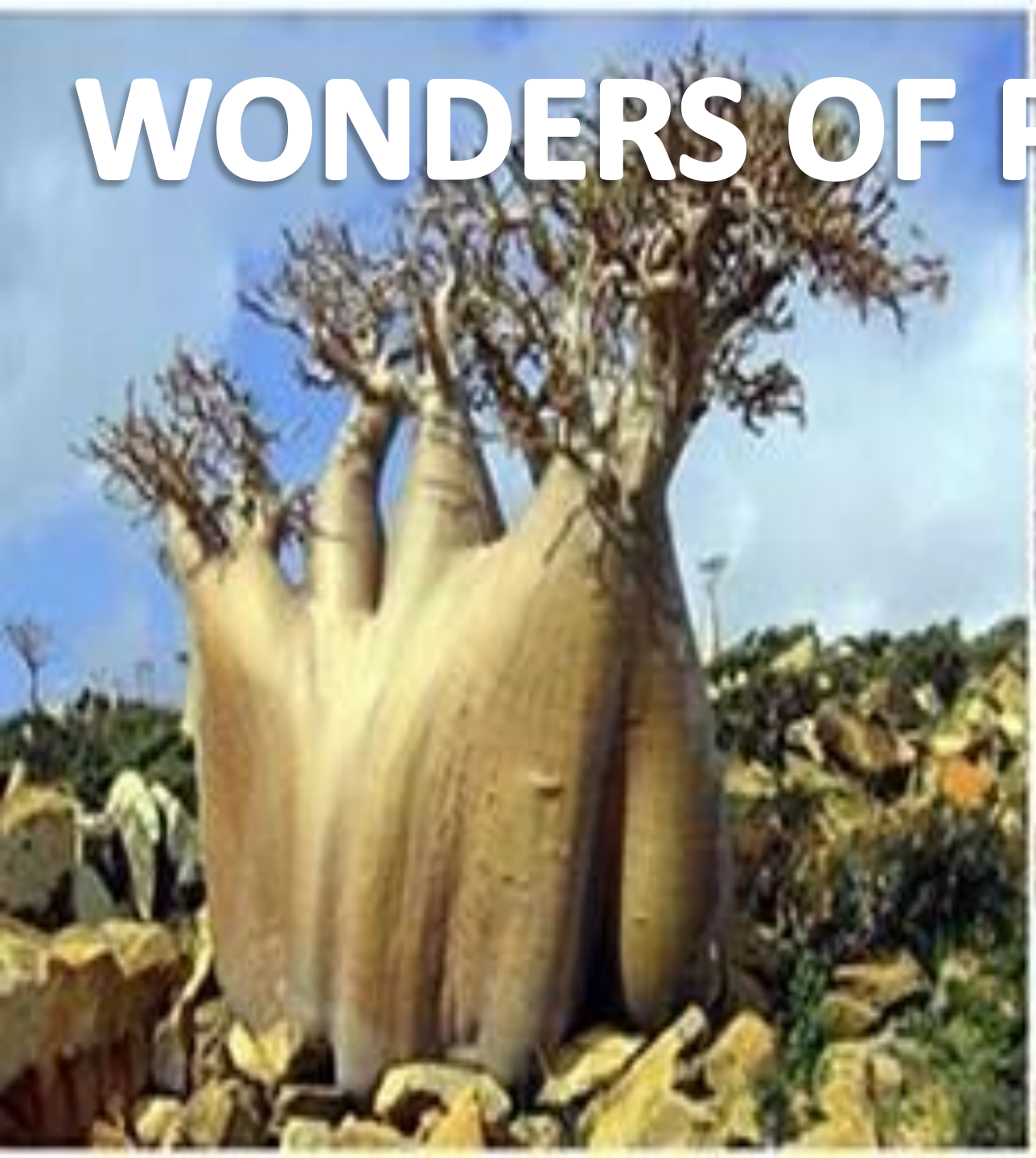
WONDERS OF PLANTS



SCOPE OF UNIT

- **Morphology of Leaf** – Simple leaf, Types of compound leaf, Phyllotaxy, Types of stipules, Leaf apex, Leaf margin, Leaf shapes, Venation and types. **Modifications of Leaf** - Spine, Tendril, Hooks, Phyllode.
- **Morphology of Inflorescence** – Racemose: Simple raceme, Spike, Catkin, Spadix, Panicle. Cymose: Monochasial, Dichasial, Polychasial. Compound: Corymb, Umbel, Capitulum. Special Types: Cyathium, Verticillaster, Hypanthodium.
- **Wonders of Plants –** *Rafflesia*, *Victorea regia;* Carnivorous plants: Pitcher plant, Venus flytrap, Sundew, Bladderwort; *Adansonia, Sequoia,* Strangler fig; Plant mimicry – Orchids.

1. *Rafflesia arnoldii*

Family - Rafflesiaceae

"*It is perhaps the largest and most magnificent flower in the world*" was how Sir Stamford Raffles described his discovery in 1818 of *Rafflesia arnoldii*, modestly named after himself and his companion, surgeon-naturalist Dr James Arnold.

•A plant with no roots, no stem, no leaves but possesses the biggest flower in the world!

•This jungle parasite of south-east Asia holds the all-time record-breaking bloom of 106.7 centimetres (3 ft 6 in) diameter and 11 kilograms (24 lb) weight, with petal-like lobes an inch thick.

•It is one of the rarest plants in the world and on the verge of extinction. Considered one of the rarest in the world not only for its gigantic petals but also for the putrid smell it emits to attract pollinators and prey, the plant is endemic to Malaysia, Thailand, Indonesia and the Philippines.

•The flower is basically a pot, flanked by five lurid red-brick and spotted cream 'petals,' advertising a warm welcome to carrion flies hungry for detritus.

•The flower withers only after emitting a stench of rotten meat to draw insects. The bloom hollow at the centre and white and red-spotted, has five petals.

•It takes about nine months for the flower to bloom and it can only last for a week.

•A *Rafflesia* flower can grow up to a metre in diameter, and the biggest can weigh up to 7kg.

•Despite having such a huge flower, the parasitic plant has no root or stem and grows inside its host, a *Tetrasigma* vine, which is of the grape family.

