*See also* Diet; Food resources; Kibble

### **Crating**

Crating is a verbification of the noun “crate,” a box made of wood slats or latticed plastic and used for transporting or storing goods. Within contemporary dog culture, a crate is a box used to transport and store dogs, and crating is the practice, increasingly common in some twenty-first-century dog-keeping cultures, of confining a pet dog to a small cage within the home. Crating has several ostensible functions: it is used for house-training puppies; to physically constrain an adult dog when not being supervised by a human or when interaction with a human is undesirable; and to prevent dogs from destroying items that humans value and label as personal property. Crating is disparagingly called a convenience practice by critics—which is to say, it may make life easier for dog owners, while at the same time making life more difficult for dogs. Yet crates are undoubtedly useful in some circumstances. They are used, for example, to safely transport pet dogs out of areas hit by flood, hurricane, fire, or other natural disaster.

*See also* Fake turf; Pet



## **Cultural attitudes**

Human attitudes toward and treatment of dogs vary enormously across cultures and historical periods. Even within cultures, attitudes toward and treatment of dogs vary widely from one place to another, one home to another. Indeed, the only safe generalization is that you can't generalize. (This is a trap that even your trusty guide here has fallen into occasionally. When reference has been made to "pet-keeping countries," for example, this is just a broad brushstroke. Many individuals within contemporary American culture neither keep pets nor see the point of keeping pets—and may even consider the practice morally or hygienically offensive.)

One generalization can be safely proffered: where there are people, there are dogs. And where there are dogs, there are (diverse) human practices and beliefs about what kind of being dogs are, what kinds of relationships with dogs are morally or spiritually appropriate, and so on. A second general pattern is that in many places, dogs are viewed as companions by at least some people, though what this means in practice varies. A third general pattern is that in a great many places, dogs partner with humans in doing certain kinds of work, often related to agricultural practices and food acquisition.

Here are some of the attitudes and practices that might vary across time or place: 1) feeding regimes: Are dogs provisioned or not provisioned? Are they fed high-quality food items, or scraps and garbage and low-quality foods? 2) spaces where dogs are allowed and not allowed: Do dogs come indoors? Where do dogs spend most of their time during the day? Do dogs share our beds? 3) familial relations: Are dogs considered part

of the nuclear family? Are they treated like children?  
4) human consumption: Are dogs on the human menu?  
5) burial: Are dogs given ceremonial burials? If so, are they buried alongside people? Or in separate areas?  
6) work: Are dogs laborers or pets or both? 7) treatment: Is cruel treatment acceptable? What counts as cruel treatment? (Beating? Vivisecting? Forced breeding? Making dogs race or fight each other for human entertainment? Keeping dogs inside? Keeping dogs outside?)

*See also* Abundance and distribution; Companion animal; Epitaphs; Hayırsız Ada Dog Massacre; Pet; Stray; Streeties

## Cur

“Cur” sounds an awful lot like “grrrrrrr.” The word first appeared in the thirteenth century and is probably derived from Old Norse *kurra* or Middle Low German *korren*, both meaning “to growl.” (Can you find other dog onomatopoeias in the English language—and other languages, too? “Bark,” “howl, the “woofer” in your stereo, perhaps “zoomies”?) Like many dog-related words, “cur” carries echoes of social discrimination: “cur” was used to refer to a “low-bred man” and to a churlish, curmudgeonly person—one who is snappish and snarling.

*See also* Dog; Hound; Mutt

## Cursorial

Dogs, like other canids, are *cursorial* animals, from the Latin *currere*, “to run”; they have long legs that make them efficient runners (unless they have been artificially bred by humans to have super short legs). Cursorial animals are adapted either to running fast, like cheetahs,

or to running at a steady pace over long distances, like wolves and dogs and humans. Dogs walk, trot, gallop, and sometimes canter. Trotting is dogs' favored form of locomotion.

As in humans, there is great variation in dogs' athleticism. Like their human athlete counterparts, some dogs are built like runners, with lithe, long bodies, while some are most assuredly *not* built like runners. Good runners are not only fit, but also have an economy of movement and gait that makes them able to cover ground efficiently. A study on the effects of domestication on locomotor gait and economy found that more "wolf-like" dogs, including the northern breeds, such as Alaskan malamutes and Norwegian elkhounds, have greater aerobic economy—they expend less energy per stride—than breeds whose physical bodies are less like their wild canid relatives'.

