

# COMPTON'S

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VOLUME

2

**Anima—Aztec  
pages 421-892**

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# Compton's Encyclopedia

## and Fact-Index

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**1991 EDITION COMPTON'S ENCYCLOPEDIA**

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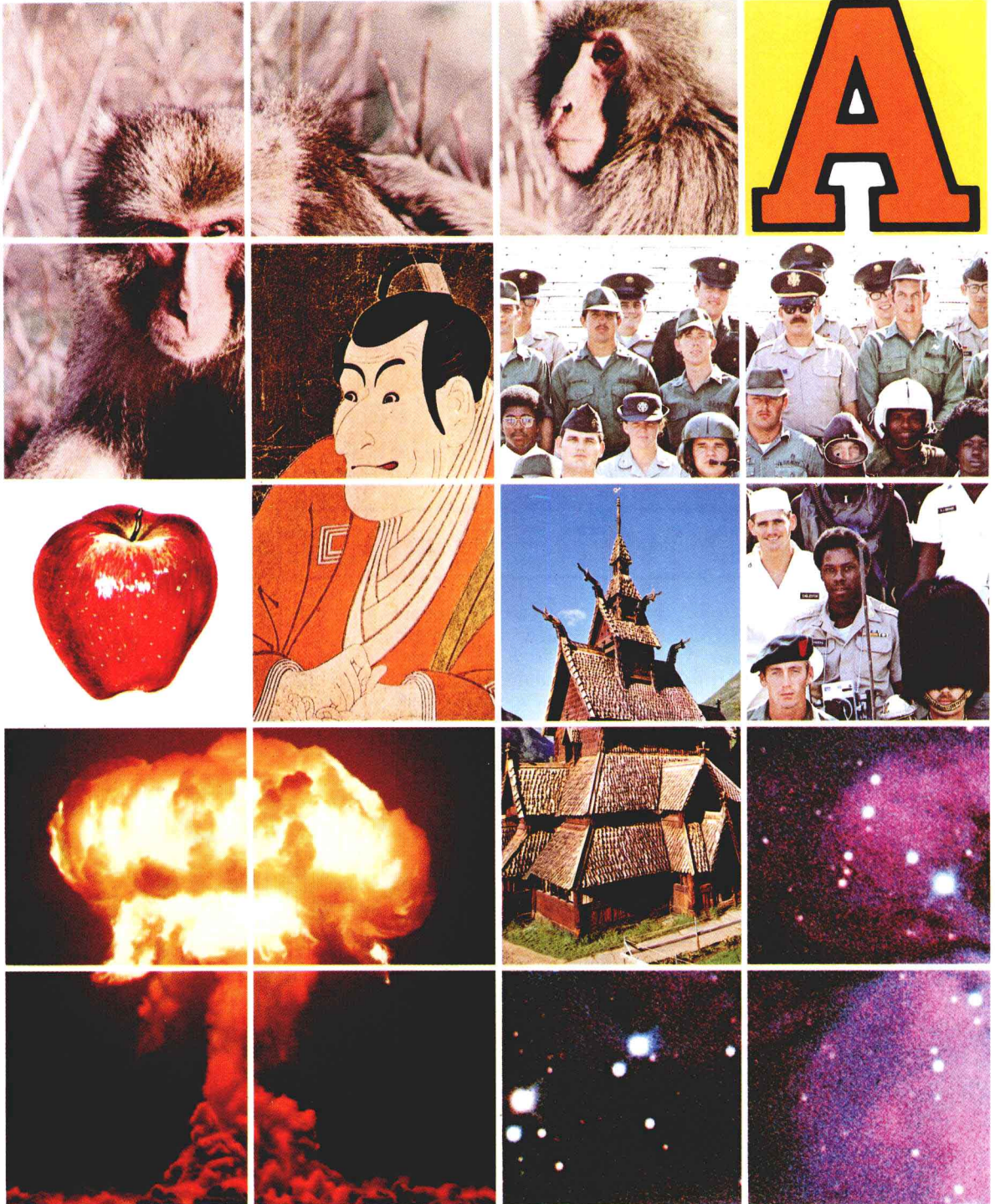


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*"Let knowledge grow from more to more and thus be human life enriched"*



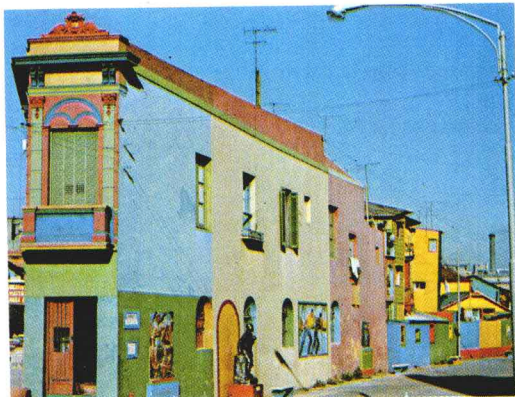


PHOTOS. Row 1: EB Inc. Row 2: (center left) photographed for EB Inc. by Benrido Co. Ltd., Tokyo; (right) U.S. Army. Row 3: (far left) EB Inc.; (center right) C.A. Peterson. Row 4: (left) Atomic Energy Commission; (far right) U.S. Naval Observatory.



# EXPLORING VOLUME 2

Art Resource—EB Inc.



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Courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.