2. *Victorea regia*

Victoria amazonica is the world's largest water lily and among the largest in the Nymphaeaceae family. The first discovery was in 1801 in Bolivia and it is indigenous to the Amazon River basin's shallow waters. The plant is famous for its enormous circular leaves.

•The Giant water lily has large leaves that have a diameter of up to 10 feet, which float on water, and a submerged stalk that is up to 26 feet long. The leaves start as pointy heads that expand so fast up to 5 square feet each day.

•The edges of the leaves turn up to form the rim.

•Under the surface, the leaves are red and have sharp spines that defend the plant from herbivorous fish.

•The floating leaves are so big and strong they can carry a small child.

•The leaves have air inside them to help them float and they are anchored into the mud at the bottom of the river with long stems.

•The flowers are white the first night they are open and become pink the second night, and purple subsequently. They are up to 9-12 inches in diameter, and are pollinated by beetles. The flowers are also strongly fragrant.

3. Carnivorous plant – Pitcher plant

•Pitcher plants (or pitfall traps) [*Nepenthes*] are carnivorous plants belonging to family Nepenthaceae whose prey-trapping mechanism features a deep cavity filled with liquid known as a pitfall trap.

•Foraging, flying or crawling insects such as flies are attracted to the cavity formed by the cupped leaf, often by visual lures such as anthocyanin pigments, and nectar bribes.

•The sides of the pitcher are slippery and may be grooved in such a way so as to ensure that the insects cannot climb out. There are hairs toward the top that aid in keeping prey trapped.

•Through a mechanism of digestion, the prey is converted into a solution of amino acids, peptides, phosphates, ammonium and urea, from which the plant obtains its mineral nutrition (particularly nitrogen and phosphorus).

•Such carnivorous plants occur in locations where the soil is too poor in minerals and/or too acidic for most plants to be able to grow.

•Some insects and animals live harmoniously with pitcher plants.

•Some predators, like spiders, use the lid to hide under, and some insect larvae, like mosquitoes, live inside the pitcher plant itself.

•Ants that die inside the plant are used for their decaying scent to attract other prey.

•Sometimes small frogs will hide in pitcher plants, eating flies that are attracted to the plant.

4. Carnivorous plant – Venus flytrap

Venus flytrap, (*Dionaea muscipula*), also called Venus's flytrap, perennial carnivorous plant of the sundew family Droseraceae, notable for its unusual habit of catching and digesting insects and other small animals. The only member of its genus, the plant is native to a small region of North and South Carolina, where it is common in damp mossy areas. As photosynthetic plants, Venus flytraps do not rely on carnivory for energy but rather use the nitrogen-rich animal proteins to enable their survival in marginal soil conditions.

•The plant, which grows from a bulblike rootstock, bears a group of small white flowers at the tip of an erect stem 20–30 cm (8–12 inches) tall.

•The leaves are 8–15 cm (3–6 inches) long and have blades that are hinged along the midline so that the two nearly circular lobes, with spiny teeth along their margins, can fold together and enclose an insect alighting on them.

•This action is triggered by pressure on six sensitive hairs, three on each lobe.

•In normal daytime temperatures the lobes, when stimulated by prey, snap shut in about half a second.

•Glands on the leaf surface then secrete a red sap that digests the insect's body and gives the entire leaf a red, flowerlike appearance. However Venus flytraps cannot digest exoskeletons. Instead, when its trap reopens, it spits out the bones of the insects.

•About 10 days are required for digestion, after which the leaf reopens.

•The trap dies after capturing three or four insects. The trap of the plant can only open and close around half a dozen times before it permanently closes.

5. Carnivorous plant – Sundew

Sundew, (genus *Drosera*), any of the approximately 152 carnivorous plant species of the family Droseraceae. Sundews are widely distributed in tropical and temperate regions, especially in Australia, and are common in bogs and fens with sandy acidic soil.

• Sundews are a carnivorous plant, and despite their tiny size they are a formidable foe for insects on every continent except Antarctica! There at least 194 species of sundew, or *Drosera*, and they can be found from Alaska all the way to New Zealand.

•Sundews can be found in places like bogs, muskegs, and swampy areas that are moist but not too wet. However some sundew species are even found in desert environments. For example, the round-leaved Sundew (*Drosera rotundifolia*), lives in the muskeg of southeast Alaska.

•The sundew plant produces a sweet, sticky fluid that coats the tiny hairs covering the leaves. This "dew" glistens in the sunlight and attracts insects who are fooled into thinking they will get a tasty meal of sweet nectar. Sundews also emit a sweet fragrance to attract insects to the plants.

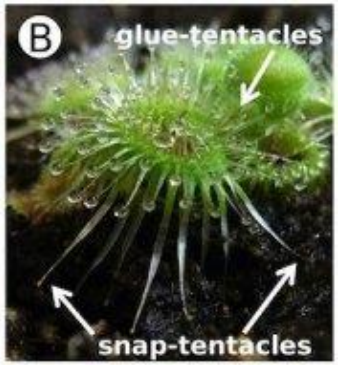
•Many sundew plants change color depending on the amount of sunlight they receive. When sunlight is plentiful, leaves turn a bright red, but if they grow in shady areas, leaves are green. Some sundews are a greenish-red.

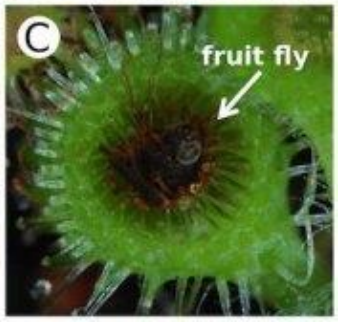
•When sundews feel prey getting caught in their sticky dew, their thigmonasty is to wrap around the prey, until it dies from exhaustion or asphyxiation. The response is faster in some species than others. Cape sundews look very dramatic and full of flair, but they take up to 30 minutes to completely engulf their prey. *Drosera glanduligera* and *Drosera burmannii* have "snap tentacles" which will wrap around their food within seconds!

• The viscous secretion on the hairs of sundews traps insects, and the leaves curl inward to place the prey in contact with smaller, inner hairs that secrete enzymes. The enzymes are an external digestion process, breaking down the organs of the insect so nutrients can be absorbed by glands in the plant. When only the exoskeleton remains, the leaf uncurls and readies itself to catch another meal.