One of the key welfare problems for dogs who are kept as pets is the lack of opportunity to run. Instead, many dogs are "walked," which typically means being attached to a collar and leash, going at a slow pace, and traveling in a straight line. Some dog guardians go to great lengths to help their dog access places where leashes are optional and dogs can let loose and run, lope, stop and sniff, dart, and zoom to their heart's content. Being unleashed can bring great joy to dogs. A 2013 study found that dogs likely experience what is known as a "runner's high," which is thought to be caused by the release of neurotransmitters, including endocannabinoids, into the bloodstream during hard running effort. The "high" is an evolutionary reward for staying fit.

*See also* Leashes

## **Cynanthropy**

Have you ever wished that you were a dog? Maybe wished it so hard that you felt your nose elongating and dark hair sprouting all over your body? If so, it seems you aren't alone. In fact, some people wish so hard to be a dog that they become one, at least in their imagination. *Cynanthropy* (from the ancient Greek *kúōn*, “dog” + *ánthrōpos*, “human”) refers to the ability to shape-shift into the form of a dog or weredog and has been an important piece of folklore in many cultural traditions. Cynanthropy also appears as a superpower in some contemporary gaming circles, granting individuals the supernatural ability to assume the form of a dog, often through the power of a full moon. Clinical cynanthropy (sometimes spelled “kynanthropy”) is defined, in psychiatric circles, as a delusional state in which a person believes himself or herself to be a dog. A 2022 report in the medical literature described the case of a 28-year-old single male diagnosed with cynanthropy two years after being bitten by a dog. Apparently, after COVID lockdown he began excessively researching dog bites on the internet and began increasingly to fear that he was being transformed into a dog. He began walking on all fours and barking, and obsessively checked his appearance in a mirror. A course of antidepressants prompted his recovery.

## **Cynoctone**

In 1902, the French animal protection organization Assistance aux animaux generously donated a cynoctone to the police's dog detention center. Put simply, the cynoctone was a device used to kill large numbers of

dogs at once. Caged dogs were lowered into an underground chamber, which was then filled with mixture of carbonic acid and chloroform. According to an early description of the invention, the gases in the chamber caused death by asphyxiation within six minutes; when brought back up to ground level, the cage would contain only corpses. The cynocotone was considered a wonder of modern technology: a machine that could apply principles of modern scientific progress to the slaughter of unwanted canines in cities. It was part of a larger movement toward what has euphemistically been called “humane euthanasia.” Unfortunately, we now know that asphyxiation is a horrible way to die.

At the turn of the nineteenth century, bustling metropolitan areas in the U.S., Britain, and Europe—cities like Paris, London, and New York—had large populations of free-roaming dogs. As cities changed and human attitudes toward dogs changed, loose dogs began to be categorized in ways that signaled their exclusion from the community. Consensus emerged that stray dogs should be rounded up and killed; they were a nuisance, a danger, an unsettlement. They carried rabies, they were dirty, they made a lot of noise, they bit people and their pedigreed dogs. Increasingly sharp lines were drawn between pet and stray, and between purebred and mongrel; the lines were traced over and over until no one could confuse these categories of dog.

At first, efforts to rid the streets of stray dogs involved hunting them down and killing them on the spot, using sticks or rocks or ropes or whatever was available. Over time, this brutal and public killing began to rub against

our tenderer impulses. Instead, dogs were rounded up and taken to centralized locations (“the pound”) where they could be disposed of more efficiently and less publicly. The killing gradually became less transparent to the public, and the narrative surrounding the killing of dogs shifted from “get rid of the pests” to “stray dogs are better off dead.” Killing became a work of compassion. Because the dogs *had* to be killed, the humane movement focused its attention on killing the poor waifs as painlessly as possible. The cynoctone was one iteration in this history of humane euthanasia. Before the cynoctone, there was lynching, drowning, clubbing; after the cynoctone, we turned to gas chambers and then, finally, to what is fondly called “blue juice”—the injection of sodium pentobarbital into the vein as the ultimate painless way to kill dogs who don’t fit into the right human social categories.