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Wm. Franklin McMahon

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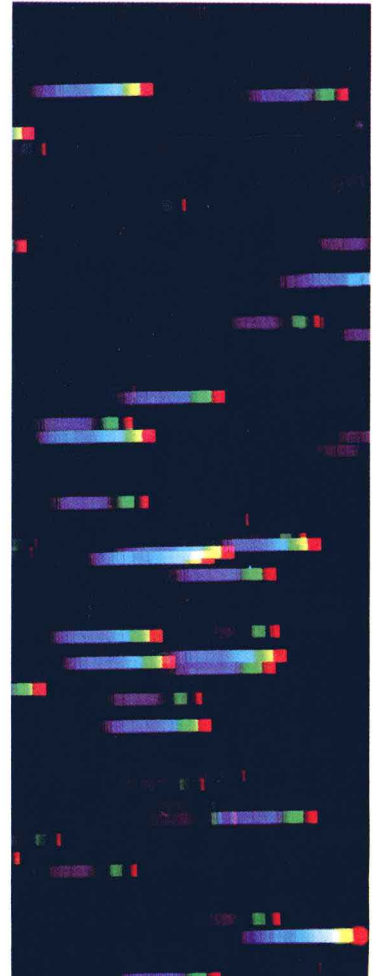
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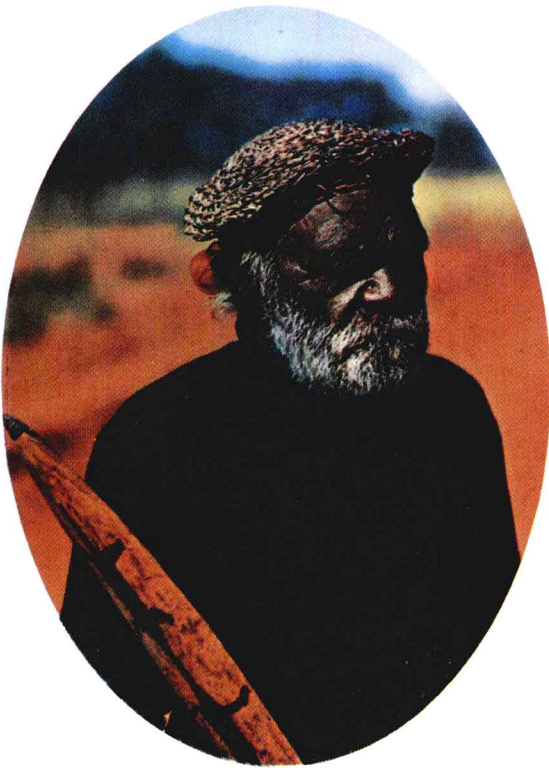


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Photos Pack—EB Inc.

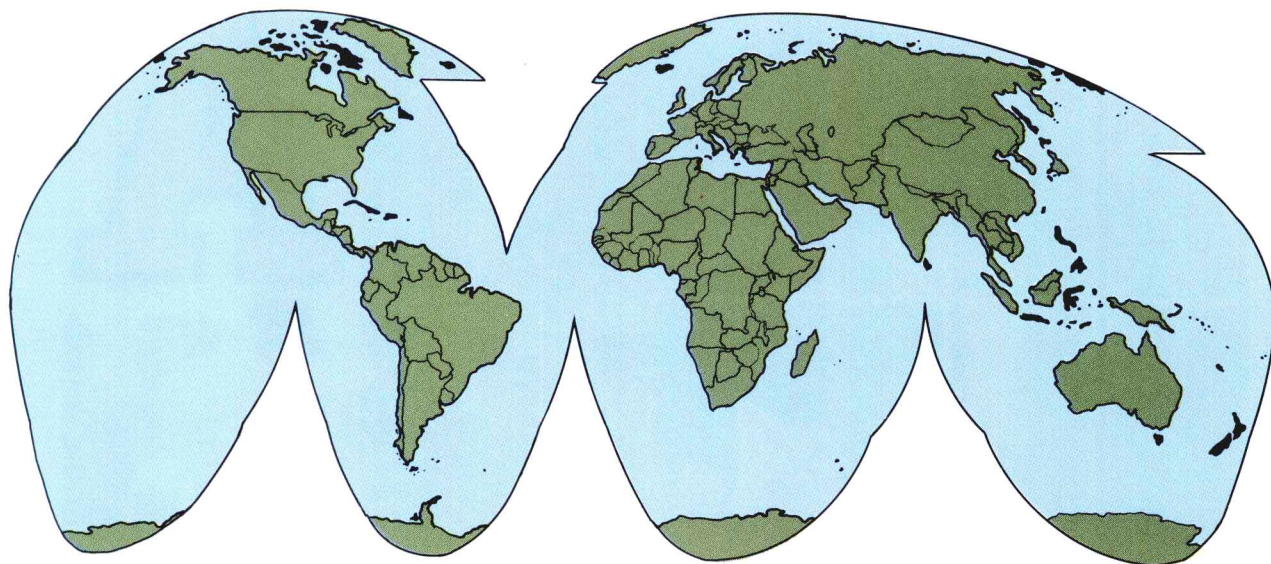






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## HERE AND THERE IN VOLUME 2

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TWA Ambassador

The cheetah, or hunting leopard, is the fastest of the land animals over short distances. It has become an endangered species in Africa and is nearly extinct in Asia.

# ANIMAL

**ANIMAL.** What is an animal? Everyone will agree that horses, dogs, cats, bears, and monkeys are animals. People usually think of an animal as a warm-blooded creature with a backbone, four legs, and a coat of hair or fur. This is but one kind of animal, called a mammal. There are many other kinds. Insects and birds, worms and fishes, corals, sponges, frogs, and snails are only a few other kinds of animals.

All living things are divided into two main kingdoms—the animal and the plant kingdoms—and two or three other kingdoms that include bacteria, blue-green algae, and one-celled creatures with definite nuclei. What is the difference between a horse, for example, and the grass? A horse moves about in the pasture eating the grass. It trots toward you when you offer it a lump of sugar and shows pleasure when you stroke its head. The grass, however, is rooted to one place. It does not respond to you or to the horse in any way. (See also *Living Things*; *Plant*.)