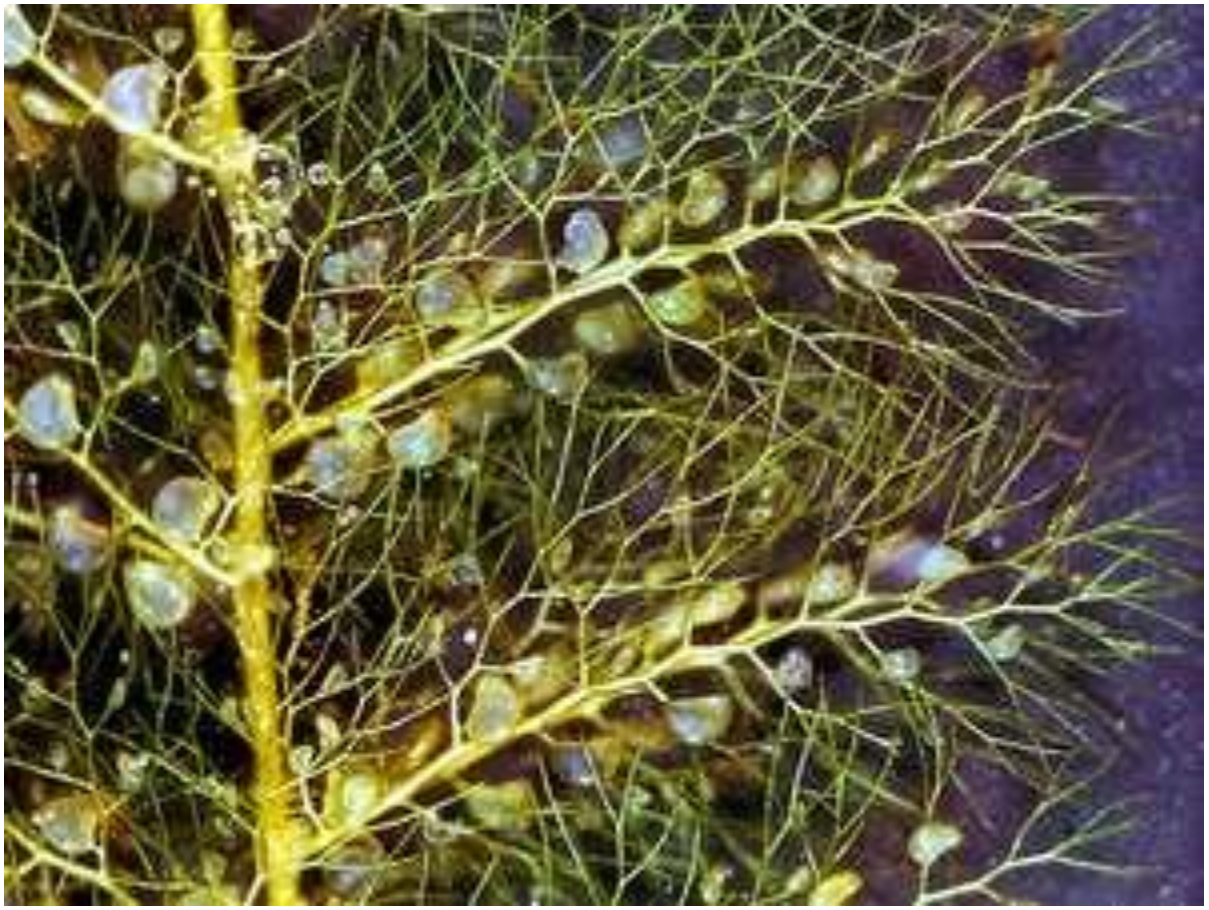
•Sundews are so highly adapted to gaining nutrients from insect prey that some species aren't even able to gather nutrients through a root system at all. Instead, the roots simply keep them, well, rooted to the ground, or are simply a place to gather or store water.


A
inflorescence stalk
snap-tentacles


B
glue-tentacles
snap-tentacles


C
fruit fly

6. Carnivorous plant – Bladderwort



Common bladderwort (*Utricularia* sps.) belonging to family Lentibulariaceae is an often overlooked, but remarkable aquatic carnivorous plant with highly divided, underwater leaf-like stems and numerous small "bladders".

•The genus *Utricularia* is Latin meaning "little bag"; referring to the "bladders" on the stems.

•The "bladders", from which the common named is derived, are used to capture small aquatic organisms.

•Hairs at the opening of the bladder serve as triggers, and when contacted, mechanically cause the trap to spring open, drawing in water and organisms like a vacuum.

•Enzymes and /or bacteria inside the traps aid in digestion.

•Common bladderwort is native to the Northern Hemisphere, and is known to occur in fifty of the United States. It is found in lakes, interdunal ponds, wet marshes, and rivers and streams; often in water up to 6 feet deep.

