

# Tour of the Toronto Zoo for Grade Three: “Growth & Change in Plants”

## Grade 3: “Growth and Change in Plants”

### Background

In this tour we will be exploring **how plants and animals depend on each other** and some of **the special adaptations plants have to help them survive**. We will attempt to engage the students by focusing on plant adaptations to animals as well as the adaptations animals have to plants, especially where the relationships are mutually beneficial.

Students on this tour should already know the basic parts of green plants: stem, root, leaves, flowers; and also know the parts of a flower. If this is not so you may need to briefly define terms like “pollen”. e. g. Pollen is the male or fertilizing element of seed producing plants. The yellow powder produced by the anther of the stamen in the flower.

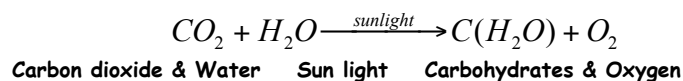
### Introduction

- **Did anyone here eat plants today?**
- **What did you have for breakfast?** Toast, jam, cereal, orange juice, bananas etc. are all from plants. Plants are food for us and all other animals.
- **Where do plants get their food?**

The green parts of plants are filled with chloroplasts, which are like tiny green food factories. Chloroplasts use sunlight and carbon dioxide from the air, and water and a few minerals from the soil to produce sugars. These sugars are called carbohydrates and form all the plant's tissues as well as the "building blocks" for all the food we eat\*. The process, called photosynthesis, also gives oxygen to the air, which humans and other animals need to breathe. \*(with the exception of salt, trace minerals and water)

#### Photosynthesis

In chlorophyll (their green tissue) plants convert carbon and water with the use of sunlight into food energy and oxygen.



Today we will be looking at how plants and animals depend on each other and the many special things about plants that help them survive. Remember that green plants must have light to live so many of their special features help them to get the sunlight they need to produce their own food. And, like all living things they must reproduce and plants often get help from animals to do this.

## **Indo-Malaya Outdoor Exhibits**

### **Lion-tailed macaques**

- **Where do monkeys like these live?** The forest. Lion-tailed macaques live only in the forests of the Ghat mountains in south-western India. Look at the monkeys' bodies.
- **Can you see any special adaptations that would help them survive in trees?** Their feet and hands are very good at gripping branches. They are able to jump long distances between branches. Look at their faces. Like us monkeys have both eyes at the front of their face. This helps them to judge distance very well and this is a very important skill when you are climbing around in trees. Lion-tailed macaques eat fruit, leaves, nuts, insects, birds and even small lizards and mammals.

## **Indian Rhino Pavilion**

### **Indian rhinoceros**

This animal has a special relationship with the plants that it eats. The Indian rhino likes to eat the tall grass that grows along river edges. It also has favourite pathways and deposits its dung in piles called "middens" in open places near water. Many grass seeds pass through the rhino's gut unharmed and grow in these fertile piles. In this way it plants a garden of its favourite food plants. Notice the long pointed upper lip. When eating tall grass the Indian rhino bends the stalk over with its prehensile (good for grasping) upper lip, bites off the top and pulls the grass into the side of its mouth.

## **Malayan Woods**

**Black-breasted leaf turtle** (Before you go through the plastic flaps look for this little turtle)

- **Can anyone find the little turtle?** Why is it hard to see? This turtle looks like a fallen leaf. This helps it hide among leaves in the forest. This little reptile eats leaves and fallen fruit but is also a hunter of insects, worms and snails along streams in tropical forests in Asia. Many reptiles that live in forests have green colouring. Watch for another green reptile later in the tour.

**Citrus tree** (*Citrofortunella mitis*, a hybrid between Citrus & Fortunella)

This is a kind of orange tree. Oranges, grapefruits and lemons grow on trees that look a lot like this.

- **Do you notice anything strange about its leaves?** There are many bite marks.
- **What would make bites and marks like this?** Caterpillars usually eat the leaves of plants. Citrus trees are particularly tasty for some caterpillars. They spend most of their life eating leaves and growing so they are often green coloured too to avoid being eaten by birds.
- **Have you ever tasted the skin of an orange or lemon?** How did it taste? This bad taste is chemical protection the plant uses to protect its fruit while the seed inside is maturing. Many plants use chemicals to defend themselves.

**Butterflies** (may be seen free flying from April until November)

Notice all the butterflies in this area. Many plants have a close relationship with butterflies because they need them to move their pollen from one plant to another.

- **What is pollen?** Pollen is usually a fine yellow dust that must be moved to the pistil of a flower to fertilize it so that seed development can begin. Without pollen a flower cannot produce seeds. Flowers produce nectar (a sweet fragrant liquid) that butterflies suck up with their long tongues.

### **Jumbo gourami**

- **Many fish are vegetarians so what do they eat?** Plants. The Jumbo gourami is a good example. It lives in the lakes and forest streams and rivers of Indonesia where it eats fruit and other vegetation that falls into the water. Because it swallows fruit whole it may even help to transport seeds that can germinate after the fish has eliminated them.

### **Banyan tree** (*Ficus benghalensis*)

This tree has a fruit called a fig.

- **Have any of you ever eaten a fig?**
- **How did it taste?** There are many, many types of fig trees in tropical forests around the world but almost all of them have fruit that some animal likes to eat. Figs are a very good tasting fruit that is filled with tiny seeds. Birds especially love to eat figs. They fly away and later expel the seeds in their droppings. In this way the animal helps the fig tree by spreading its seeds throughout the forest. Notice the aerial roots. In the forest, figs often have to start life in the branches of trees and then send down roots to the ground for water and minerals. This gives them a head start to get their leaves up to the sunlight at a young age while other trees must sprout from the ground.

