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mammal – navigation

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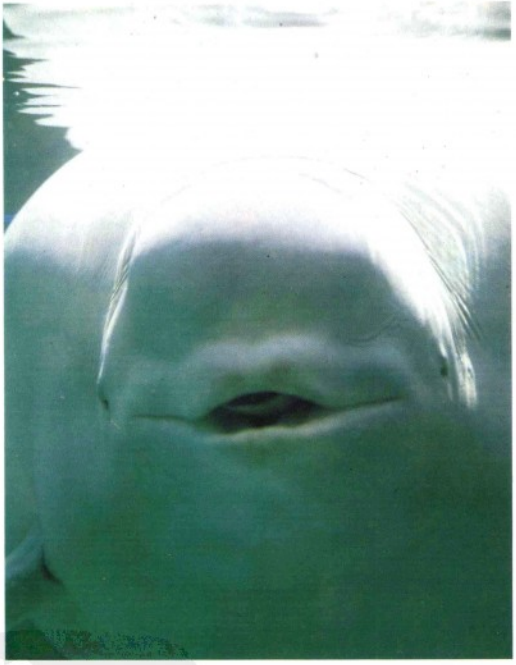
mammal



You are a mammal. So are dogs, cats, horses, cows, kangaroos, rabbits, and mice. Lions and tigers are mammals and so are the creatures that they hunt – antelopes, zebras, wildebeest and buffalo.

The word 'mammal' comes from the Latin word *mamma*, meaning breast. All mammals have breasts, or mammary glands. In adult female mammals the mammary glands produce milk. Young mammals feed on the milk of their mothers by sucking at the breast. No other types of animal are able to nourish their offspring in this way.

Not all mammals live on land. Whales and dolphins are mammals that live in the sea. Their bodies are suited for life in the sea and they cannot live on land. They are occasionally washed ashore. But they soon die because their internal organs are crushed by the great weight of their body, which is normally supported by the water (see: *whale*). Seals and sea lions are mammals that are at home on land as well as in the sea (see: *seals and sea lions*).

No mammals can fly except for one group – the bats. Bats have their front limbs specially modified for flight. Some other mammals, such as the flying squirrels, have folds of skin between their front and back legs. They can be used for gliding to the ground from the tree tops but not for flying (see: *flying creatures*).

A few mammals, like the moles, live underground. Moles have strong front limbs which they use for burrowing through the soil. For most of their lives moles are in total darkness. They have little use for their eyes and some kinds of mole are blind.

Altogether there are about 4,200 different types, or species, of mammal in the world. In distribution, they range from the freezing cold Arctic regions to the hot jungles of the tropics. In size, they range from the tiny pygmy shrew to the giant blue whale. The pygmy shrew is only four centimetres (one and a half inches) long and weighs less than a five-pence piece. The blue whale can grow to 30 metres (100 feet) long and may weigh up to 175 tonnes. It is the largest animal that has ever lived – larger even than the biggest dinosaurs (extinct reptiles that died out about 70 million years ago).

It may be difficult to imagine that the blue whale and the pygmy shrew have many features in common. Mammals such as the armadillo, the kangaroo, the giraffe, and the dolphin all seem to be very different from one another, but a biologist places them all in the class Mammalia.

Biologists classify plants and animals by arranging them into groups. These are kingdom, phylum, class, order, family, genus, and species. A number of species may make up a genus and a number of genera may make up a family, and so on. Mammals are members of the animal kingdom. So, too, are amebas, frogs, insects, spiders, snakes, and fish, but these are not mammals.

The mammals are members of the group of animals called the 'vertebrates'. The vertebrates are all the animals that have a backbone. The vertebrates include the fish, amphibians, reptiles, birds, and mammals. (Amphibians are animals that can live in water and on land, see: *amphibian*.)

Some vertebrates live in water, and breathe with gills. These are the fish and the immature stages of the amphibians, tadpoles for instance.

Both the European dwarf shrew *(top left)* and the white whale of the Arctic Ocean *(above)* are mammals, although their appearance and habits are very different. Like all mammals, the females have mammary glands, from which the young obtain milk. Shrews are among the smallest of all mammals. Whales are the largest mammals

But mammals, mature amphibians, reptiles, and birds breathe with lungs. Even the mammals that live in water, such as the whales, breathe with lungs. Although they can live for half an hour or more under the water, whales have to come to the surface to breathe. In this respect they are quite different from fish, which breathe under the water with their gills.