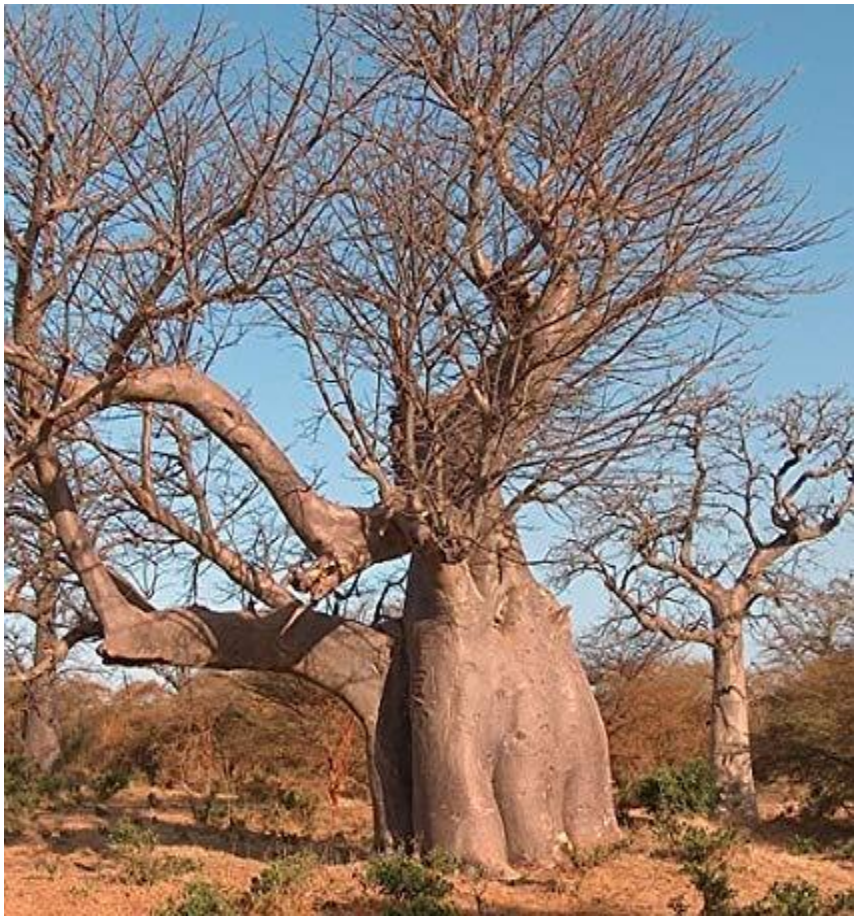
•Several insects, mammals, and waterfowl use common bladderwort as a food source, and others use the stems as shelter, or to lay eggs.

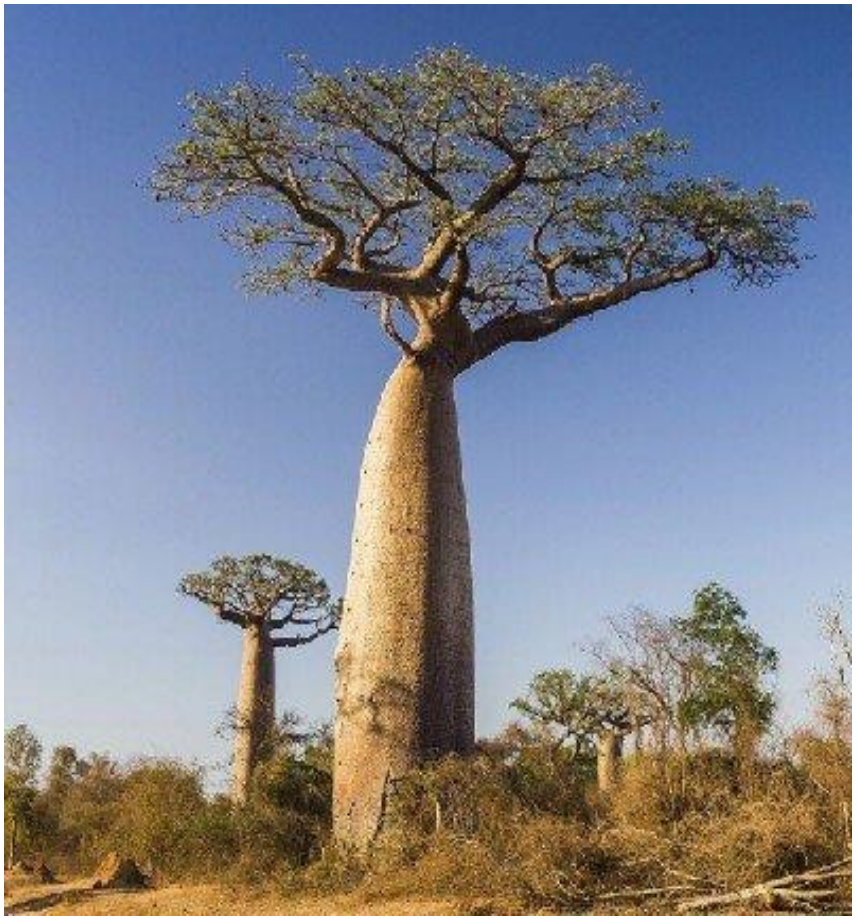
•Bladderwort captures animals in 1/35 part of second. After 15 to 35 minutes, trap can be re-used. Stem is covered with hundreds of traps. Aquatic species have larger traps.

•Scientists believe that bladderworts live in symbiosis with microorganisms which attract prey and facilitate digestion (provide enzymes) of small animals.

•People cultivate bladderworts because of their ornamental flowers.

7. *Adansonia*





The strange – looking tree bearing the thickest trunk in the world!

▪Botanical name: *Adansonia digitata* [Genus name dedicated to French botanist Adanson; *digitata* means ‘finger-like’ referring to the shape of the leaf.

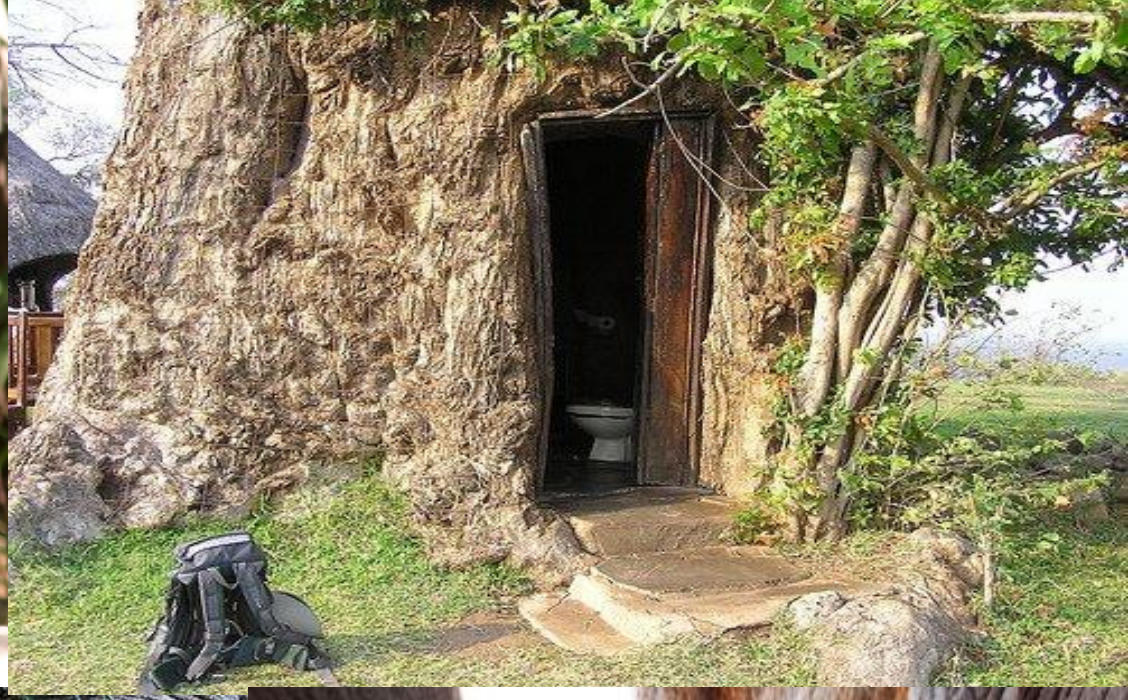
▪Also called ‘Monkey-bread tree’ as monkeys eat their fruits with apparent relish. Vernacular name in Africa is ‘Baobab’ which has been accepted in English.