## Animals Move About and Sense Surroundings

Here then are two differences: Animals *move* freely from place to place, and they *sense* their surroundings; that is, they can taste, smell, hear, see, touch, and think. Certain lowly animals, such as the corals and barnacles, spend most of their lives fastened to one spot, but they are able to swim freely when they are young. Even these rooted animals have parts that move in order to capture food. Plants, however,

cannot shift about at their own will. They react to heat, light, chemicals, and touch, but the responses are automatic, quite different from those of animals.

All living things are made up of cells of protoplasm. They may consist of a single cell, such as the amoeba, or billions of cells, such as a tree or a horse. The cell wall of a plant is composed of a woody material called cellulose. Wood, cotton, linen, and paper are forms of this substance. No true animal contains cellulose. Animal cells are bounded by a membrane composed chiefly of fat and protein. (See also *Cell*.)

Both plants and animals require food. Green plants make their own food. With the aid of the green substance called chlorophyll, they use the energy in sunlight to change carbon dioxide and water into carbohydrates and other food materials. No true animal contains chlorophyll. Animals must eat the food manufactured by plants. A horse cannot stand in the sun and wait for its body to make fat and proteins. It must move about the pasture in search of green grass. Even meat eaters—for example, lions—live on animals, such as zebras, which in turn subsist on plants.

The most significant differences between plants and animals are these:

1. Animals move about freely at some period of their lives.
2. Animals sense and respond to their surroundings.
3. Animals live on ready-made foods.
4. No true animal contains woody material.





Foxes, bright and alert, are among the most intelligent of wild animals. They are famous

for their cleverness in outwitting dogs, hunters, and other enemies.

### The Variety of Animal Life

More than a million different kinds of animals inhabit the earth. The exact number is not known, for new kinds are continually being discovered. They live in the seas, from the surface down to the black depths where no ray of light penetrates. On mountaintops and in deserts, in mud and in hot pools some form of animal life may be found.

Animals are infinitely varied in form, size, and habits. The smallest animals are bits of protoplasm that can be seen only with a microscope. The largest are the blue whales. They may be 100 feet long and weigh 300,000 pounds.

### The Shapes of Animals

The most familiar animals, such as dogs, birds, frogs, and fish, all have a backbone and a central nervous system. They are called *vertebrates*, meaning animals with backbones (*see* Vertebrates). They have a head. Sense organs are located in the head. These animals usually move head foremost. They have limbs, wings, or fins by which they move about.

Vertebrates have what the scientists call *bilateral* (meaning "two-sided") *symmetry*. If they were divided down the middle, they would have an eye, an ear, an arm or wing, and a leg or fin on each side. One side matches the other, but in reverse; that is, vertebrates have a right and a left side.

It seems obvious that if an animal is to move and capture food it must have a backbone, a head, and limbs. There are many kinds of animals, however, that lack these advantages. These are the *invertebrates*—the animals *without* backbones.

One-celled animals called *protozoans* live in fresh and salt water (*see* Protozoa). They are shapeless creatures, with no top or bottom, no head or rear, no right or left sides. Such animals cannot swim toward their food. They move along by squeezing out a fingerlike projection from the body. This is called a *pseudopod*, meaning "false foot." The pseudopod fastens to something solid, and the rest of the body flows into it. The amoeba also moves in this manner. One-celled animals are very small. A single blob of liquid enclosed in a thin membrane cannot reach large size or a very definite shape.

Many-celled animals without backbones include the sponges, hydras, corals, jellyfishes, and sea anemones. They are shaped somewhat like a wheel. They are said to have *radial symmetry*. If they were divided down the middle, the two sides would be identical.

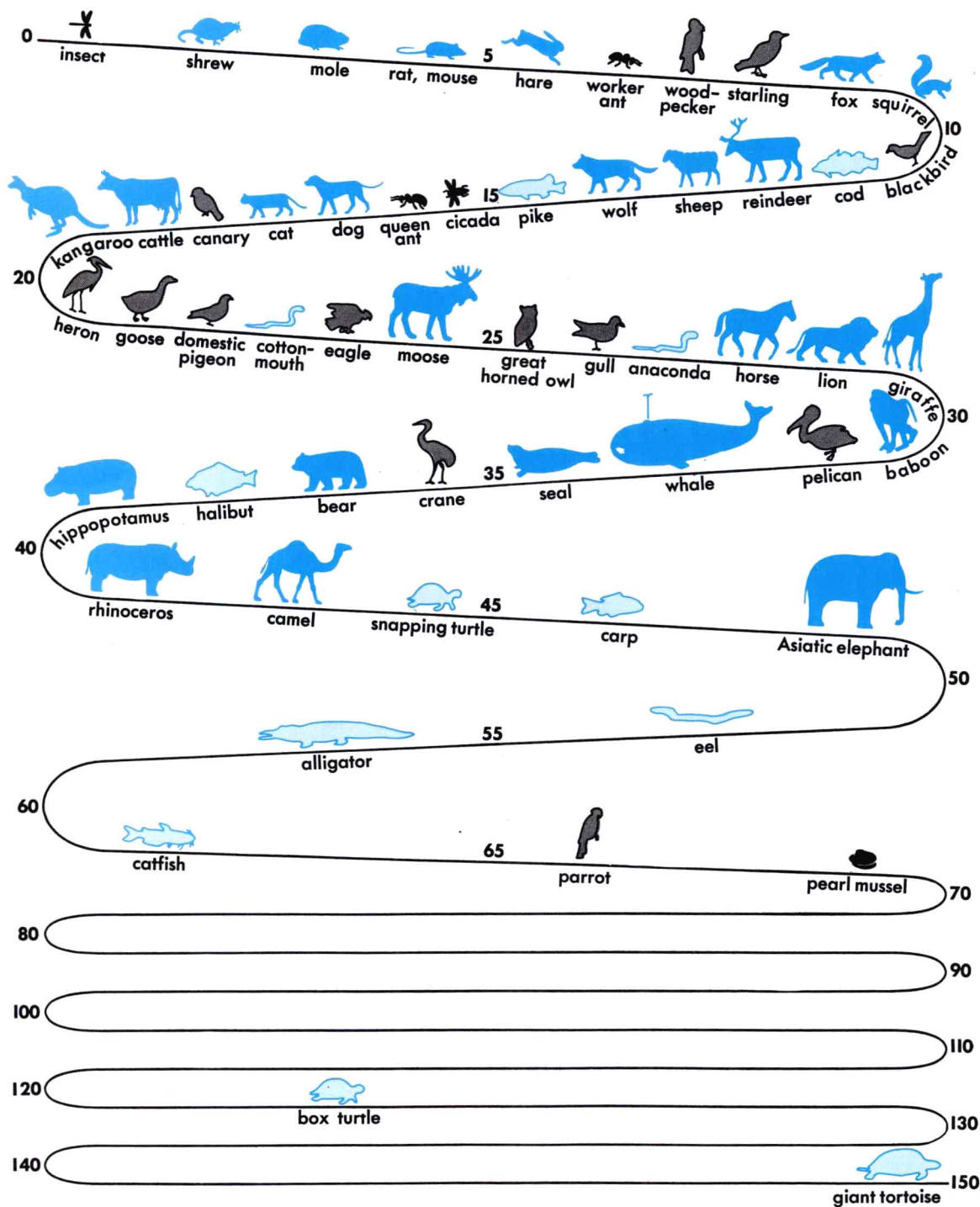
All these animals live in water. Some drift with the currents, unable to swim in any definite direction. Others become attached to a solid object by the "down" end and float with the mouth end upright. Tentacles arranged in a circle around the mouth sweep in food particles and ward off enemies.