*See also* Shelters; Stray

**D**efecation  
Poop typically refers to the actual pile of brown stuff. Defecation is the physiological process of creating a pile of brown stuff, but it is also far more than this. Defecation is an important element in canine social behavior. Poop contains olfactory information for other dogs. Like other canids, dogs sometimes mark territory by defecating in a certain place. Unlike humans, who generally prefer to poop in out-of-the-way, private places, dogs like to poop out in the open, where the message will be prominently available to others.

*See also* Anal glands; Ground scratching; Poop laws; Urine

## **Diet**

Although dogs belong to the taxonomic order Carnivora (placental mammals who have specialized in eating flesh), and have the dentition to tear and chew flesh, they are dietary generalists and can and do eat a wide variety of foods. Indeed, being highly flexible in whom or what they will eat is one of the things that has made dogs so successful. Dogs' diet varies considerably from one ecosystem to the next and depends on the availability and type of human-derived materials (also referred to as anthropogenic food resources), the types of prey available and how easy or hard they are to catch, and competition from other species for the same food sources. Free-roaming dogs tend to eat a lot of fruits and other vegetation, human-derived materials, and small mammals. Also, to a lesser extent, they forage on fish, birds, reptiles, amphibians, insects, and what might be classed as "non-food" items (cardboard packaging). In some areas, dogs may eat a narrow range of foods, because that's what's available to them. For example, in India, dogs mainly eat human-derived materials (garbage, feces, scraps) and vegetation; in Zimbabwe, they mostly eat mammal prey; and in the U.S., they primarily eat food provisioned by their human guardians.

The diet of homed dogs is highly variable and depends on what the guardian of the dog has decided is most nutritious, cheapest, easiest, or has the cutest packaging. Many homed dogs are fed kibble or canned foods, designed and processed by dog food manufacturers. These foods generally contain a protein source—often the rendered parts of slaughtered animals that humans find disagreeable and don't want

to eat ourselves—combined with grains, vegetables, or fruits. Whereas free-roaming dogs may sometimes suffer from insufficient food, homed dogs often suffer from excess. Obesity is an enormous public health epidemic among pet dogs. Mirroring patterns seen in humans, over 50 percent of pet dogs are overweight or obese.

The question of what diet is best for dogs is highly contentious among humans who keep dogs as pets. Some have argued that dogs should eat like wolves. But the comparison to wolves is problematic in the realm of diet. For one thing, dogs don't get nearly as much exercise as their wild relatives. Perhaps more importantly, dogs have evolved to eat differently, because of their close association with humans and the sharing of food between humans and dogs. Domestication has altered dogs' digestive system. Their microbiome is different from wolves', and they have adaptations, including the alpha-amylase 2B gene for digesting starches, that allow them to process a wider range of foods.

*See also* Food resources; Kibble; Taxonomic classification

## **Digging**

Why must dogs dig holes in our perfectly landscaped gardens? Well, dogs might have their own sense of what's beautiful. And, perhaps more importantly, digging just seems to bring them joy. Digging is an instinctive behavior, and dogs may feel the need or desire to dig even if it doesn't serve any immediate purpose. The behavior may be related to hunting prey, especially going after burrowing animals and insects. It may also relate to denning. Studies of free-roaming dogs have



included observations of denning. Dogs dig holes to bury stuff, like bones. This is a smart way of caching food for later. Dogs who dig may be looking for items stashed by other digging dogs. Sometimes digging may be an attempt to escape, by digging under a fence or other barrier. Sometimes dogs will dig down into sand or dirt to create a cool space to rest on a hot day. Some dogs may be bored, and digging may provide an outlet for creativity or a way to burn off nervous energy. Some dogs may just be trying to dig their way to China.

Digging behavior has been developed in some breeds of dog through selective breeding. For example, terriers, who were bred to hunt critters who live in holes (like rats), may be especially driven to dig. Whatever the reason, many dogs like to dig, and find digging satisfying. Unfortunately, digging—like many other natural dog behaviors—is something for which dogs are often scolded or punished in human environments. To provide acceptable outlets for digging, some dog parks have designated digging holes, and some dog guardians will provide special dig-friendly places like a sandbox in their yard.

*See also* Joy; Selective breeding

### **Displacement behavior**

The term “displacement behavior” was coined by ethologists as a way of describing a normal behavior that seemed out of context, or “displaced.” Animals engage in displacement behaviors when in a state of inner conflict or anxiety—perhaps they are curious, but also afraid. The individual tries to achieve a sense of control and calm by performing an activity that feels safe. Some displacement behaviors seen in dogs are yawning, lip

licking, tongue flicking, grooming, sniffing at the ground before meeting another dog, urinating, and picking up an object like a toy or stick and carrying it.