Mammals are 'warm-blooded' animals. They keep their body temperature at a constant level, regardless of the outside temperature. The body temperature of human beings remains so close to 37°C (98.6°F) that any marked change in temperature is usually a sign of illness. Birds too are warm-blooded. Reptiles (such as lizards and snakes), amphibians (such as frogs and toads), and most fish are all cold-blooded. Their body temperatures vary with their surroundings.

Birds and mammals keep their body temperature regular by balancing the heat gained and the heat lost. Heat is gained by the chemical processes in the body called metabolism (see: *metabolism*). Heat may also be gained from the surroundings, for example, the Sun or a hot fire. One way heat is lost is through the skin (see: *skin*). To prevent too much heat being lost birds have a warm coat of feathers. Mammals have fur or hair that grows out of their skin (see: *hair and fur*). All mammals, with a few exceptions, are covered with hair or fur. Man is less hairy than most other mammals. But we wear more clothes when it gets colder. A layer of fat under the skin also helps to cut down heat loss (see: *cold*).

Milk glands

As we saw earlier, female mammals are unique among animals in producing milk from their mammary glands. A baby whale or dolphin can feed on its mother's milk while it is under the water. The female whale has special muscles in her mammary glands with which she can squirt milk into the baby's mouth. (See: *milk*.)

The female also nourishes and protects her young before birth. Most mammals are born after growing for some time inside their mother. This time is called the gestation period. Pups are born 63 days after the eggs (female sex cells) of the mother dog have been 'fertilized' by the sperms (male sex cells) of the father dog when the parents mated. The gestation period of man is approximately 280 days, and of horses it is 336 days. (See: *gestation*.)

During the gestation period, the young mammal is inside the uterus, or womb, of its mother. It is linked by a tube, called the umbilical cord, to the 'placenta', attached to the uterus. Food materials pass from the mother through the placenta to the young mammal. Inside its mother, the young mammal is protected while it is most delicate and liable to injury. Having a placenta has given the mammals an enormous advantage for survival. But there are a few mammals that do not have a placenta.

The duck-billed platypus and the echidna are the only two members of a strange group of mammals, called the monotremes, Echidnas live in Australia, Tasmania, and New Guinea. The platypus lives only in eastern Australia and Tasmania. These two mammals are the only ones that lay eggs. They have mammary glands but no teats. Instead the milk oozes out of pores in the skin where the newly hatched young lap it up. Some scientists would not include the monotremes among the mammals at all. They have several features in common with reptiles.

The second group of mammals that do not have a placenta are the marsupials, most of which live in Australia, Tasmania, New Guinea and nearby islands. Among the Australian marsupials are the kangaroo, the wombat, and the koala. But there are also a few marsupials, including the opossum, that live in America. One, the common opossum, is found from Argentina to Canada. The others are restricted to Central and South America.

The mammary glands of the female marsupial are inside a pouch on its belly. The young marsupial is born comparatively soon after its parents have mated. The gestation period of the opossum is only 12½ days. When it is born a young opossum is in a very immature state. It is smaller than a honeybee. However, in less than half a minute it has found its way to its mother's pouch. There it is protected until it is ready to fend for itself. As soon as it enters the pouch, it fastens onto one of the many teats of the mammary glands. On average, less than two thirds of the young born to opossums reach the pouch and survive. Those that do, stay there until they are about ten weeks old. Then they leave the pouch, though they may still return for protection. They leave the mother when they are about 4 months old. (See: *marsupial*.)