▪In India the tree is known as ‘Choyarichich’, ‘Gorakhaamli’, Gorakh Chinch’, etc.

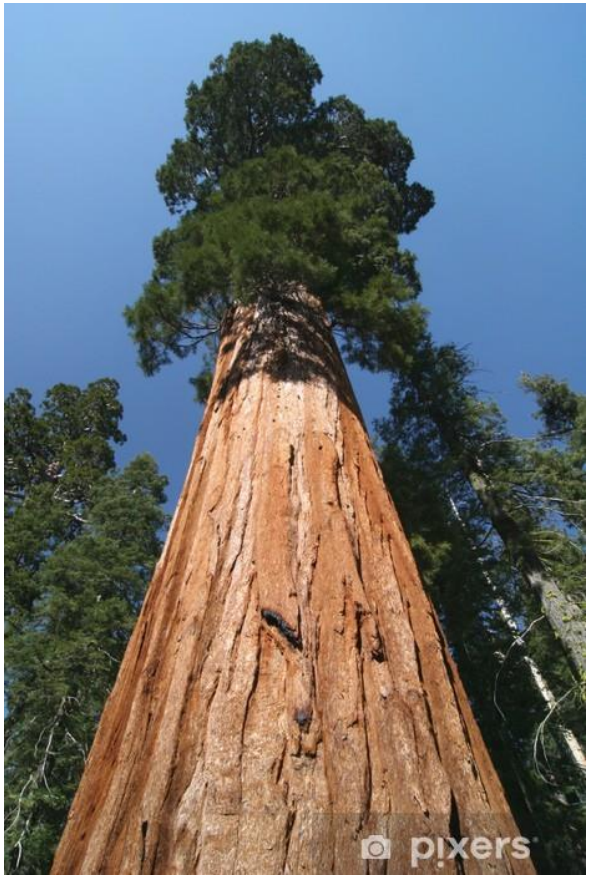
- Formerly, it was cultivated near houses, temples, etc. on account of its strange looks and of its medicinal value of most of its parts.
- It is a soft-wooded tree and its trunk is considered to be the thickest in the world. Trunk is grotesquely fat, suddenly tapering into thick branches.
- Trunk is reported to reach girth of about 30 m in Africa – about 14 – 15 tall men spreading their arms fully can encircle the trunk of this tree!!

- Another striking feature of the Baobab is its supposed venerable old age.
- Adanson himself calculated that a large tree he noticed in Africa was more than 5000 years old!
- The same author remarked that he had seen in Africa some trees on the bark of which visitors had carved their names in the 14th or 15th century, and such trees were still growing strong in the 18th century!

- The soft trunk of the tree is known to be hollowed out and made into living houses; Livingstone described one of those excavated trunks as sufficient to allow 30 men to lie down in it!
- In some parts of Africa the dead bodies of witch doctors and other distinguished men are suspended inside the hollowed trunks of these trees, where such bodies soon become perfectly dry and mummified without any further treatment.



8. *Sequoia*

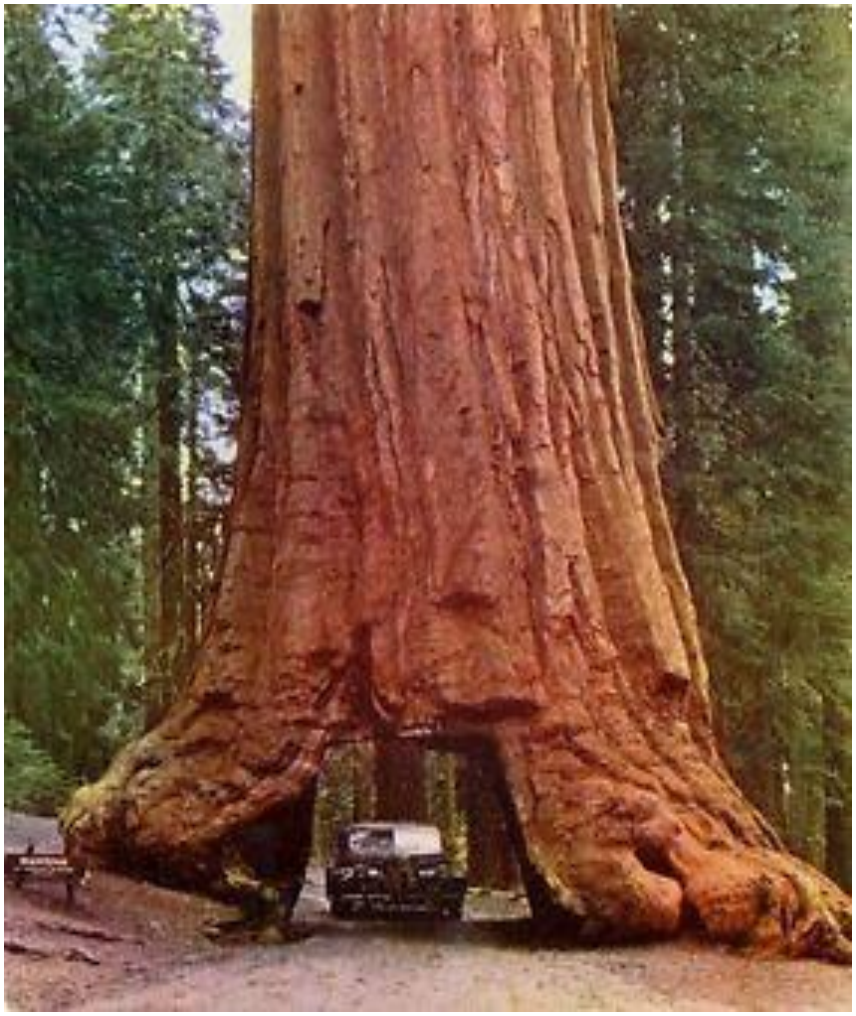


This giant tree (*Sequoia sempervirens*) is an endangered species belonging to the Cupressaceae family

The coast redwood is the tallest tree on earth.