### Animals with Outside Skeletons and Feet

Mollusks have soft bodies that are not divided into specialized sections (*see* Mollusks). Many mollusks are enclosed in hard, hinged shells. These are the lowliest form of animals with feet. The feet appear in strange places, however. Snails are "stomach-footed" mollusks. They have a single large, fleshy foot on the stomach side. The octopus and the squid are "head-footed." The head is surrounded by a circle of eight or ten tentacles which act as arms and feet. Oysters, clams, mussels, and scallops are "ax-footed." They have a single ax-shaped foot with which they burrow into sand.

Most mollusks do not move around efficiently. Oysters fasten themselves to something solid and settle down for life, letting food drift to them. Scallops move in zigzag leaps by clapping their shells together.

# HOW LONG DO ANIMALS LIVE?

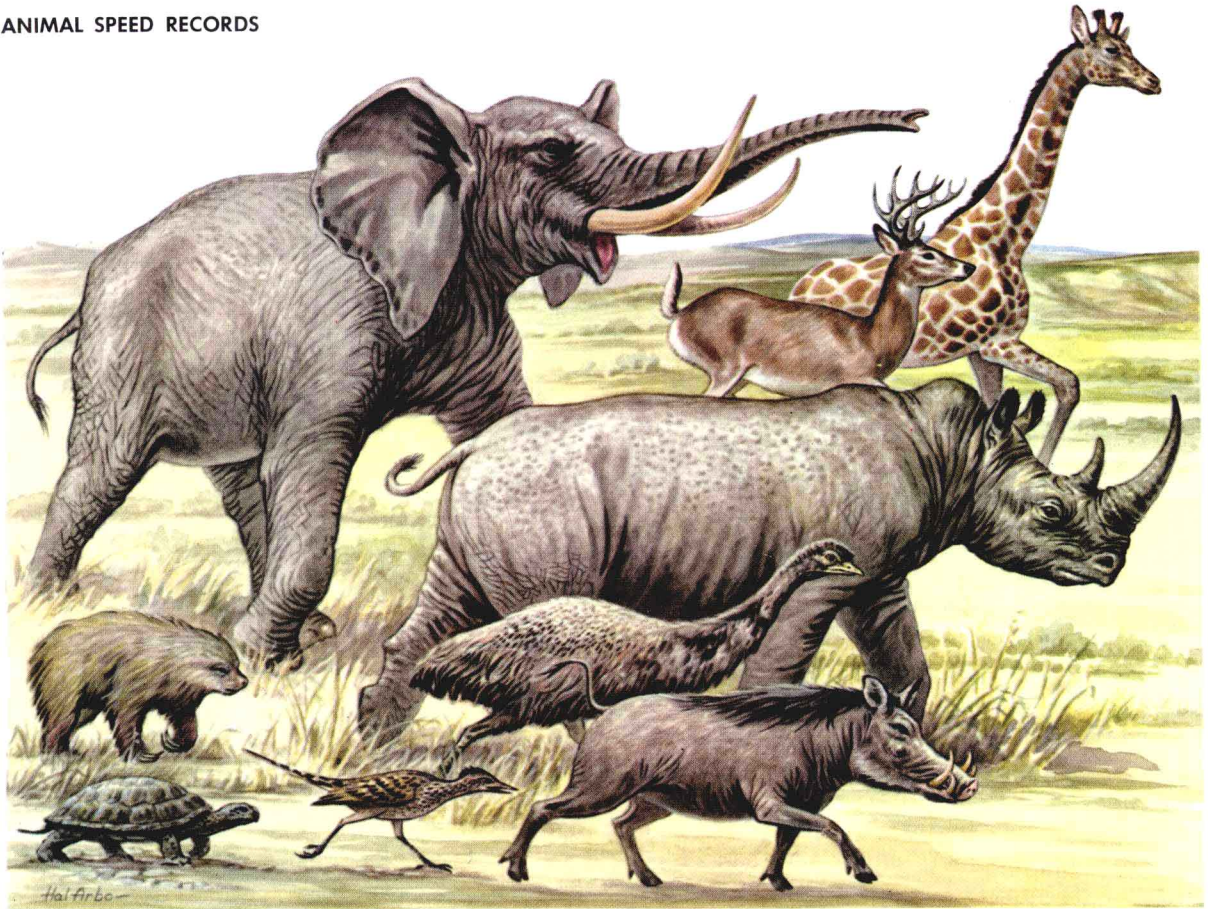


Average ages which certain animals may be expected to reach, based on reports of zoos and estimates of biologists. Individuals have been reported as much older. (Data from S.S. Flower, 'The Duration of Life in Animals', in *Proceedings of the London Zoological Society*.)