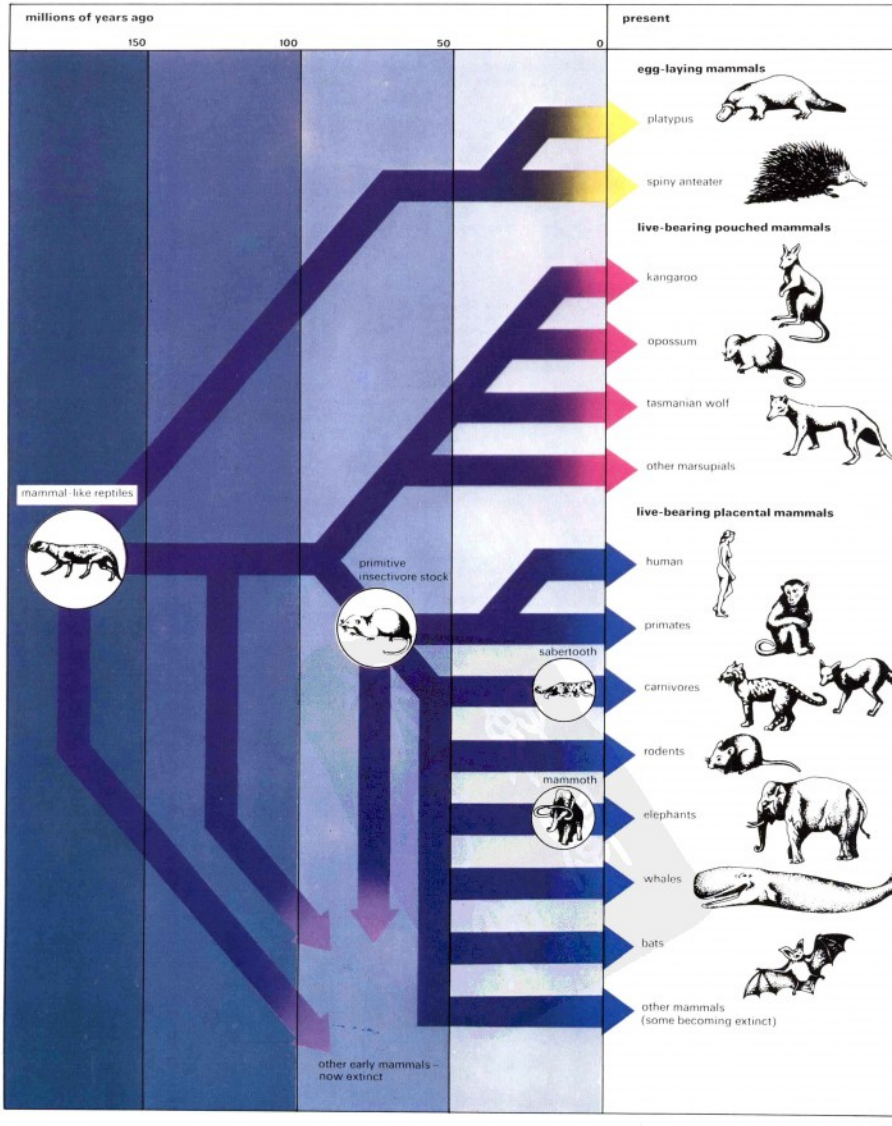
The two most obvious things that distinguish mammals from the other vertebrate animals are the way that they nourish their young with milk, and also the hairs, or fur, in their skin. But there are several other features which mammals have that separate them from other classes of animal.

Every mammal has a sheet of muscle called the diaphragm, separating the abdominal cavity from the chest cavity. The chest cavity contains the lungs. The muscular diaphragm contracts and relaxes, thereby varying the pressure in the chest cavity. When the diaphragm contracts, the pressure in the chest cavity is lower than that of the outside air. Air forces its way into the lungs. When the diaphragm relaxes, air is pushed out of the lungs. (See: *breathing, lung*.)

The bones of the skulls of mammals are different in several ways from those of other vertebrates. The lower jaw of mammals is hinged directly to the skull. In other vertebrates, it is connected through a separate bone.

The skin of mammals is different from that of other animals, not only for its hair, but also because it contains special structures, the sweat glands, and the oil glands. (See: *skin, sweat*.) Oil glands are usually connected to the roots of the hairs. The oil lubricates the hairs, and for many mammals it serves the useful function of making the coat waterproof. The sweat glands open onto the surface of the skin. When they are too hot, mammals lose sweat,

The descent of the mammals. Scientists have traced the origins of the many different kinds of mammal living now back to mammal-like reptiles alive some 200 million years ago in the age of the dinosaurs. The first true mammals probably appeared some 70 million years ago. Not until about 2 million years ago did the first man-like mammals appear


