

Introduction

The dog is one of the two most ubiquitous and popular domestic animals in the world (the cat is the other). For more than 12,000 years the dog has lived with humans as a hunting companion, protector, object of scorn or adoration, and friend. The dog has evolved from similar (that is, undifferentiated) fur-bearing animals into more than 400 distinct breeds. Human beings have played a major role in creating dogs that fulfill distinct societal needs. Through the most rudimentary form of genetic engineering, dogs were bred to accentuate instincts that were evident from their earliest encounters with humans. Although details about the evolution of dogs are uncertain, the first dogs were hunters with keen senses of sight and smell. Humans developed these instincts and created new breeds as need or desire arose. Dogs are regarded differently in different parts of the world. Western civilization has given the relationship between human and dog great importance, but, in some of the developing nations and in many areas of Asia, dogs are not held in the same esteem. In some areas of the world, dogs are used as guards or beasts of burden or even for food, whereas, in the United States and Europe, dogs are protected and admired. In ancient Egypt during the days of the pharaohs, dogs were considered to be sacred. Characteristics of loyalty, friendship, protectiveness, and affection have earned dogs an important position in Western society, and in the United States and Europe the care and feeding of dogs has become a multibillion-dollar business. All dogs belong to the family Canidae, along with their relatives wolves, jackals, and foxes. They are members of the mammalian order Carnivora, or "Flesh Eaters." Although there are more than 400 different dog breeds, all dogs belong to a single species, *Canis familiaris*. Dogs have played an important role in the history of human civilization and were among the first domesticated animals. They were important in hunter-gatherer societies as hunting allies and bodyguards against predators. When livestock were domesticated about 7,000 to 9,000 years ago, dogs served as herders and guardians of sheep, goats, and cattle. Although many still serve in these capacities, dogs are increasingly used for social purposes and companionship. Today, dogs are employed as guides for the blind and disabled or for police work. Dogs are even used in therapy in nursing homes and hospitals to encourage patients toward recovery. Humans have bred a wide range of different dogs adapted to serve a variety of functions. This has been enhanced by improvements in veterinary care and animal husbandry.

Domestication.

It is uncertain when the first dog became a companion of humans, but it is likely that wild canids were scavengers near tribal campsites at the same time that ancient humans discovered a hunting partner in the animals that ventured close by. In ancient Egypt, dogs were thought to possess godlike characteristics. They were pampered by their own servants, outfitted with jeweled collars, and fed the choicest diet. Only royalty was permitted to own purebred dogs, and upon the death of a ruler his favourite dog was often interred with him to protect him from harm in the afterlife. Illustrations of dogs dating from the Bronze Age have been found on walls, tombs, and scrolls throughout Europe, the Middle East, and North America. Often the dogs are depicted hunting game with their human counterparts. Statues of dogs guard the entrances to burial crypts. In many cases these dogs clearly resemble modern canines. Such relics are indelible testimony to the importance that humans have given to the dog throughout the ages.

General characteristics.

Dogs come in a wide range of shapes and sizes. It is difficult to imagine that a large Great Dane and a tiny poodle are of the same species, but they are genetically identical with the same anatomic features. All dogs have 78 chromosomes, or 39 pairs of chromosomes (humans have 23 pairs). One member of each pair comes from each parent. Teeth. Dogs have two sets of teeth. Twenty-eight deciduous teeth erupt by six to eight weeks of age, and by the time puppies are six to seven months old these deciduous teeth are all replaced by 42 adult teeth. The permanent teeth include incisors, which are used to nip and bite; canines, which tear and shred flesh; and premolars and molars, which shear and crush. In short, a dog's teeth serve as weapons and as