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## ANIMAL SPEED RECORDS



TWO-TOED SLOTH, ½ mph    AFRICAN ELEPHANT (charging 120 yards), 24.5 mph    WHITE-TAILED DEER, 30 mph    GIRAFFE, 32 mph  
 DESERT TORTOISE, ½ mph    ROAD RUNNER, 15 mph    EMU (10 miles), 31 mph    WART HOG, 30 mph    RHINOCEROS, 35 mph

### The Joint-Legged Animals

Joint-legged animals have a far better body plan than that of any of the animals mentioned so far. Their bodies are divided into segments which have specialized functions. They have many jointed legs. Most of them are covered with a jointed skeleton made of a horny material. This outside skeleton is lighter than the shells of the mollusks. The legs and muscles and many other organs are attached to it. The joint-legged animals, or arthropods, include insects, lobsters, crabs, centipedes, millepedes, and spiders. Many of them have wings. They can run, jump, swim, creep, or fly. They live on land, in fresh water, and in salt water.

The grasshopper and flea are champion jumpers. The flea can make a standing high jump of 100 times its own height and a broad jump of 200 times its own length. The flea is a better jumper than the kangaroo, which can leap only five times its length. The horsefly is one of the fastest insect fliers. It can soar through the air at the rate of  $31\frac{1}{2}$  miles an hour. The botfly can reach a speed of 25 miles an hour.

### How Backboned Animals Move About

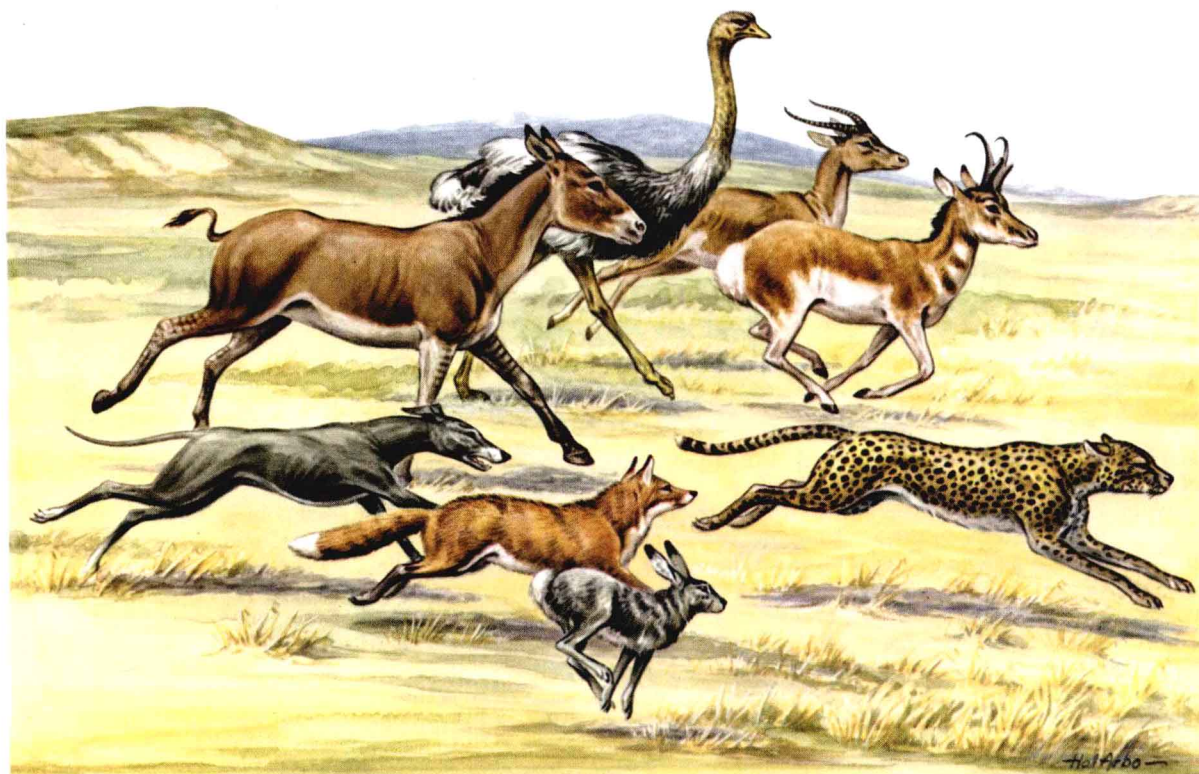
The animals with backbones move through the water, the air, and over the ground with the greatest speed and skill. Birds, with their feathered wings, are the greatest of all fliers. Fish are the champion swimmers. Other backboneed animals, however, also can fly and swim. The bat flies on wings of membrane. The flying squirrel glides on a broad membrane between its legs. The flying fish soars over the surface of the water with its great back fin.

Turtles swim with paddlelike front legs. Some water birds can swim under water with their wings. Old squaws and shearwaters are examples. The mud-skipper is a fish that walks on mud by pulling itself along on its front fins. It can also hop on its tail and fins.