Sequoia sempervirens, called coast redwood, is so named because it is native to moist, foggy, coastal plain areas along the Pacific coast, now being primarily confined to a narrow coastal belt.

This is a narrow-conical, evergreen conifer that is typically found, sometimes in magnificent pure strands, in high moisture coastal areas that are regularly blanketed with fog rolling in from the Pacific.



The bark of a giant sequoia may be the thickest of any tree we know—on some specimens the outer layer of bark measures over two feet thick at the base. This formidable exterior provides the trees with super-powered protection. Their bark also doesn’t contain any flammable pitch or resin, and if it were to ignite in a forest fire, the girth would slow flames from reaching the wood inside.

Giant sequoias not only can survive forest fires, they thrive on them. When a sequoia grove catches fire, the heat opens up cones on the forest floor and releases the seeds inside. The blaze eats up any brush or deadwood that’s accumulated on the ground while leaving behind nutrient-rich ash in which the saplings can flourish.

The largest tree on Earth is born from a very tiny seed—91,000 of them add up to a single pound. Giant sequoias can’t sprout from roots or stumps like the coast redwood can, which means all the reproductive responsibilities fall to the seeds. Animals like squirrels, chickarees, and beetles are instrumental in cracking open sequoia cones and dispersing the contents. But for a seed to germinate it needs to make direct contact with bare, mineral soil (which is why fires are so vital). Giant sequoias release 300,000 to 400,000 seeds per year, so there are plenty of chances for the conditions to be just right.

Before the first Olympics were held or the first pyramids were built in Mexico, the oldest living sequoia had already started to grow. The President, located in California's Prairie Creek Redwoods State Park, is estimated to be about 3200 years old. Despite its old age, the giant hasn’t slowed down at all. The annual wood production of older sequoias is actually greater than that of younger specimens.

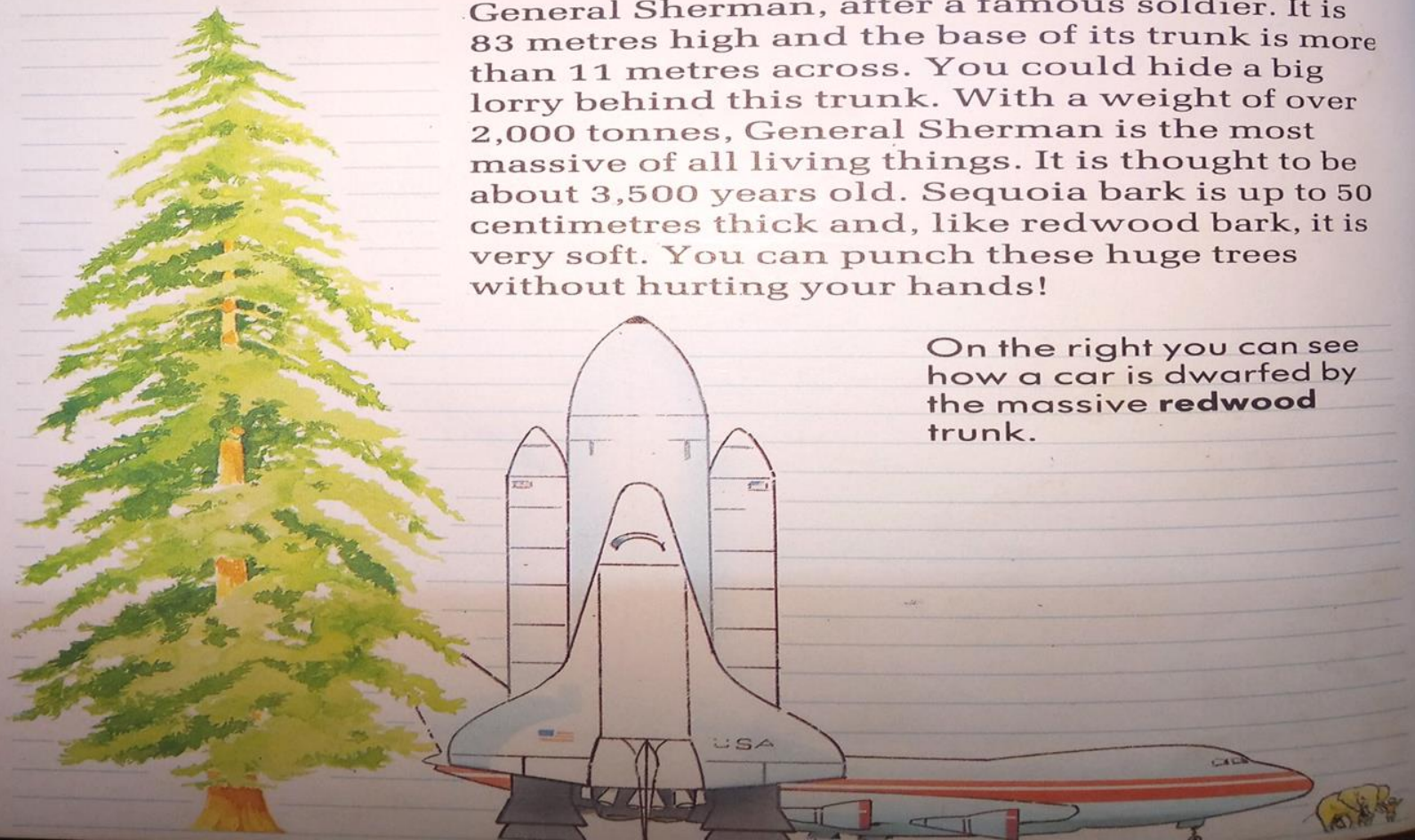
General Sherman in California's Sequoia National Park boasts a mass of 52,500 cubic feet, which is over half the volume of an Olympic-sized swimming pool. The trunk alone weighs about 1400 tons or the equivalent of 15 blue whales. According to the National Park Service, all that lumber could be used to build 120 average-sized homes.