tools for cutting or tearing food. The canines are the upper and lower fangs for which the dog family was named. As in most carnivores, the teeth are high-crowned and pointed, unlike the broad, grinding teeth of many herbivorous animals. The teething process can be difficult for puppies. Their gums hurt and become swollen, they may lose their appetites, and they may have mild intermittent diarrhea. Digestion. Dogs rarely chew their food. Once the food is taken into the mouth, it is gulped or swallowed and passed through the esophagus into the stomach, where digestive enzymes begin to break it down. Most of the digestion and absorption of food takes place in the small intestines with the aid of the pancreas and the liver. The pancreas secretes enzymes needed for the regulation of the digestive process. As in humans, the pancreas produces insulin and glucagon, both of which are necessary for the regulation of glucose. The liver is the largest internal organ in the body. It has six lobes (whereas the human liver has only one). The liver is responsible for many essential life-preserving functions. It helps digestion by producing bile, which aids in the absorption of fat. The liver also metabolizes protein and carbohydrates, and it excretes toxins from the bloodstream. In addition, it manufactures major blood-clotting agents. Because the liver performs all these vital functions, liver disease can be a major problem in dogs. Skeletal structure. The skeletal frame of the dog consists of 319 bones. If a dog's tail is docked or absent at birth, there obviously are fewer bones in the skeleton. The muscles and tendons of a dog are similar to those of a human; however, a dog's upper body muscles bear half the weight of the entire body and are better developed than a human's. The weight distribution between the front and the rear of the dog are relatively equal. Dogs are running animals, with the exception of those bred specifically for different purposes. For instance, the bulldog, with its large head and short, "bowed" legs, cannot be called a creature born to chase game. Most dogs, however, are well equipped to run or lope over long distances, provided that they are physically conditioned for such activities. The construction of the shoulder and pelvic bones and the way they articulate with the leg bones and the spine allow most breeds to trot, run, or gallop with ease. Certain breeds have distinct gaits that have been genetically selected by humans. The German shepherd dog is known for its "flying trot." The extreme extension of the front and rear legs causes the dog to appear as if it were soaring, although one foot always remains on the ground. Another unique gait is that of the greyhound. This dog was bred for great bursts of speed, and its most comfortable gait is the gallop. The spine is unusually flexible, allowing the dog to contract and extend its four legs in unison, whereby all four feet are off the ground at the same time. Other breeds also have unique features. The Afghan hound was bred to chase game over long distances in rocky terrain. Its structure permits great flexibility through the hip joints and lower back, enabling the dog to turn quickly in a small area. The dachshund, by contrast, is long and low with short legs. This dog was bred to hunt badgers underground, and its shape allows it to enter subterranean tunnels in search of its prey. Although most breeds no longer follow the pursuits for which they were originally bred, their instincts remain strong, and their structure still allows them to perform their specific tasks. Senses. Dogs have the same five senses as humans. However, some are more highly developed, and others are deficient compared with those of humans. Dogs' sense of smell is by far the most acute and is immeasurably better than that of humans. Dogs are used for such tasks as tracking missing persons, digging underground, and tracing toxic substances, such as gases, that are undetectable by humans. Dogs can detect drugs, explosives, and the scents of their masters. Not all canine noses are the same, however. Some breeds, such as the German shepherd and the bloodhound, have much more keenly developed olfactory senses than others. One would not choose a short-nosed breed, such as the pug, to engage in tracking. Even in short-nosed breeds, however, the olfactory centre is relatively highly developed. It is arranged in folds in order to filter smells from the incoming air. Some rescue dogs are trained to follow a scent on the ground, and others are trained to scent the air. Both are able to distinguish one person from another even after a considerable passage of time. Hunting dogs such as pointers, retrievers, and spaniels are trained to scent birds and can distinguish one variety of bird from another. The dog's sense of taste is poorly developed compared with that of humans. If forced to live on their own, dogs will eat almost anything without much discrimination. Dogs possess an acute sense of hearing. Aboriginal breeds had large, erect and very mobile ears that enabled them to hear sounds from a great distance in any direction. Some modern breeds have better hearing than others, but they all can detect noises well beyond the range of the human ear. Dogs are able to register sounds of 35,000 vibrations per second (compared with 20,000 per second in humans), and they also can shut off their inner ear in order to filter out distracting sounds. The eyesight of a dog is not as keen as its sense of smell, and it is generally thought that dogs have poor colour perception. Some breeds, such as the

Saluki and the Afghan hound, were developed to chase game by sight over long distances, and these dogs can see well enough to detect any movement far on the horizon. Dogs can generally see better in poor light than humans but not as well in bright light. They have a wider field of vision than humans because their eyes are set further toward the sides of their heads, but they are not as adept at focusing on objects at close range or at judging distances. Dogs have a third eyelid, a membrane that protects the eyeball from irritants and is sometimes visible in front of the eye. Dogs are sensitive to touch, the fifth sense, and use this sense to communicate with one another and with their human counterparts. Learning where to touch a dog is an important part in either stimulating or relaxing it and is useful in training a puppy or bonding with an adult dog. Coats. There are three basic types of hair: short (as on a pointer or Doberman pinscher), medium (as on an Irish setter or Siberian husky), and long (as on a chow chow or Maltese). Within these categories there are also coarse and fine types of hair. Dogs come in a wide variety of colours, but in many breeds colour selection is an important consideration, as is the colour distribution on the dog. Most dogs shed their coats seasonally. This is a natural occurrence that depends in large measure on the amount of available daylight. In the fall as days become shorter, a dog's coat will grow thicker and longer. In the spring the dog will begin to shed its coat, and it will take longer for the coat to grow in over the summer. Temperature influences the amount of body coat a dog grows. Dogs living in warm climates all year long rarely grow hair coats as thick as those living in colder areas, although this will affect the body coat and the amount of protective undercoat more than the topcoat or the length of furnishings on the belly, ears, and tail. Grooming is an important part of touch to a dog and can be a pleasurable and relaxing means of relating to it. The dog's coat forms a barrier between the environment and the skin. Grooming the coat enhances the dog's beauty and well-being and gives the owner the chance to evaluate the general health of the dog.