millions of years ago
150
100
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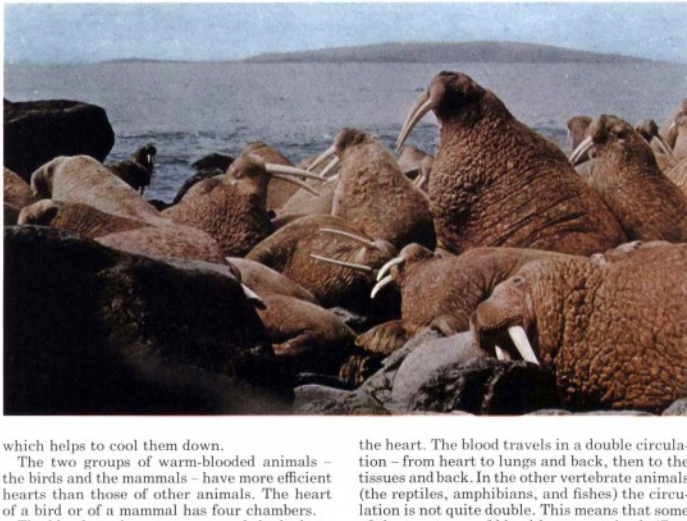
present
egg-laying mammals
platypus
spiny anteater
live-bearing pouched mammals
kangaroo
opossum
tasmanian wolf
other marsupials
mammal-like reptiles
live-bearing placental mammals
primitive insectivore stock
human
primates
sabertooth
carnivores
rodents
mammoth
elephants
whales
bats
other mammals (some becoming extinct)
other early mammals – now extinct

◁The Rock Hyrax. Hyraxes are in an order of mammals all to themselves. Although they look very much like rodents, they are hoofed animals (ungulates). It is uncertain which other groups they are related to, although they show some strong resemblances, for example in teeth patterns, to rhinoceroses and to elephants. They may be a direct descendant of a long-extinct ungulate that lived before today's hoofed animals developed

▷The beaver is one of the rodents — the largest order of mammals. Rodents have large front teeth, specialised for gnawing, which keep growing all through the animals' life.

◁The Spectacled Flying Fox is a member of the Chiroptera order (the bats). In these mammals, the forelegs are modified to form wings

▽ The duck-billed platypus is a primitive mammal — one of the monotremes. The only other monotreme is the echidna (see : *insectivore*). The monotremes still show signs of the reptilian ancestry of mammals. They lay eggs and can only really be called mammals because the young, once hatched, are fed on milk. The milk oozes out of the pores on the mother's belly

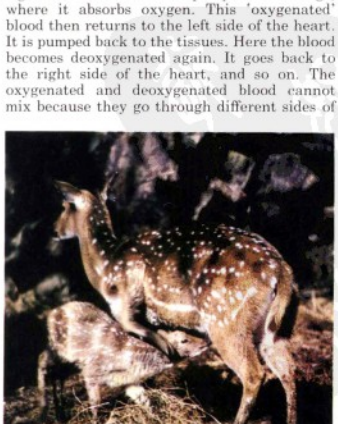


Many mammals live together in groups, like this herd of walruses. Walruses are water mammals, but like all mammals they have lungs and breathe oxygen from the air. When underwater, a walrus closes its nostrils. It must come to the surface to breathe

which helps to cool them down.

The two groups of warm-blooded animals – the birds and the mammals – have more efficient hearts than those of other animals. The heart of a bird or of a mammal has four chambers.

The blood carries oxygen around the body to the tissues, where it is required for the chemical processes of metabolism. Blood that contains little oxygen is said to be deoxygenated. The deoxygenated blood from the tissues goes to the right side of the heart. It is pumped to the lungs, where it absorbs oxygen. This 'oxygenated' blood then returns to the left side of the heart. It is pumped back to the tissues. Here the blood becomes deoxygenated again. It goes back to the right side of the heart, and so on. The oxygenated and deoxygenated blood cannot mix because they go through different sides of the heart. The blood travels in a double circulation – from heart to lungs and back, then to the tissues and back. In the other vertebrate animals (the reptiles, amphibians, and fishes) the circulation is not quite double. This means that some of the two types of blood becomes mixed. (See *heart*.)

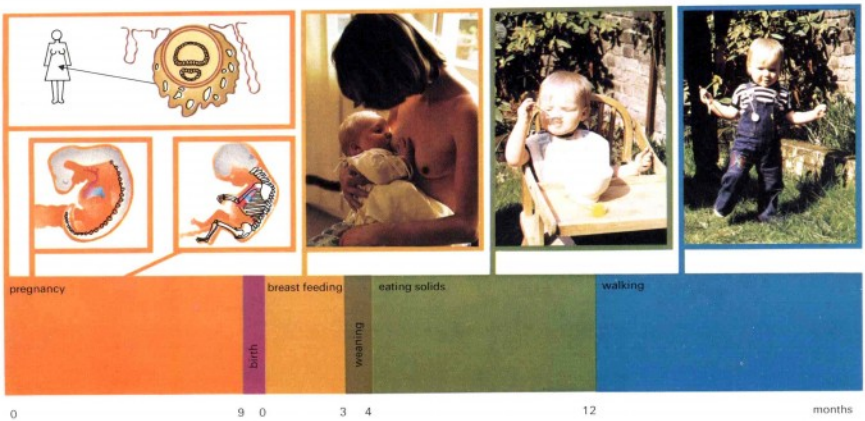


A young deer sucks milk from its mother. All adult female mammals have mammary glands which produce milk to feed their new-born young. When it is mature enough the young mammal will look for its own food. No other animals provide for their young in this way