Human displacement behaviors include fidgeting with your hair when you are talking to someone you find sexy, or scratching your head when you can't decide what to do.

*See also* Yawning

## **Dog**

“Dog” is a biological designation (quadruped of the genus *Canis*), but it is so much more. Oddly, for a word that is used millions of times a day in English-speaking countries, its etymology remains one of the great mysteries of the English language. Best guesses suggest that “dog” comes from the Proto-Indo-European root *kwon* (also the root of *canid* and *canine*). By at least the twelfth century, “dog” was used in reference to persons, and not in a complimentary way. The various uses and meanings of “dog” point toward a long history of negative attitudes toward dogs. Used figuratively, a “dog” is a worthless or contemptible person, an unattractive woman (sprinkling some sexism onto our speciesism), an undesirable or inferior piece of merchandise. To “dog” or “hound” someone is to be a source of constant, unrelenting irritation; “going to the dogs” suggests impending ruin.

*See also* Cultural attitudes; Cur; Mutt; Hound

## **Dogor**

It is a dog? Or . . . ? Dogor, which means “friend” in the Yakut language, was the name given to the 18,000-year-old remains of an early canine specimen found in 2018



in Siberia and remarkably well-preserved by permafrost. Dogor appears to have been about two months old when he died—he still has his milk teeth. Sequencing of DNA extracted from one of Dogor’s rib bones puzzled scientists, who couldn’t decide whether he was a dog or a wolf, or perhaps a transitional species. Eventually, scientists concluded that Dogor was a wolf who lived during a period when early dogs were beginning to evolve. Even with the Dogor mystery solved, questions about dog evolution and domestication remain in flux and are keeping scientists very busy. If Dogor had been a dog, he would be the oldest ever found to this point. The so-called Bonn-Oberkassel puppy, whose remains were found in a quarry in Germany, has been aged at 14,200 years old, and is currently the oldest identified

dog specimen. But there are probably proto-dog remains that are at least as old as Dogor, and our story of dogs' history will surely continue to change as new discoveries are made.

*See also* Domestication; Paleofeces; Teeth

## **Domestication**

Domestication is a biological process that has led to the formation of unique human-animal relationships. Domestication is not the same as taming. Taming refers to the habituation of an individual animal to the presence of humans. Taming does not alter DNA. Domestication, on the other hand, involves genetic changes that are heritable, and is something that happens to a whole species. Taming was likely part of the domestication process for dogs: tame wolves became, at some nebulous point or several points, domesticated dogs. Dogs are one of only 14 large mammal species to have undergone domestication.

The domestication of dogs was arguably one of the most important events in both human and canine history. And yet that's about all we can say without dipping our feet into one controversy or another. It happened such a long time ago, the only historical record is fossils, and it was an incredibly complex series of events. There is much we still don't understand, and new archaeological data and genetic analyses are constantly updating and altering the story. We can review in broad strokes how dog domestication may have gone down, but take everything here with a grain of salt—because new evidence will certainly have emerged, and the scientific consensus evolved, by the time this book is in print.

The domestication process for dogs likely took place over thousands of years (it is still underway), beginning roughly 40,000 years ago. Some scientists push the date back as far as 100,000 years; others believe the evidence favors a shorter timeframe of 15,000 years ago. Domestication probably took place on the Eurasian continent, but perhaps in more than one location on the continent. Dogs are descended from at least one, maybe several, precursors to today's gray wolves and have undergone a process of natural and artificial selection that has affected their morphology, cognition, behavior, and metabolism. One possible scenario is that some wolves were more predisposed than others to tolerate the presence of humans and felt lower levels of fear. The wolves who chose to live in proximity to humans had fitness advantages such as better access to food and a level of protection from predators.

At some point, humans started to selectively (though unconsciously—they wouldn't have known modern genetics) breed dogs for certain functions, such as pulling sleds. At some much later point (at least 2,000 years ago, perhaps more), humans began selecting and breeding for highly specialized physical and behavioral traits, in a process that we now call artificial selection. Though many current dogs are the product of deliberate breeding for certain traits, many are not. Dogs still mate and reproduce outside human channels and live semi-independently of humans. Some dogs, such as the dingo and the New Guinea singing dog, may have undergone early stages of domestication, but have been free of direct human selective pressures for some time.