Reproduction.

Sexual maturity. There is some variation in the age at which dogs reach sexual maturity. Small breeds appear to mature faster than large ones, which usually cycle later. It is not uncommon for large-breed females to come into heat for the first time at more than 1 year of age, although 8 to 9 months is the norm. Dogs are sexually mature between 6 months and 1 year but are not socially mature until they are about 2 years of age. Females first cycle anywhere from 6 to 18 months of age and approximately twice a year thereafter. The only exception is the African basenji, which cycles annually, bearing one litter a year. Reproductive cycle. The heat cycle of the female lasts from 18 to 21 days. The first stage is called proestrus. It begins with mild swelling of the vulva and a bloody discharge. This lasts for about 9 days, although it may vary by 2 or 3 days. During this phase the bitch may attract males, but she is not ready to be bred and will reject all advances. The next phase is the estrus. Usually the discharge decreases and becomes lighter, almost pink, in colour. The vulva becomes very enlarged and soft, and the bitch will be receptive to the male. This stage may last 3 or 4 days or as long as 7 to 11 days. The female may be receptive a day or two past the time when she would still be fertile. In order to be sure that the breeding is taking place at the optimum time, vaginal smears and blood tests can be done by a veterinarian beginning before estrus and through the estral phase. At about the 14th day, or whenever estrus ends, the final, or luteal, stage of the cycle begins; this stage is called diestrus. The discharge becomes redder, the vulva returns to its normal size, and the bitch will no longer accept the male for mating. When all signs of discharge and swelling are absent, the heat is complete. The diestrus stage lasts 60 to 90 days (if no pregnancy has occurred) or until the bitch gives birth. She then enters anestrus, which is the time frame between the end of the last cycle and the beginning of the next proestrus. Canine males are always fertile from the onset of their sexual adolescence, usually after six months of age. Larger-breed males may take a few months longer to become sexually mature. Males are usually promiscuous and are willing to mate with any available female. Males produce far more sperm than is needed to impregnate the ova that are released during estrus. Small-breed bitches usually produce small litters. Two or 3 puppies in a breed such as a Yorkshire terrier is considered the norm. Large-breed litters can have as many as 10 or 12 puppies, although the normal bitch can suckle up to 8 at a time. Gestation and whelping. The normal gestation period is 63 days from the time of conception. This may vary if the bitch has been bred two or three times or if the eggs are fertilized a day or two after the mating has taken place. Eggs remain fertile for about 48 hours. Sperm can live in the vaginal tract for several days. In order to determine if a bitch is pregnant, a veterinarian can manually

palpate her abdomen at about 25 days after breeding. Ultrasound also can be done at that time. At about 40 days X rays will confirm pregnancy. Most bitches whelp normally. However, the large-headed, short-bodied breeds and the toy breeds often must undergo cesarean sections in order to deliver live puppies. Reproductive capacity. Both males and females are fertile well into their advanced age. It is generally considered best for the bitch to be bred for the first time upon maturity but not before her second or third heat cycle, depending on her age at the first. Because small breeds mature more quickly, they can be bred at an earlier age than large breeds. A bitch will have less difficulty in conceiving and carrying a litter if she is bred before the age of five. As she becomes older, litter size generally decreases. After the age of seven, bitches are likely to have small litters and experience problems in delivering the puppies. Veterinarians feel that bitches generally should not be bred after that age. Males can be bred as long as they are fertile, although with age the motility and quantity of sperm decrease.

Selection.

The next consideration is the selection of a particular type of dog. Many people want a purebred dog because they like the appearance or the personality, and they are assured that the puppy they buy will grow up to look like the breed it represents. Others find that a mixed breed will do just as well, and there are many shelters, humane societies, and rescue groups that harbour dogs in need of homes. No matter what kind of dog a person chooses, it is essential that it be a healthy animal. When evaluating a puppy or an adult dog, several features will help determine the physical condition of the animal. The dog should appear friendly and outgoing. Puppies in particular should exhibit curiosity and a tail-wagging enthusiasm. They should not hang back or appear timid or frightened. Eyes should be bright and shiny with no discharge, and the inner eyelids ought to be smooth and pink. Ears should be clean-smelling and free of debris. Gums must be pink and firm, except in the case of chow chows and shar-peis, whose gums and tongue are black. The skin should feel warm and dry to the touch. Clammy skin or the presence of reddened patches, crusts, scales, or parasites are indicative of problems that could be both external and internal. The hair coat ought to be clean and sweet-smelling. The dog should be in good form and build, but not obese or so thin that the ribs and hipbones show. People buying purebred dogs should know the distinctive characteristics of the breed they have chosen, so that they can ask the breeder proper questions and have some means of evaluating the quality of the dog they are purchasing. Many purebred dogs have hidden genetic problems of which good breeders are aware. Many of these problems can be controlled by careful breeding, but the purchaser must know through reading about the breed and talking to fanciers what questions to ask. Mixed-breed dogs also can have hidden genetic problems, but there is no way to determine what they might be or whether they will eventually affect the dog in an adverse manner. Great strides are being made in veterinary research to identify genetic defects and thereby assist breeders to select the best breeding stock. By eliminating from their gene pool those dogs with genetic abnormalities, breeders can help ensure that the breed remains healthy and viable.