Frogs and kangaroos and the various cats are superior jumpers. There are also some good jumpers among fish. Salmon leap up waterfalls when they travel from the sea to their home streams to lay their eggs. Tarpon, swordfish, and sailfish make great leaps out of the water when they are pursuing their prey.



## ANIMAL SPEED RECORDS



MONGOLIAN WILD ASS, 40 mph    OSTRICH (½ mile), 50 mph    GOBI GAZELLE, 60 mph    PRONGHORN ANTELOPE, 60 mph  
 GREYHOUND (¼ mile), 36 mph    RED FOX, 45 mph    JACK RABBIT, 45 mph    CHEETAH (100 yards), 70 mph

or trying to escape an enemy. Snakes are the most well-known “creepers” (see Snake, subhead “How a Snake Gets About”).

### Various Ways of Breathing

All animals must take in oxygen in order to change food into a form that the body can use. One-celled animals that live in water absorb oxygen directly through their membranes. The sponge is a very simple many-celled animal. The surface of a sponge is covered with millions of tiny pores. Water, bearing dissolved oxygen and minute food particles, flows through the pores and out of the opening at the top of the sponge.

Fish and tadpoles breathe by means of gills (see Fish, subhead “How Fish Breathe”). Insects and caterpillars take air into the body through breathing pores called spiracles (see Insects, subhead “The Internal Organs”).

Mammals, birds, and reptiles obtain oxygen from the air. They take it into the lungs. The oxygen goes through membranes in the lungs into particles called red blood cells. The blood stream then carries the

oxygen to every part of the body (see Blood; Lungs; Respiration). Frogs and other amphibians have lungs, but they also have thin, moist skins which absorb oxygen directly (see Frog, Anatomy of).

### How Animals Reproduce

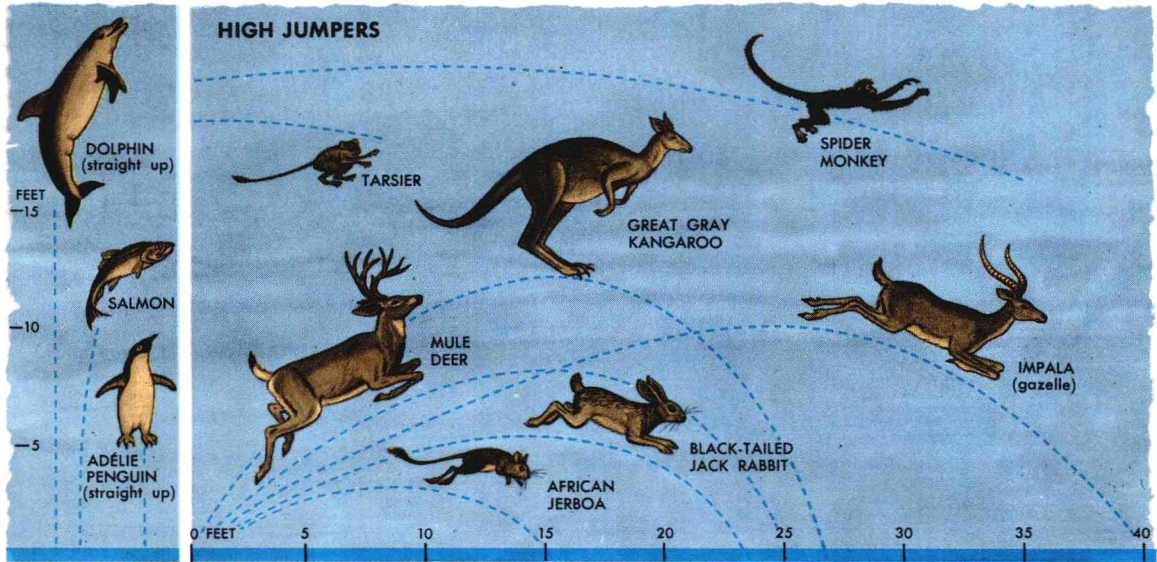
All animals reproduce their own kind. One-celled creatures such as the slipper animalcule, or paramecium (shown on a later page), pinch together in the middle and divide in two. The process is called *cell division* or *fission*.

A kind of sea squirt reproduces by budding. Lumps appear along a branchlike organ and develop into young sea squirts. Sea squirts, sponges, corals, and other creatures that bud often remain together and form large colonies. The picture of a sea squirt on a later page shows the beginning of a colony. The hydra also reproduces by budding, but in time the young bud separates and goes off to live alone.

### Reproducing by Eggs

Many animals reproduce by means of eggs which develop into new animals. Fish, snails, clams, crabs





and lobsters, insects, frogs, snakes, and birds are some of the egg-laying animals.