You often hear generalized statements such as “humans domesticated dogs.” But bear in mind that domestication is a profoundly complicated and synergistic process involving human-directed changes as well as adaptations to specific and perhaps novel ecological niches. Humans cannot—sorry to say—take full credit for domesticating dogs. Dogs did a lot of the work themselves, and nature had a large hand in it, too. And just as dogs have evolved through their close interrelationships with us, so too have humans been indelibly shaped by our long history with dogs.

*See also* Artificial selection; Attachment; Breed; Landrace; Neoteny; Paedomorphism; Puppy-dog eyes; Selective breeding; Wolves

## **Dominance**

Dominance is one of the most misunderstood and most consequential concepts in the realm of contemporary human-dog relationships. Dominance is often confused with or conflated with other things, including aggression, leadership, obedience, and punishment.

Simply put, dominance is control over the behavior of a conspecific (a member of the same species). Dominance, perhaps counterintuitively, is an evolutionary strategy for reducing conflict, which it does by establishing rank, and by creating clear signals of rank. Strategies for achieving and maintaining dominance sometimes involve physical interaction; dominance can also be communicated using body language, facial expression, and olfactory signaling, among other things.

Dominance and submission are linked concepts, used to understand and describe the behavior of social animals for whom intragroup, or within-group, conflict is costly. Social animals must work together to survive, and survival depends on cooperating, negotiating, and retaining peaceful relations. Fighting takes time and energy and can lead to injury or death. Social animals who are aggressive (e.g., wolf, dog, human) have evolved various strategies for reducing conflict, and dominant/submissive relations are one of these. Dominance and submission are extremely important in wolf packs; dogs also understand and use dominance and submission, but the behaviors don't function in precisely the same way for dogs as they do for wolves.

Dominance-based training—colloquially referred to as “I am the boss of you!”—has held a strange appeal within dog-training circles over several decades. (Strange because it is both scientifically and ethically flawed.) Although dominance-based training is a loose and imprecise designation, it generally reflects the idea that to train well we need to be in a position of power, and we gain and maintain this power through brute force and intimidation. Training methods include the so-called alpha role, which involves pushing a dog onto her back and pinning her there, usually by holding the throat until she stops struggling against you; “scruffing” (forcefully grabbing hold of the loose skin of a dog's neck); and grabbing and holding a dog's snout. Contemporary evidence-based training has moved beyond these fraught methods.

*See also* Aggression; Appeasement; Submissive behavior

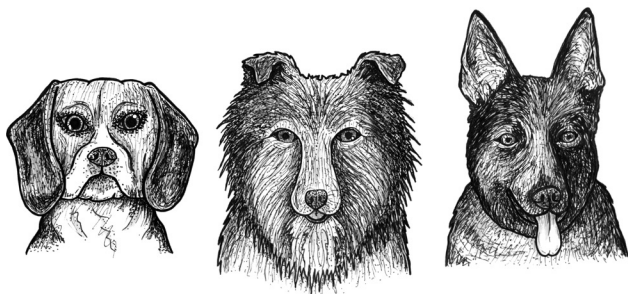
## Dreaming

Do dogs dream of chasing rabbits? Almost certainly, or at least they dream of chasing something or someone. Scientific understanding of animal dreaming is accumulating and supports the idea that dreaming is a neural activity spanning a diverse range of animal species. When dogs dream, they are likely replaying, rehearsing, or running through behavioral simulations of canine reality. A question we cannot answer yet is whether a dreaming dog ever successfully catches her leporine prey.

**E**ars The dog's ear is a wonder of anatomy. The pinna, or ear flap, has 18 muscles which allow the ear to raise up and lower down, rotate and twist, perk and droop. By comparison, the human ear has only 10 muscles, 4 of which are vestigial and serve no real purpose. Dogs have exceptional hearing—far better than our own. A dog's ear is like a funnel for sound; dogs can move their ears separately, so one can point forward while one is rotated backward or sideways, the better to take in auditory information from multiple directions. Head tilting might be a dog trying to hear better by changing the angle at which sound waves are hitting the ear canal.

In addition to collecting sensory information, ears are used to communicate mood and intention. Ears pulled back communicate appeasement, ears standing up and pointing forward communicate alertness and interest, ears flattened down communicate an agonistic response, while ears held sideways express a state of inner conflict.