Nutrition and growth.

Puppies need three basic things in order to thrive: good nutrition, warmth, and companionship. Puppies need to eat three or four times a day from the time they are weaned until they are about six months old. Thereafter they can be fed twice a day until maturity and once daily after that. However, many dog owners, especially those with large breeds, feed twice a day throughout the dog's life (this does not mean feeding more than the required daily amount, but it is a more balanced method of feeding). Puppies need twice an adult dog's maintenance requirements of energy and nutrients for proper growth from the time they are weaned until they reach about half of their expected mature weight. There should be steady growth on a weekly basis, but there should be no excess fat around the abdomen. Puppies grow best if they remain at a suitable weight without becoming obese. Overweight puppies are candidates for crippling bone diseases if they are too heavy during the critical growing months. On the other hand, feeding too little will result in poor growth and lack of energy. Adult dogs burn fewer calories than do puppies or young and active adults. Therefore, they need to eat less in order to maintain optimum weight and activity. Dogs that work require extra nutrients. For instance, sled dogs need to be fed a diet that is much higher in calories, one with a ratio of fat, protein, and carbohydrates very

different from the diet of more sedentary dogs. Owners may have to experiment with different types of food to determine which are best suited to their dogs. There are three basic types of commercially produced dog foods: canned, dry, and semimoist. Predominant ingredients of most of these include corn, wheat, barley, rice, or soy meal, in combination or alone. Commercial dog foods also include a meat such as beef, lamb, chicken, or liver, or meat by-products. It is important to read the labels to determine the proportions of each and the amounts of proteins, carbohydrates, fats, and vitamins and minerals contained. Sleep is almost as important as nutrition for puppies. A warm, quiet place for them to rest is essential for normal growth. Puppies will usually play vigorously and then suddenly fall asleep. Their need for sleep decreases as they grow into adulthood, but dogs spend a great deal of their time sleeping when they are not stimulated to activity. All dogs need exercise, some more than others. Achieving good health and sound temperament demands that dogs be given the opportunity for regular stimulating exercise. Puppies should be allowed to run at will without restraint and without being pushed beyond their limits. As dogs mature, jogging or walking on a lead can be introduced, but any forced exercise should be withheld until the dog is fully grown. The most common cause of a dog's destructive behaviour in the house is lack of exercise. Behavioral problems such as tail chasing, chewing, and excessive barking and whining can in most cases be traced to confinement for long periods of time without respite. The ability to provide adequate exercise is one of the most important considerations that prospective dog owners must face before acquiring a puppy. Exercise, however, does not mean allowing the dog to run at large. Dogs ought to be supervised at all times when outside: they either should be accompanied by owners using a lead or have a securely fenced area in which to play. The term companion animal means that dogs need company. They are happiest when allowed to be an integral part of the household. Puppies thrive and learn when they are included in the household routine at an early age. Training becomes easier when the unique bond between human and dog is strengthened from the beginning.

Toys.

The Toy group is composed of those canines that were bred specifically to be companion animals. They were developed to be small, portable, and good-natured, the sort of dog that ladies of the court could carry with them. These dogs were largely pampered and treasured by aristocracy around the world. Several of these breeds come from ancient lineage. The Pekingese and the Japanese Chin were owned by royalty. No one else was permitted to own one of these breeds. They were carefully bred and nurtured, and until the mid-20th century they were not allowed to be exported out of their countries of origin. In England the cavalier King Charles spaniel, a bred-down version of a sporting spaniel, was the favourite pet of many royal families. Cavaliers, while popular in the United States, are not registered with the AKC, but their close cousins, the English toy spaniels, are. Toy poodles also belong to this group. The miniature pinscher resembles the Doberman pinscher but in fact is of quite different legacy. This perky little dog has a particularly distinctive gait, found in no other breed. Its standard calls for a hackney gait, such as that found in carriage horses. Other members of the Toy group are equally individual in their looks and personalities, making this the most diverse group. They make ideal apartment or small-house pets and are found ranging from hairless (the Chinese crested) to the profusely coated Pekingese or Shih tzu. In general, however, Toy breeds are alert and vigorous dogs. They are fine-boned and well-balanced, often considered graceful animals.