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Animals In Flight

illions of years ago, a variety of animals learned to defeat the force of earth's gravity by flying or gliding over land and water. The squid and the octopus invented jet propulsion; a small fish learned to glide, so did squirrels and phalangers. Insects were the first land organisms to develop true flight. Later, birds became the masters of the air, while one mammal, the bat, not only taught itself how to fly, but also perfected radar and the science of ballistics.

Then humans arrived on the terrestial scene. They were the most intelligent form of life and the most inventive. They watched birds in flight, became jealous, and tried to copy them. Many strapped on great wings, climbed to some convenient hillside and jumped into air. Of course, they fell like stones. Eventually, humans gave up trying to fly like birds. They realized that the muscles of their arms and shoulders were too weak to pump artificial wings and that their body weight was too great to allow them to get off the ground. But for hundreds of years they did not realize that the feathers of a bird and the leathery wings of a bat are highly specialized "instruments" resulting from thousands of years of evolutionary change. They are impossible to copy even today, when we have developed so many scientific skills.

In time, we invented the internal combustion engine and were then able to defeat the force of gravity and take to the air. But we have never really learned to fly like birds or bats.

We have instead used ideas based on the flight of the flying squirrel, the phalanger, the flying fish, the squid, the octopus, and insects. The only flying machines we can make either glide, (like the flying squirrel) are propelled from the rear by rocket engines, (pushing themselves like the squid) or are driven by conventional propellers that *pull* the aircraft through the air (like the wings of insects).

The machine closest to one kind of natural flight is the helicopter. It does with heavy rotor blades and an engine what the hummingbird does with its wings, moving forwards, backwards, upwards, downwards or just hovering. But the tiny hummingbird can do better than the helicopter—it can also fly by flapping its wings.

he bat is the only mammal that can fly. It is also the inventor of radar and of the science of ballistics. (Ballistics is the science that measures the speed, direction and height of a moving object such as a bullet.) For these reasons alone, the bat is one of the world's most interesting flyers.

The wings of bats are made of skin that is attached to the legs and arms and tail and they are made up of three parts. A small piece runs from the forearm to the shoulder. A large piece runs from the fingers to the legs. A medium piece runs between the legs and around the tail. The bat has developed a hook on each wing and uses the hooks to hang upside down.

Why do bats fly from side to side? The moths, their favourite food, forced them to. At some point in the evolution of moths these insects developed six tiny "ears" on their chests which are able to pick up the ultrasonic sounds made by bats. With these ears the moths could tell from which direction the bats were approaching and they learned how to avoid their enemies. The bats

learned to fly from side to side to confuse the moths, who did not know if they were going to be attacked from the left or from the right.

For this reason, moths developed a new way of avoiding capture. If they could not tell from which side the bat was coming, they simply folded their wings and dropped to the ground. The bats then taught themselves ballistics. They calculate the moth's speed, height and position and scoop up the moth before it can find safety on the ground.

nsects, apart from being the very first creatures to fly, are the oldest living species of land animals. They appeared on earth some 425 million years ago. The first insects may have been wingless. It was not until some 200 million years later, or about 225 million years ago, that flying insects became common on earth.

There are almost one million different kinds of insects in the world, which means that they outnumber all other forms of life by about four to one. A few species have never learned to fly, but the majority have two pairs of wings, one pair in front, the other behind. These are made of light, often transparent material, strengthened with thicker ribs.

An insect's wings in flight are moved up and down and twisted slightly at the same time, rather like aircraft propellers, using tiny muscles that contract and expand as many as 100 times a second.

Although the wing movements of most insects are similar, the shape and size of their wings varies a great deal. So does the speed of flight and the way in which each species of insect moves about. Butterflies and moths have larger wings and bodies, but they are slower fliers. Dragonflies can move swiftly, darting up and down with ease, almost like helicopters. Houseflies zip around a room very rapidly and have the ability to twist and dodge in a small area. But no matter how fast insects fly, birds can do better, being able to swoop and twist and dodge more easily. They capture millions of insects each year.

wallows and other insect catchers feed on the wing, swooping through the air and using their keen eyes to spot tiny insects in flight. These birds change course with a flick of their tails and gulp down their prey in one easy movement.