Dog ears come in variety of shapes and sizes: pricked (erect and V-shaped), floppy or dropped, semi-erect, and lobate, to mention just a few. It has been hypothesized that some of these ear shapes might compromise a dog's ability to communicate with other dogs and could also potentially affect the acuity of hearing. Extremely long and droopy ears, such as we see on the basset hound, cannot rotate very easily, and cannot prick or flatten with nearly as much nuance as a “regular” (wolf-like) dog ear. Surgical altering by humans of dogs' ears—a practice known as “cropping”—also effects communication by forcing the ears into an unnaturally pointy shape with reduced range of motion. A dog with permanently pricked ears, such as those seen on the Doberman pinscher, is rather like a human who has had too much Botox and whose face looks frozen in place.

One additional function of ears is temperature regulation. When a dog gets hot, blood vessels in the ears can expand, enabling more blood to flow closer to the surface of the skin. Hot ears on a dog can be a sign of fever.

When puppies are born, their ears and eyes are closed, an evolutionary strategy that protects these delicate and essential sensory structures from injury. Both will be open by the time a pup is about 14 days old.

*See also* Communication; Facial expressions

### **Ecological niches**

Ecological niche refers to the various factors that play a role in a species' survival, including food, shelter, competition, and climate. Humans and dogs don't have the same ecological niche, but we have overlapping niches. We can exist in the same place together but fill slightly different and mostly complementary roles. It is often said that the ecological niche of the domestic dog is the human home. But this is an oversimplification, and a human-centered way of describing things, assuming that the niche is created by us and we give dogs permission to live in it. It also overlooks the fact that the majority of the world's dogs don't live within human homes.

*See also* Abundance and distribution; Activity patterns; Conservation impact of dogs; Diet; Food resources; Pet; Stray; Streeties

### **Electricity**

Who would have guessed that dogs were involved, albeit nonconsensually, with the development of electricity? Let us go back in time to a famous feud between Thomas Edison and George Westinghouse in the late nineteenth century, over two competing systems of electric lighting. Edison's direct current had trouble traveling over extended distances; Westinghouse's alternating

current didn't have this problem, and it drove Edison crazy with jealousy. Edison began an aggressive campaign to discredit Westinghouse's alternating current, demonstrating that it was dangerous by holding public executions by electrocution not only of a well-known circus elephant named Topsy, but also of various stray dogs whom he had purchased for 25 cents each from neighborhood boys who enjoyed the sport of rounding up loose dogs. Edison also spent time in his laboratory in New Jersey exploring what would happen if one attached electrodes to calves and horses—how long would it take the animals to die under varying strengths of current? Try not to think about that the next time you turn on your lights.

## **Emotions**

It is hard to imagine, if you have shared close friendship with a dog, that the question “Do dogs have emotions?” was ever entertained by serious scientists. But it was, and it took until just the last few decades for animal emotions, including dog emotions, to become a major focal point of scientific research. Now that the winds have shifted, people are busy trying to understand the complex emotional experiences of dogs, and, more importantly, how we can harness this knowledge to help dogs living with us to be happier and more emotionally healthy.

Emotions are psychological phenomena that help animals manage and control behavioral responses to their environment. Fear, for example, elicits an adaptive behavioral response (run!). What emotions do dogs experience? For starters, dogs likely experience fear,

anger, sadness, happiness, joy, shame, embarrassment, resentment, rage, love, jealousy, pleasure, disgust, grief, and despair. Some questions that we cannot now answer with certainty (and probably never will): How are their inner experiences of these emotions different from our own? Are there emotions that are unique to dogs (for which we have no label, since we are incapable of even conceiving what these might be)?

Although inner states are, by definition, private and subjective, we can often infer the inner states of other animals by using what are called behavioral correlates. When an animal is doing X, they are likely feeling Y. The emotions of dogs are often evident in their facial expressions and body postures and can also be inferred from how they make decisions. One methodology used for inferring emotional states relies on testing what is called “cognitive bias.” Mood states are thought to bias decision making, with negative moods states leading an animal to be pessimistic about outcomes, to view the glass as half empty rather than half full, and to make decisions based on that pessimism. One study of cognitive bias in pet dogs found that dogs who exhibited high levels of separation anxiety were less optimistic about the possibility of finding food in a bowl placed across the room than their happier peers.