Some mammals have a very high rate of metabolism, or general working of the body. This means that they are extremely active, and burn energy at a very high rate. To provide enough energy, a shrew has to eat almost the equivalent of its own body weight in food every 24 hours. A long-tailed shrew breathes in and out 800 times every minute. Its heart beats about as fast. Compared with shrews, human beings have a slow rate of metabolism. At rest, we normally breathe in and out 15-20 times every minute. And at rest our heart beat is about 65-70 times a minute, though it may be as low as 40 or as high as 90 times a minute. During exercise our heartbeat and breathing rates both increase. The heartbeat may double.

Some scientists think that the rate of metabolism in mammals is related to the length of their lives. For instance, the shrew with its very high rate of metabolism lives only for 15 months at the most. Humans, with a low metabolic rate, are the longest-lived mammals. The average length of life for a Briton is 70 years. But some individuals reach an age of 100 years or more.

Oxygen is carried in the blood in special cells, called the red blood cells. The red blood cells of mammals are different from those of all the other vertebrate animals. They do not contain a central controlling body, the nucleus (plural: nuclei). The red cells of other vertebrates have nuclei. In mammals, new red cells are not created by the division of old ones. New red cells are constantly being produced by special



The growth of a human baby. Most female mammals have an area inside the body, called the womb. Here a baby begins, as a fertile egg planted in the lining. It is nourished, kept warm, and protected as it grows until ready to be born. After birth a baby is fed and cared for by its mother. But by about one year old he is feeding himself. By two years he is walking by himself. He really is a separate person now. But for many more years the human baby is cared for by its parents until he is a mature adult

tissues in the bone marrow. Each cell remains in circulation for about 120 days. It is then destroyed by the liver. (See: *blood.*)

Among the vertebrate animals, the mammals have the widest range of 'adaptations' for their different ways of life. Adaptation is the process by which living things develop special features that make them better able to survive in their particular surroundings.

All-purpose limbs

An example of the wide range of adaptation can be seen in the limbs of different mammals. All mammals have four limbs and most mammals walk on all four of them. Humans, however, and some apes, walk on two legs. The hoofed mammals have developed special hard feet, called hooves, which help them to run on hard ground (see: *hoofed animals*). Some mammals have limbs that are adapted for life in trees. The sloth spends its time suspended upside down, hanging onto branches with its long claws. Squirrels use their sharp claws to help them to run up the trunks of trees. Monkeys and some apes swing from the branches of trees, holding on with their long fingers and toes.

In whales and seals the limbs have become adapted for swimming – they are flat paddles like the fins of fishes. The front limbs of bats are adapted for flight. The bony frame in the wings of bats is very like that in the wings of birds. But bats' wings do not have feathers. They consist of a tough web of skin stretched over this framework, which is formed by the bones of the front limb.

Different mammals are adapted to deal with different kinds of food. Flesh-eating, or carnivorous, mammals have sharp-pointed teeth, called canines, for killing their prey. Their rear teeth, or molars, have sharp cutting edges for tearing flesh. (See: *carnivore.*)

Animals that eat plant foods are called herbivores. Herbivorous mammals have molars with broad flat surfaces, which are ideal for grinding plant food. The front teeth, or incisors, of most herbivorous mammals are sharp and are used for breaking off grass and leaves. (See: *herbivore.*)

Many mammals are well adapted to defend themselves against attack. Deer and antelope have keen senses of sight and smell. They can detect predators from a great distance. If they are attacked they can run very swiftly to escape danger. Many mammals are 'camouflaged' among their surroundings. The pattern and colour of their coats help them to blend in with their surroundings.