The speed king of the bird world is the peregrine falcon, which is about the size of a crow, but much more streamlined. It can dive at a speed of 280 kilometres per hour. The peregrine is a hunter of other birds and can fly as easily upside down as upright.

Another agile, swift flyer is the tiny hummingbird, no bigger than your thumb, which can fly from Canada to the Gulf of Mexico during migration time. It is the helicopter of the bird world. It moves so quickly and burns up so much energy that it must feed every 15 minutes in order to keep up its strength. When it is migrating it puts on a great deal of body fat as fuel for a long flight.

Vultures, on the other hand, are slow fliers but magnificent gliders. They can stay in the air without flapping their wings for a long time, taking advantage of updrafts and thermal movements of air.

Some birds fly 3,200 kilometres and more during migration. Birds are able to maintain themselves in air and make long flights because of their specialized chest and arm muscles. The deep "keel" (chest) of a bird is made of heavy muscles and serves two purposes: it allows the bird to flap its wings tirelessly and its weight helps to keep the bird on an even course.

When a bird beats its wings in flight, its

feathers come together to form a curved, smooth surface during the downward stroke. Then they come apart, like spread fingers, on the upstroke. They offer resistance to the air on the downstroke, and no resistance on the upstroke. A bird's bones are hollow and light, and inside its body there are several air sacs like small balloons that help to keep it in the air.

Some birds, such as gulls and albatrosses, can be found far out in the oceans, bobbing up and down on the water or flying slowly in search of food. These are often rewarded by an easy meal that pops right out of the seas and flits along in the air for 9 to 12 metres.

his is the so-called flyingfish, which does not fly at all. It glides. Flyingfish are small, usually about 18 centimetres long. They abound in the Pacific Ocean and are also found in the Mediterranean. Members of this species have longer-than-usual pectoral (chest) fins which allow them to build up a great deal of speed in the water. When chased by a larger fish, the flyingfish swims toward the surface, then drives itself into the air with powerful thrusts of its tail. It goes up about 3 metres, then glides until it loses height and falls back into the water again.

he squid and the octopus, like the flyingfish, can move above water for quite long distances at heights of up to 3 metres. But these Cephalopods, as they are also called, are jet propelled. They pump out sea water with great force through a tube that lies along one side of their bodies and move in jerks. By pumping faster, they can build up speed. When they are chased by predatory fish, they aim themselves upwards, burst out of the water, and are propelled varying distances by the force of their jet speed.

ver the centuries, two land animals, the flying squirrel and the phalanger, seem to have been trying desperately to fly. These animals have developed a "mantle" of loose skin that runs from front legs to back legs. When spread, this mantle acts rather like a kite, carrying the owners for distances of 30 metres or more. Their tails are used as rudders to change direction. Flying squirrels launch themselves from high up in trees. Usually, their glides are short, depending on the height from which they start gliding. They turn sharply, descend steeply—then level off. When they land, they lift their tails and bodies suddenly, and settle gently. Flying squirrels are usually active only at night.

Phalangers live in Australia in New Guinea. Though they are squirrel-like in many ways, they are a distinctly separate class of mammal. The best known of these is the Sugar Glider of Australia, which is a little larger than the flying squirrel and has a bushier tail. It, too, moves about mostly at night.

inally, there is the flying dragon, and a tree toad found in parts of the East Indies and Southeast Asia. The tiny flying dragons, growing to a length of about 20 centimetres, are really lizards. Like the flying squirrel, they glide rather than fly. Folds of skin stretched over extensions of the ribs help flying dragons to glide from tree to tree. The tree toad can parachute to the ground and from tree to tree in search of insects and small animals. There are enormous folds of skin between its widespread toes. When it jumps, these webs catch the air and the toad half glides and half parachutes through space.

YOUR NAP, SIR WART?

BIRD BITS

The ostrich is the largest of existing birds. It may reach 2.5 metres in height, and 140 kilograms in weight. It lives in the open country of Africa. It has long, powerful legs and highly valued plumage. In some areas the ostrich is ridden like a horse for sport. The ostrich cannot fly.