Dogs and humans—and many other animals—experience a phenomenon called emotional contagion. Emotions are infectious: emotional states spread from one person to the next, from one dog to the next, and even from person to dog and vice versa. Studies of emotional contagion in dogs—all of them conducted with pet dogs—have come up with a range of findings:

dogs are highly sensitive to the emotional states of their human guardian, and the longer they live with a person, the more they “catch” that person’s feelings. In particular, if a dog’s guardian is anxious, the dog is likely also to feel anxious. Female dogs show more contagion than male dogs.

*See also* Communication; Eureka!; Grief; Guilt; Inequity aversion; Jealousy; Joy; Love; Zoomies

## **Epitaphs**

Humans have ceremonially buried, mourned, and honored the lives of dogs for thousands of years. Some of the most visible markers of our commemoration are the epitaphs written for dogs and often placed on their grave. More epitaphs for dogs are found in the historical record than for any other animal. These epitaphs give us a window into how deep the human affection for dogs can run and reflect practices of boundary setting between dogkind and humankind.

An Egyptian dog named Abutiu (also spelled Abuwtiyuw) is one of the earliest known domesticated dogs to be given an epitaph—indeed, one of the earliest documented animals to have his or her name recorded. Dated to about 3100 BCE, an inscribed block of white limestone in Abutiu’s tomb tells us that the beloved dog of a king has died. The king wanted to be sure that the soul (or *ka*) of his dog would reach the afterlife and would be waiting for him when his own death came. The king ordered that the dog be buried in a coffin from the royal treasury, lined with red linen. Abutiu was likely a *tesem*, a hunting dog who might have looked like a modern-day greyhound.

The Greeks and Romans memorialized certain dogs and gave them burials and tombstones. On a tombstone with marble relief, erected sometime around 100–200 CE and found at Salernum, a lyrical poem honors the life of a dog named Patrice:

*Bedewed with tears I have carried you, our little dog, as in happier circumstances, I did fifteen years ago. So now, Patrice, you will no longer give me a thousand kisses nor will you be able to lie affectionately 'round my neck. You were a good dog and, in sorrow, I have placed you in a marble tomb and I have united you forever to myself when I die. . . . You, sweet Patrice, . . . were accustomed to lick with your greedy tongue the cup which my hands often held for you and regularly to welcome your tired master with wagging tail.*

Lord Byron wrote an entire poem for his Newfoundland dog, Boatswain, who died of rabies in 1808. Sometimes called “Epitaph to a Dog,” the poem is inscribed on Boatswain’s tomb, which happens to be much larger than the tomb of Byron himself, perhaps a fitting reflection of Boatswain’s superior moral character. Both tombs are at Newstead Abbey, Byron’s estate. The poem begins with a description of Boatswain’s impeccable moral virtue.

*Near this Spot  
are deposited the Remains of one  
who possessed Beauty without Vanity,  
Strength without Insolence,  
Courage without Ferocity,  
and all the virtues of Man without his Vices.*

Byron goes on to expound further upon the nobility of his dog's character, especially in comparison to hypocritical, lustful, deceitful, and vile humans, an interesting choice of focus, considering Byron's own moral lassitude. Yet Byron touches on a common theme in human-dog relations: we often project onto dogs those qualities of character to which we aspire and at which we are most likely to fail.

Modern epitaphs can be found at any of the hundreds of dedicated pet cemeteries in the U.S. and elsewhere around the world. Academic researchers whose work focuses on dog epitaphs—and yes, there are people who specialize in this area—believe that epitaphs are a window into cultural attitudes toward pets. For instance, scholars have noted a distinct shift in the early to mid-nineteenth century in the U.S. Dogs started to be spoken of as family, and gravestones began to denote human guardians as “Mommy” or “Daddy” and dogs as “our beloved baby.” Dogs were increasingly referred to using surnames (“Brownie Smith”). Another interesting shift reflected in epitaphs on dog tombstones occurred in the 1940s and '50s: the gates of heaven slowly creaked open wide enough to allow dogs. More and more gravestones of dogs had religious symbols or allusions to heaven.

*See also* Cultural attitudes; Domestication; Grief; Love; Pet

### **Eureka!**

Animals are wired to find hard work rewarding; reward, in the form of neurochemicals that create positive emotions, is nature's way of reinforcing behaviors that help

*(continued...)*