In several Arctic mammals the colours of the coat change at different times of the year. The Arctic hare is brown in summer, and it is camouflaged among the Arctic vegetation. In winter it grows a white coat, and it is hidden in the snow. (See: *camouflage.*)

The armadillo has an armour of hard plates covering its back and sides. When attacked or threatened, the armadillo curls up into a ball so that the hard plates are presented to the enemy and the soft undersides are protected. Hedgehogs and porcupines are mammals that protect themselves with sharp spines. A skunk can defend itself by squirting an evil-smelling liquid into the face of its attacker. (See: *adaptation.*)

Some animals travel great distances every year from summer to winter feeding grounds and back again. These annual movements are called migrations. Some insects, birds, and fish are great migrators. Certain mammals, too, migrate long distances. During the summer the caribou deer of Canada and Alaska feed on the tundra. The tundra are the vast treeless plains of the Arctic, where little grows but grass,

◁Elephants are the only living members of the *Proboscidae* order, which gets its name from the proboscis, or trunk. Mammoths and mastodons were members of the order. They are now extinct. Elephants are the largest land animals now living on Earth. They live in herds that may contain as many as one hundred animals

▽ The Brazilian tapir is one of the odd-toed ungulates. Although its short trunk makes it appear similar to elephants, it is related to horses and rhinoceroses. Tapirs have been in existence for the last 20 million years. Their success is probably due to the sensitive trunk which is used continually to smell out danger

Monkeys are an example of social mammals. They live in groups, somewhat like families. The young learn from behaviour of older members in the group. The offspring of many other mammals set off on their own while still young

mosses, lichens, and shrubs. In the winter, with the coming of the snow, the caribou move further south in search of food (see: *reindeer*).

Another migratory mammal is the Alaskan fur seal. It breeds on islands in the Bering Sea between Alaska and Eastern Siberia. Every winter the female seals and their young swim from the Pribilof Islands to Southern California nearly 5,000 kilometres (3,000 miles) down the coast. The male seals travel only part of the way. In the following spring all adults and young travel back to meet at the breeding grounds on the Pribilof Islands. (See: *migration*.)

In the cold of winter when food is scarce, some mammals hibernate. They save their energy by cutting down their movements and staying in a sleep-like state. Bats hang upside-down through the winter months. Bats are unusual mammals for their forelimbs are wings and they can fly

Some mammals 'hibernate' during the winter. When an animal goes into hibernation it finds a sheltered spot and enters a state resembling sleep which sometimes lasts for several months. In autumn most hibernating mammals build up a store of food in their bodies in the form of fat, which they can use as an energy supply. Energy is used up at a very slow rate in hibernation – metabolism is low and the rates of heartbeat and of breathing are slowed down. Mammals that hibernate include squirrels, jumping mice, and many bats. (See: *hibernation*.)

The evolution of mammals

Scientists divide the long history of the Earth into different ages, or eras (see: *geology*). We are now living in the Cenozoic era, which has been called the age of mammals. The name 'Cenozoic' is Greek for 'new life'. The Cenozoic era began about 70 million years ago. During that time the mammals became the most successful forms of life, in terms of changing into a variety of forms. The first mammals had probably appeared well before the beginning of the Cenozoic era in the middle of the Mesozoic era, some 200 million years ago. The Mesozoic was the age when the huge cold-blooded reptiles, such as the now-extinct dinosaurs, were at their most successful. One branch of the reptiles slowly changed, or evolved, and gave rise to the mammals.

The first mammals were probably insect-eating creatures about the size of shrews. Gradually, over millions of years, many mammals became larger and better adapted to their environment. However, it was not until about two million years ago that there appeared an unusual mammal, with an upright posture and a highly developed brain (see: *brain*). This was the ancestor of man. Man is unique among animals in being capable of abstract thought – he can think about imaginary future situations. This ability has led to the development of speech, writing, and the world of science and technology. Let us hope that we use this ability wisely.

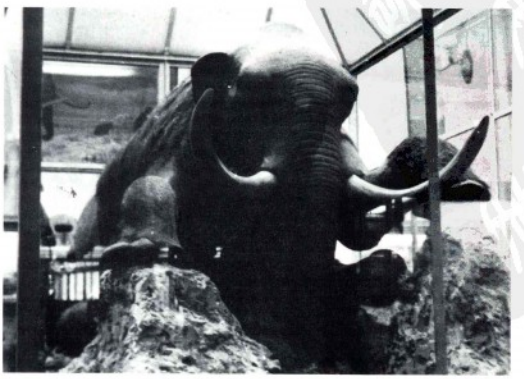
See: *animal*, *bird*, *evolution*, *reptile*, *vertebrates*.