The largest bird that can fly is the trumpeter swan, which weighs up to 18 kilograms.

The smallest of existing birds is the bee hummingbird, about 5 cm long and often weighing only 3 grams.

The world's bird population is estimated at over 100 billion (100,000,000,000). Of these, only about 70 are whooping cranes. The first whooping crane ever born in captivity was named Dawn.

During migration between breeding and wintering grounds, some birds fly thousands of kilometres to return to exactly the same spot where they nested the previous year.

Soaring is a method of flight by which a bird glides on rising air currents without actively flapping its wings. The vulture and albatross are among those birds that use this energy-saving form of flying.

Why does the hummingbird hum? He doesn't know the words.

The wandering albatross has a wing-span of 3.5 metres.

The anhinga, a bird found in warm, inland swamps and lakes, can fly underwater.

Birds are distinguished from all other animals by having feathers.

Brailling is a way of making a bird flightless by binding the wing so that it cannot be extended.

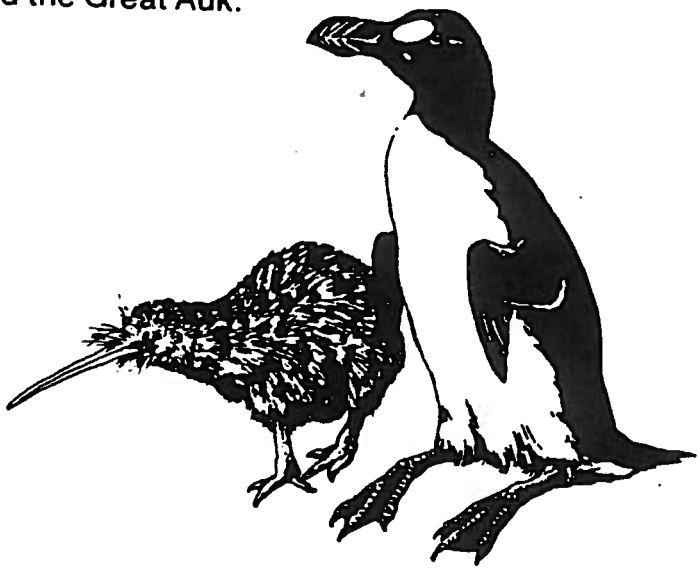
Clipping is the cutting of the primary feathers of one wing of a bird to inhibit its flight.

Claws are found on the wings, as well as on the toes, of secretary birds, screamers and hoatzins.

Swifts are small, brownish birds and perhaps the most excellent flyers. They are even able to sleep on the wing.

How do you get down from an elephant? You don't get down from an elephant, stupid, you get down from a duck.

Some birds cannot fly. Examples of flightless birds are the emu, kiwi, tinamou, rhea, penguin, takahé, ostrich, cassowary, dodo and the Great Auk.



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Comprehension Questions

1. What major force must be defeated in order for an object to fly? _____

2. Different animals have developed specific skills in order to overcome gravity. Name the skills the following animals have developed.

Octopus and squid _____
Fish and squirrels _____
Bat _____

3.Humans eventually realized they could not fly like birds. What made it impossible for them to fly? _____

_____

_____

4.What technological invention allowed humans to defeat the force of gravity and take to the air? _____

5. Our flying machines either glide like a _____, are propelled by

rocket engines, pushing themselves like the _____, or are driven by propellers that pull the aircraft through the air like the _____ of _____.

6. There is only one mammal that can fly. It is the _____. This flying mammal is also the inventor of what? _____

7. Why were bats forced to teach themselves ballistics? _____

_____

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8. In addition to being the oldest species of land animals, insects were also the first creatures to do what? _____

_____

9. Two creatures are mentioned in the article that fly like a helicopter. They are the _____ and the _____.

_____

10. Which bird can dive at a speed of up to 280 kilometers an hour? _____

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11. Describe the wing action in the flight of insects. _____

_____

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12. Describe what occurs when a bird beats its wings in flight. _____

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13. The tree toad of the East Indies and Southeast Asia glides rather than flies. Explain how a toad is capable of doing this? _____

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