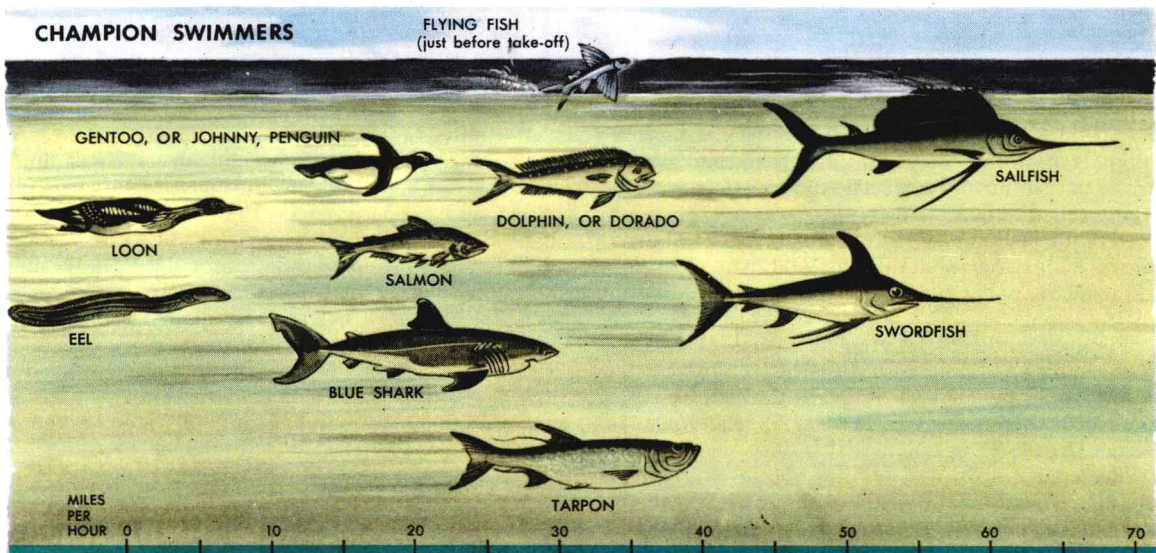
Water-dwelling species generally lay their eggs and pay no more attention to them. The same is true of turtles and most spiders and insects. Ants, bees, and wasps have worker "nurses" that care for the eggs and young. Mother lobsters carry their eggs about, and some fish guard both their eggs and their young. Most birds and certain snakes protect their eggs. Other snakes and some lizards produce eggs with shells, but they keep the eggs in their bodies until they hatch. When the young animals come out of the eggs, they are ready to take care of themselves.

Most mammals begin as tiny eggs which have no shells and develop inside the mother's body (see Mammals; Egg). In time the baby animals are born. The mother cares for them and feeds them with her milk.

### Homes of Animals

Many animals build temporary or permanent homes for themselves and their young. Birds occupy their nests only while they are incubating eggs and feeding the helpless nestlings (see Birds). A few fish make temporary nests for their young (see Fish).

No animal dwelling has excited more wonder and interest than the lodge built by the beaver. Almost as remarkable is the dome-shaped winter home of the muskrat. Underground burrows with sleeping rooms, food-storage rooms, connecting tunnels, and emergency exits are constructed by ground hogs, prairie dogs, European rabbits, gophers, kangaroo rats, and field mice. Chimpanzees and gorillas build temporary nests and sleeping platforms of sticks in trees. As wonderful as the lodges of mammals are the living





## TERMS FOR CERTAIN ANIMALS AND THEIR GROUPS

ANIMAL	MALE	FEMALE	YOUNG	GROUP
Bear	Boar	Sow	Cub	Sloth*
Beaver	....	....	Pup, Kitten	Colony
Bee	Drone	Queen, Worker	....	Hive; Swarm (in flight)
Bison	Bull	Cow	Calf	Herd
Cat	Tomcat	....	Kitten	Litter; Clowder*
Cattle	Bull	Cow	Calf	Drove; Herd
Chicken	Rooster	Hen	Chick	Flock; Brood (of chicks)
Crow	....	....	....	Murder*
Deer	Buck; Stag	Doe	Fawn	Herd
Dog	Dog	Bitch	Pup	Litter; Pack (wild); Kennel
Donkey	Jackass	Jennet	Colt	Drove; Herd
Duck	Drake	Duck	Duckling	Flock
Eagle	....	....	Fledgling	Aerie
Elephant	Bull	Cow	Calf	Herd
Fish	....	....	....	School; Shoal
Fox	Reynard	Vixen	Kit; Cub; Pup	Skulk
Goat	Buck	Doe	Kid	Herd; Trip
Goose	Gander	Goose	Gosling	Flock; Gaggle; Skein (in flight)
Grouse; Partridge; Quail	Cock	Hen	Chick	Covey
Hog	Boar	Sow	Shoat; Farrow	Drove; Herd; Litter (young)
Horse	Stallion; Stud	Mare; Dam	Foal; Colt (male); Filly (female)	Stable; Herd; String or Field (of race horses)
Jay (bird)	....	....	....	Band
Kangaroo	Buck; Boomer	Doe; Flyer	Joey	Troop; Herd
Lion	Lion	Lioness	Cub	Pride
Locust	....	....	....	Host
Ox	Steer	Cow	Stot	Drove; Herd
Pheasant	Cock	Hen	Chick	Nye
Rabbit	Buck	Doe	Kitten	Colony; Warren
Seal	Bull	Cow	Pup	Herd; Rookery; Harem
Sheep	Buck; Ram	Ewe; Dam	Lamb	Flock; Hurtle*
Swallow; Dove	....	....	....	Flight
Swan	Cob	Pen	Cygnets	....
Trout	....	....	....	Hover*
Turtle	....	....	....	Bale*
Walrus	Bull	Cow	Cub	Herd
Whale	Bull	Cow	Calf	Gam; Herd
Wolf; Coyote	....	....	....	Pack
Zebra	Stallion	Mare	Colt	Herd

\*Obsolete but still used in literature.

quarters made by the different kinds of ants. Certain tropical bats cut palm fronds in such a way that they droop to form a leafy shelter from the hot sun and torrential rains.

### Defenses Against Enemies

All animals have some means of defending themselves against enemies. Cats can usually outrun a dog and climb the nearest tree. If they are cornered, they scratch and bite. Dogs, wolves, foxes, and coyotes have swift legs and sharp fangs.

Porcupines and hedgehogs roll into a ball and raise their sharp quills. The quills come off at a touch, their barbed tips sticking into the nose of an unwary dog or some other enemy. Skunks spray a foul-smelling fluid from a gland when they are frightened.