Parts of the world where the woolly mammoth lived in the cold of the Ice Age nearly 2 million years ago. The remains of about 25,000 mammoths have been found in the area we now call Siberia, in Russia. Mammoth hair is commonly found in some parts of Alaska in North America

mammoth

In 1846, a Russian surveyor was mapping parts of Siberia. It is very cold there and temperatures often fall as low as –73°C (–100°F). For most of the year the ground is frozen and covered with ice and snow. But it was an unusually warm summer that year and the upper layer of soils had thawed out. As he was exploring a bog, the surveyor saw a huge dark object floating in the water. When he got close he found that it was a large elephant-like creature, covered in shaggy hair, with curved tusks 250 centimetres (over eight feet) long.

The Russian had discovered a woolly mammoth that had been preserved in the ice for 8,000 years or more. The extreme cold had prevented the decay of the animal's body – just as if it had been kept in a deep freezer for all that time. Its fur, bones, teeth, and internal organs were still in good condition. (See: *refrigerator*.)



The Beryosov mammoth in the USSR Academy of Sciences' zoological museum in Leningrad. This mammoth was found in Siberia at the beginning of this century. It was complete with muscle and skin, preserved by the cold

The remains of about 30 mammoths have been found since then, mostly in Siberia. One of the most famous finds was in 1899 when a frozen carcass was dug out of the bed of the Berezovka River in Siberia. The creature is now on display in the Leningrad Museum in Russia. About 50,000 mammoth tusks have been discovered in Siberia. Pieces of undigested plant food have been found in the intestines of frozen carcasses. They tell us that mammoths were herbivores (plant-eaters), like elephants.

Mammoths roamed the Earth during the last great Ice Age which began about 2 million years ago. They lived all over the world except Australia and South America. They died out at the end of the Ice Age, only about 8,000 years ago. These giant creatures probably wandered quite freely between Asia and North America across the bridges of land that connected these two continents at the time (see: *continent*).

There were several kinds of mammoth. Most of them were not much taller than the African elephant of today, which can grow to 350 centimetres (11½ feet) tall. But their bodies were longer and they were more massively built. Indeed, the word mammoth is now used to describe anything that is very large. If you had a big job to do, you might say you had a mammoth task to perform.

The imperial mammoth of North America is the largest mammoth known, reaching a height of 430 centimetres (14 feet). The woolly mammoth was about 290 centimetres (9½ feet) tall with 250-centimetre (eight-foot) tusks and a 180-centimetre (six-foot) trunk. It had an undercoat of yellow fur two-and-a-half centimetres (one inch) thick and a long shaggy outer coat. There was a thick layer of fat under the skin. The shaggy hair and the fat layer kept the mammoth warm. When food was not available, the fat could be used for energy (see: *metabolism*).

Mammoths were hunted by big cats called sabretooth tigers which also became extinct at the end of the Ice Age. They were also hunted by cavemen with spears and clubs.

See: *elephant*, *Quaternary period*.

map making

Think of a map as a picture of an area of the Earth's surface drawn flat. The better the map, the better will be the picture conveyed. Most features such as roads, hills, and lakes are shown by symbols. Thus maps are more useful than photographs. Unimportant details can be left out and important details marked strongly.

The oldest map known dates from 3800BC. Since then, progress in map making has been linked with voyages of exploration, wars, and the progress of science and technology. All these required better maps.

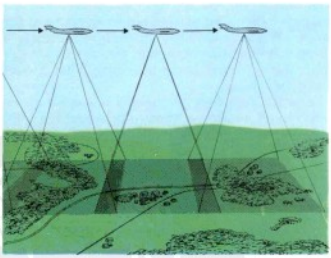
The truest map of the Earth is a globe, because this is very nearly the shape of the planet. The first globe was made about the time that Columbus discovered America. Before this, maps had been made on flat paper, but only of a small part of the Earth's surface. Large areas of the Earth had not been discovered. Many different ways of representing the whole surface of the Earth on flat paper have been tried. They are called projections.

◁ Surveying on a plane table to map the area, during an expedition to the Himalayan mountains in 1957. The table can be adjusted to level it on such uneven ground, so that it is exactly horizonta

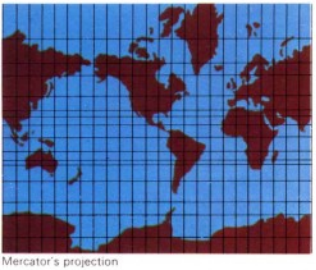
Map projections

There are three basic types of projection that have been used, called cylindrical, conic, and azimuthal. Each type has certain advantages. But each introduces some kind of error in direction, shape, or area. Each kind of projection can be illustrated by placing a light inside a transparent globe, and a sheet of paper outside. The features on the globe are then projected onto the paper by the light.