The biggest living thing

A mature **redwood** towers over a space shuttle or a jumbo jet. And it is 50 times as tall as a fully grown person. Yet it has grown from a seed weighing 1/250 th of a gram!

The blue whale is the largest animal that has ever lived – bigger even than the largest of the dinosaurs. But even the blue whale is dwarfed by the redwoods and giant sequoias that grow in California.

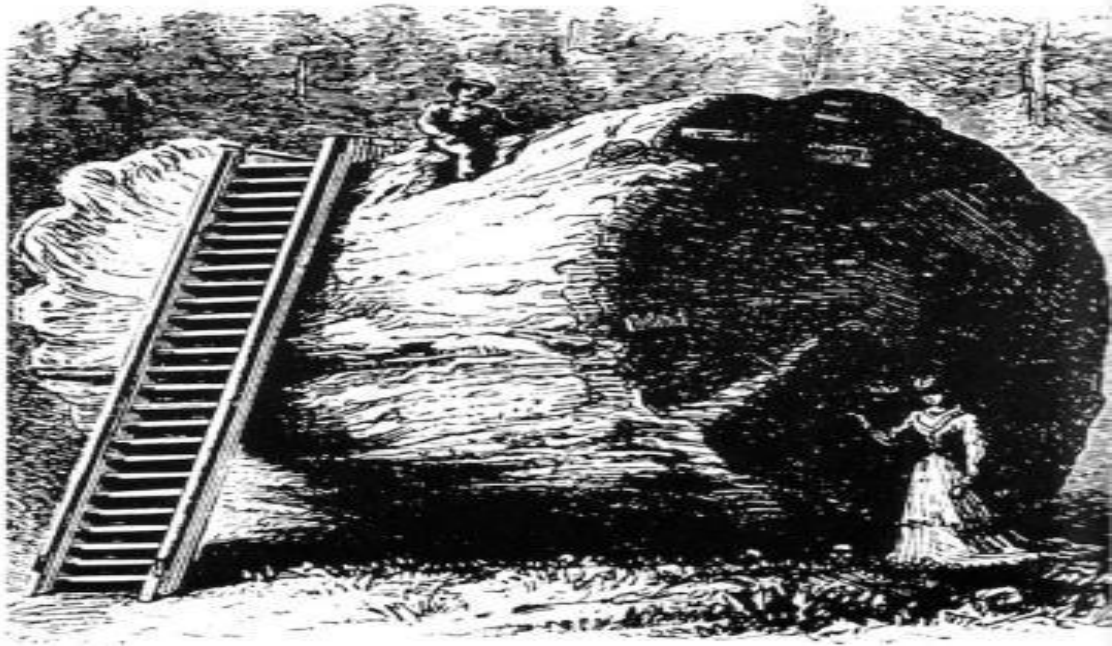
The Californian redwoods are the world's tallest trees. Many of them reach more than 100 metres into the sky. The giant sequoias, though not as tall as the redwoods, have much thicker trunks. One huge specimen is called General Sherman, after a famous soldier. It is 83 metres high and the base of its trunk is more than 11 metres across. You could hide a big lorry behind this trunk. With a weight of over 2,000 tonnes, General Sherman is the most massive of all living things. It is thought to be about 3,500 years old. Sequoia bark is up to 50 centimetres thick and, like redwood bark, it is very soft. You can punch these huge trees without hurting your hands!



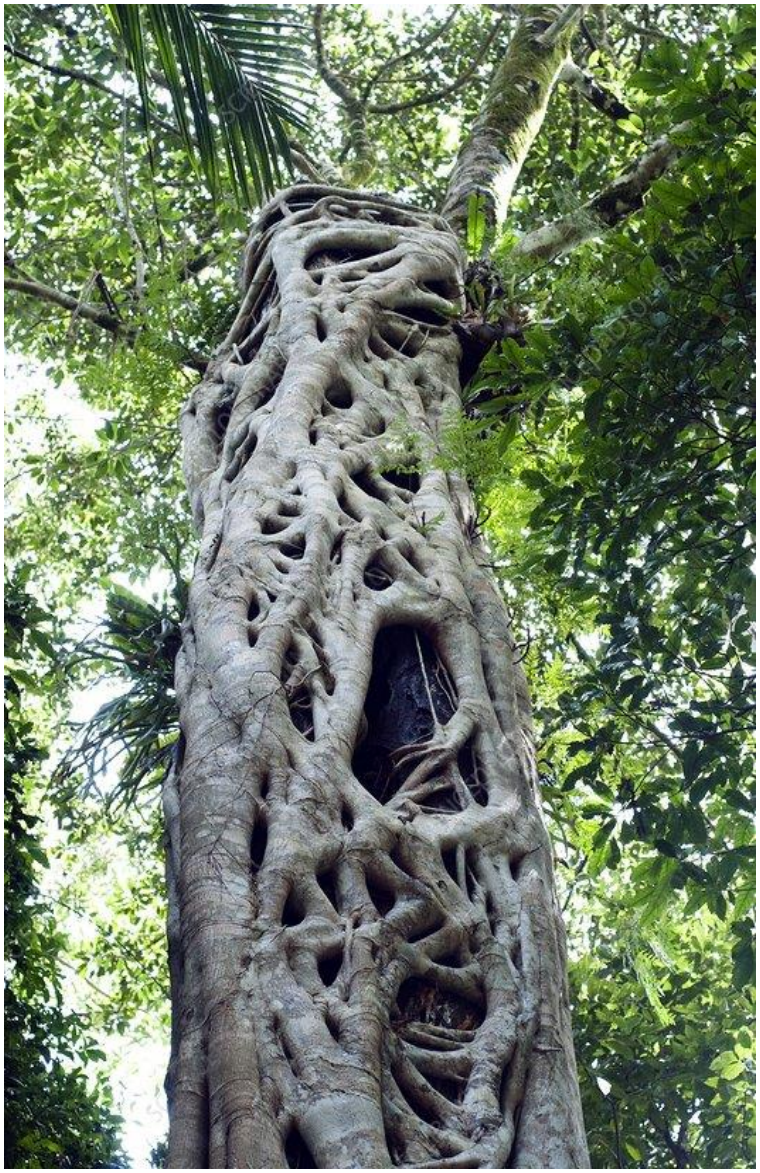
On the right you can see how a car is dwarfed by the massive **redwood** trunk.