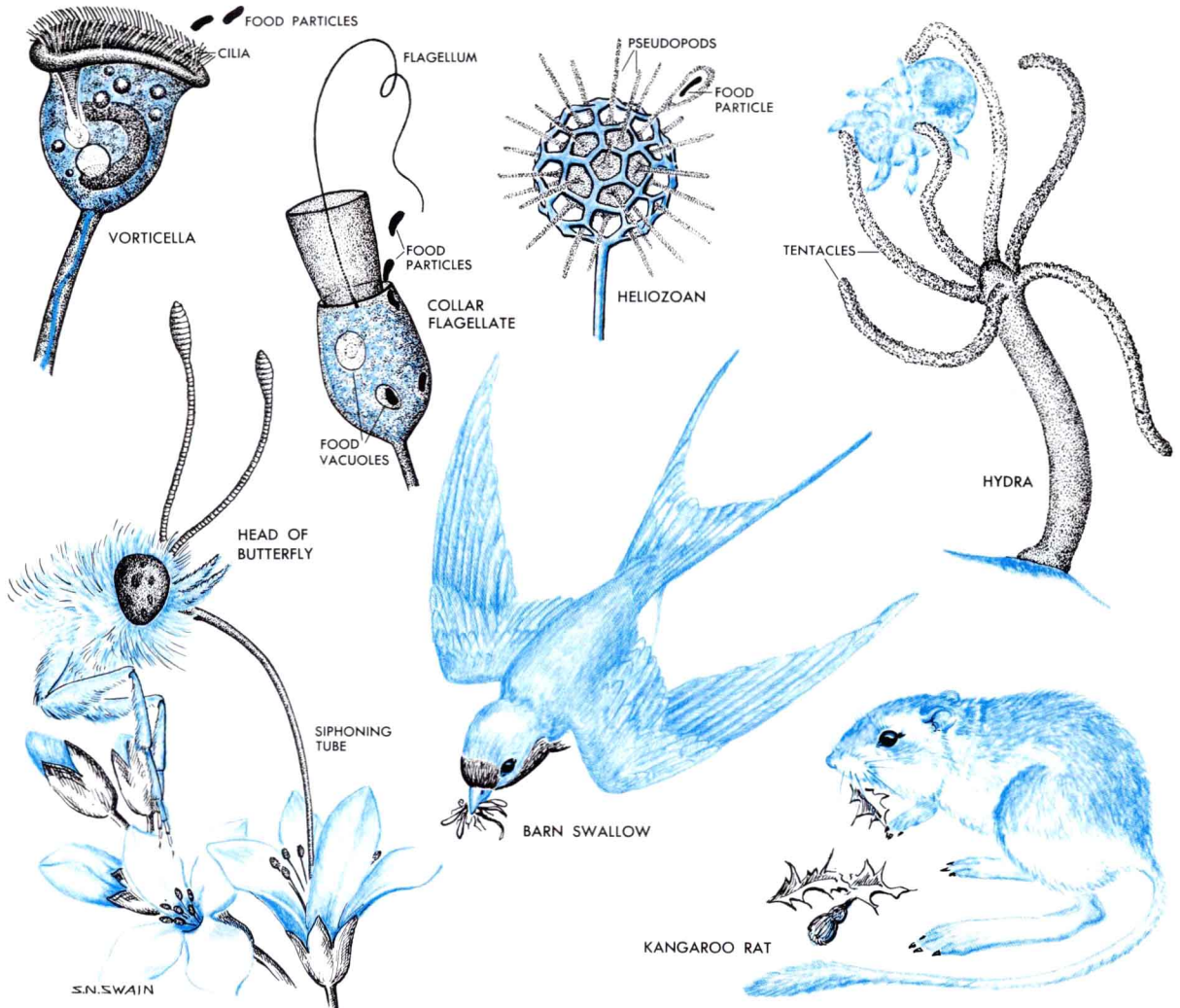
Deer, moose, and antelope fight with their antlers. An elephant's trunk is a powerful weapon. It can be used to pick up another animal and smash it to the ground.

Squids shoot out a cloud of inky material and escape in a smoke screen. Torpedo fish and several other kinds of fish have built-in electric storage cells by which they can deliver a paralyzing shock. Some snakes and lizards protect themselves with their poison.

Many animals hide by means of *protective coloration*. A baby deer is almost invisible in the forest because its spotted coat looks like patches of sunlight in the brown leaves. Many fishes, birds, insects, lizards, and snakes use nature's camouflage to avoid observation. (See also Protective Coloration.)



## HOW SOME ANIMALS CAPTURE FOOD



## How Some Animals Capture Food

One-celled animals, such as the vorticella, collar flagellate, and heliozoan, live in fresh or salt water. The pictures of them above are very greatly magnified, for they can be seen only under a microscope. They feed on even tinier organisms in the water. The vorticella is attached by its stalk to some solid object. At the upper end is a mouth surrounded by tiny hairs called *cilia*. The hairs sweep food particles into the mouth by setting up a whirlpool action in the water. The food is enclosed in a bubble called a *food vacuole*, where it is digested.

The collar flagellate has a delicate, transparent collar. From the center of it grows a whiplike organ, the *flagellum*. The beating of the whip draws a current of water toward the cell. Food particles in the current pass through the wall of the cell into the food vacuoles.

The heliozoan, also called "sun animal," moves about and captures food by means of pseudopods. In this case the pseudopods are stiff spines that radiate from the center of the cell. The spines wrap around the food and enclose it in a vacuole.

The hydra in the picture is capturing the larva of a kind of shellfish. It has a mouth surrounded with long tentacles. The tentacles sting and paralyze the prey and then shove it inside the mouth.

Butterflies and moths have tubelike mouth parts. With these they suck nectar from flowers. Grasshoppers and beetles have chewing, grasping, and tearing mouth parts. (For picture of insect mouth parts, see Insects.)

The barn swallow catches insects in flight. Some birds hammer into the bark of trees for grubs, comb the leaves with their bills for small insects, swoop down on rodents and on other birds. (For picture of the feeding habits of birds, see Birds.)