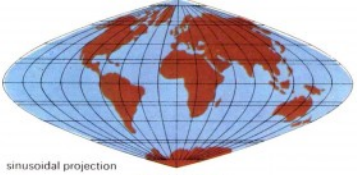
A cylinder placed over a globe and touching it at the Equator, which then has the globe projected upon it, represents a cylindrical projection. The best known cylindrical projection is named after Gerhardus Mercator, a geographer of the 16th century. The lines of latitude (east - west lines) and of longitude (north - south lines) are shown as straight lines. This map is convenient for navigation because any straight line shows true compass direction. However, shapes are distorted. Sizes on the map are increased for areas near the North Pole, such as Greenland, and the South Pole. The Poles themselves do not appear.



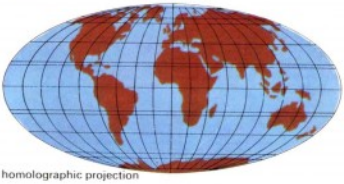
◁ Aerial mapping : As the aircraft flies in a straight path, cameras mounted inside photograph the land beneath. Exposures overlap by 60 per cent so that every point of ground is covered more than once (For clarity, the diagram shows less overlap.) *(Far left)* The photographs are fitted together and maps drawn from them.
▽ Part of a map by J W Powell, in 1879, after his expeditions for the United States government to map land which until then was still uncharted



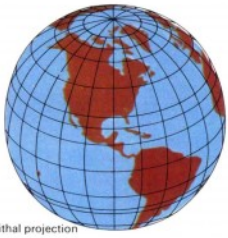
Mercator's projection



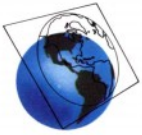
sinusoidal projection

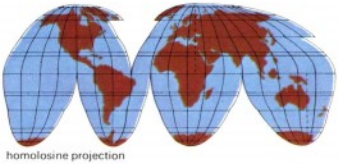


homolographic projection

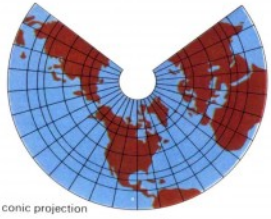


zenithal projection

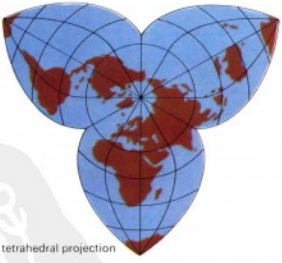




homolosine projection



conic projection



tetrahedral projection

Map projections — ways of showing the round globe on flat paper. Mercator's projection is useful for navigation, but toward the Poles it is distorted. In zenithal, or azimuthal, projections, the area is mapped in a circle centred on one of the Poles, the Equator, or tilted as here. Distortion increases from the central point outward. Conic projections cannot show the whole globe. Other more complex projections attempt to show areas nearer their true global shape

A conic projection is made by placing a cone over the globe and projecting the features of the Earth onto it. Suppose the cone is centred over one of the Earth's Poles. When the cone is cut and laid out flat, the lines of latitude are circles. The lines of longitude are straight lines meeting at the centre. The scale is true only on the line of contact of the cone with the globe. Area, shape, and distance become distorted at other points on the projection.

The azimuthal, or zenithal projection is often used. It is made by transferring the Earth's features onto a flat surface which is touching the globe at one point. Usually, the flat surface is centred on the Equator or on one of the Poles. All lines radiating from this point give true direction, but area, shape, and distance are increasingly distorted away from the centre. The Equator, on a Pole-centred map, does not appear. With the development of air routes over the Poles, azimuthal maps centred on the North Pole have become common.

Maps are made by measuring positions of individual points on the Earth's surface. For small areas this is done using simple optical instruments and measuring tape. This is called surveying. Maps are used for various purposes. Therefore different features may have to be surveyed for each type of map.

Natural features

Topographical maps emphasize the natural features of the Earth, such as hills, forests, and rivers, as well as man-made structures, such as highways, railways, dams, and canals. These maps, normally show heights, positions, latitude, and longitude as well as Magnetic North. Topographical maps of areas of water are called hydrographic maps. They emphasize features below the surface of the water so that ships can be navigated. These features include reefs, shallows, deeps, and sandbanks.