THE STUMP AND TRUNK OF THE MAMMOTH TREE OF CALAVERAS.

Showing a Cotillion Party of Thirty-two Persons Dancing on the Stump at one time



9. Strangler fig



Strangler fig, also called **strangler**, many species of tropical figs (genus *Ficus*, namely *F. microcarpa; F. citrifolia*, etc.), belonging to family Moraceae, named for their pattern of growth upon host trees, which often results in the host's death. Strangler figs and other strangler species are common in tropical forests throughout the world.

Beginning life as a sticky seed left on a high tree branch by an animal such as a bird, bat, or monkey, the young strangler lives on the tree’s surface. As it grows, long roots develop and descend along the trunk of the host tree, eventually reaching the ground and entering the soil. Several roots usually do this, and they become grafted together, enclosing their host’s trunk in a strangling latticework, ultimately creating a nearly complete sheath around the trunk.

The host tree’s canopy becomes shaded by the thick fig foliage, its trunk constricted by the surrounding root sheath, and its own root system forced to compete with that of the strangling fig. This process can kill the host; if not, the host tree, being much older than the strangler, still dies eventually and rots away and a magnificent fig "tree" is left behind whose apparent "trunk" is actually a gigantic cylinder of roots.

Strangler figs are ecologically important in some tropical forests. The hollow centres of strangler figs are full of large hollows that provide shelter and breeding sites for bats, birds, and other animals. Perhaps more importantly, stranglers are “keystone species” in that they provide food to a wide variety of animals during times of scarcity.


Strangler figs also grow
around ancient structures
like some monuments

10. Plant Mimicry - Orchids

Orchids are world-class liars, using smells and visual tricks to lure male insects into trying to mate with them so that their pollination can be carried out by these insects.

Across Europe, Australia, Africa and South America, orchids have independently evolved ways to manufacture irresistible bouquets. Many of these smells mimic the sex pheromones – otherwise known as aphrodisiacs – of insects.

Orchids release a perfume that mimics a fertile female insect, luring in male insects. Overcome by the female scent, the males are duped into attempting to mate with the flower. During their futile attempts at copulation, they pick up a gobbet of pollen, so that when they visit another flower they will pollinate it.

And what do the male insects get in exchange for their labours? ABSOLUTELY NOTHING!

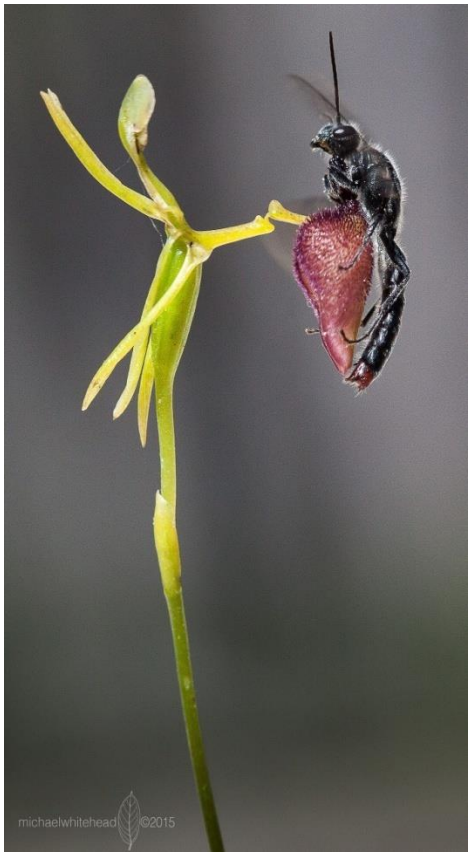
Australia's endangered **hammer orchids** go a step further, and use visual lures as well as smell. Each flower has a landing platform called a labellum ("lip"), which is actually a modified petal. It is shaped like a hammer, hence the name.

The only insects that can pollinate these strange-looking orchids are **thynnine wasps**. These orchids produce chemicals called pyrazines to lure the male wasps.

But the hammer orchid doesn't stop there. Its hammer-shaped labellum resembles a female wasp, so it is an additional lure. Its shape also manipulates the male's mating practices.

Female thynnine wasps are flightless, so when a female releases her pheromone she first crawls up a stick. The male flies down, picks her up, and they start to mate in flight as he carries her off to a food source. So when a male gets lured by a hammer orchid, he grasps the labellum and attempts to simultaneously copulate with it and fly off with it.

This doesn't really work. The labellum is mounted on a hinge, so the male's momentum makes it swing over, flipping him upside-down. He lands neatly on the stigma, ensuring that his pollen load ends up exactly where the orchid needs it.



Some orchids go even further than the hammer orchids. They entrap their insect victims, to ensure that they transport the maximum amount of pollen.

The fungus gnat now tries to squeeze his way out

The banded greenhood orchid *Pterostylis sanguinea* does just this to luckless fungus gnats of the genus *Mycomya*. It's one of the most sophisticated deceptive systems thus far described for orchids.

Attracted from far away by the orchid's female-mimicking smell, the male gnat lands on the flower and attempts to copulate with the labellum. But he is in for a shock. His movements cause the labellum to swing up like a drawbridge, shutting him inside a chamber.

The fungus gnat now tries to squeeze his way out. On its way, the gnat smears its load of pollen onto the orchid's stigma, and then picks up a new parcel of pollen.


THAT'S THE END OF THIS WONDERFUL UNIT!!
HOPE YOU ALL ENJOYED AND LEARNED SOMETHING NEW AND INTERESTING!