### **Java Glory Bower** (*Clerodendrum speciosissimum*)

This tree produces bright scarlet flowers that attract butterflies but it selects its pollinator by hiding a reward deep in its flower. Many plants have one type of insect that they depend on to spread their pollen and they often reward the insect with rich food called “nectar”. Only swallowtail butterflies have tongues long enough to reach the nectar of the Java Glory Bower.

### **Ganges Primrose** (*Asystasia gangetica*)

Some plants have special adaptations to enable them to get to the sunlight in the forest. The Ganges primrose will climb up other plants to get to sunlight without spending the energy to produce a stiff strong stem. Climbing plants like this do not need to develop very large leaves because their leaves will eventually reach unobstructed sunlight. In some species, the plant develops juvenile, then adult leaves.

Many animals make their homes in trees. The next two animals we will look at may be hard to see.

### **Clouded leopard**

- **Can anyone see the cat that lives here?**
- **Why was it hard to find it?** The clouded leopard is very well camouflaged. Its markings and coat colour help it to hide among leaves and branches. Both predators and prey animals that live in forests have some kind of camouflage that helps them to hide. Clouded leopards hunt monkeys, squirrels, birds and other animals in trees and

may ambush larger animals like deer and buffalo from low branches. Clouded leopards are expert climbers and unlike most cats can even run down tree trunks like a squirrel.

- **What special features of the leopard's body help it to live in trees?** Claws, flexible paws and body, tail for balance.

### **Red-tailed green rat snake**

There is another animal here that is very well adapted to living in trees.

- **Can you find it?**
- **Why was it so hard to see?** Green colour blends in perfectly with leaves. This snake's body looks just like a vine in a tree. Notice its very long thin body. This helps the rat snake to move between widely spaced branches to hunt rats and other rodents in trees.

### **Indomalaya pavilion**

#### **Rubber plant (*Ficus spp.*)**

As we saw with the orange tree, plants are often attacked by nibbling insects and they have come up with many responses. The rubber plant has developed a sap that glues the mouth parts of the insect together so it cannot continue to chew. This substance has also become very useful to people.

- **Can you think of any use for rubber?** Tires, erasers, bungee cords...

Feel the leaf. It is very smooth and waxy. This allows the water droplets to slide off the leaf very quickly during the heavy rain storms that are frequent in rain forests. Leaves have to shed water quickly because while they are covered in water small holes called "stomata" on their upper surface cannot absorb the carbon dioxide from the air that the plant needs to make its food.

#### **Pepper (*Piper nigrum*)**

I'll show you a plant that you have all eaten. Next to salt it's probably the most commonly used spice. Can you guess what it is? Black pepper is a spice that most of us have on our table. It is the unripe fruit of this forest vine.

#### **Orangutan**

- **How does the orangutan move in trees?** Hands have long fingers and feet are also able to grip branches well. The orangutan can hang comfortably from one hand or foot. Their bodies are designed to hang down from branches enabling them to reach fruit hanging at the ends of branches. Note their large mouths. These allow them to gather large amounts of fruit or nuts before retreating to a more stable platform to eat them. Their lips are also long and very flexible which helps when peeling nuts or fruit.
- **How do orangutans help plants in the forest?** Orangutans eat a lot of fruit and also can move long distances in the forest. As a result they are responsible for spreading the seeds of many trees in their droppings.

Orangutans look a lot like humans. Like us they have a large brain and are very intelligent. Orangutans are able to remember not only the location of a large number of fruit trees in their range but also when each tree is likely to have fruit. Many orangutans will arrive at the same time when a large fig tree has ripe fruit.

#### **Climbing vines (*Epipreimum sp.*)**

Notice how these leafy vines cover many trees here. Rain forest vines have the ability to climb any vertical surface to gain sunlight. This avoids the energy consuming task of growing a strong rigid stem. Notice the roots that emerge from the vines here and there.

Some of these reach the ground and provide water and minerals while others help anchor the plant to vertical trees or rocks.

### **Taro (Elephant ears) (*Colocasia esculenta*)**

- **Do you notice anything unusual about this plant?** The leaves are extremely large. This plant lives in the forest and never grows taller than about one metre. To get enough sunlight to survive it has developed enormous leaves to collect what little light filters down. Notice also how the leaves are bent slightly to point down. This allows the Taro to shed water quickly during the very heavy rains that occur in rain forests. Taro is a very important plant to people in tropical rain forests. It has a large starchy root that provides an important part of their diet. In Hawaii this food is known as 'poi'. This type of root, known as a "corm" must be cooked in a special way to remove the needle-like crystals that it contains.

### **Chinese hibiscus (*Hibiscus rosa-sinensis*)**

Notice these large and showy flowers. Large flowers like these are usually found only on plants that need to attract animal pollinators like insects, birds, reptiles or even small mammals. Identify the flower parts. Note how the stamen is well separated from the pistil to avoid self-pollination. In India and the West Indies this plant is called the shoeshine plant because the flower is used to shine shoes.

### **Screw pine (*Pandanus veitchii*)**

Feel the leaves.

- **What do you notice along the edge?** Spines or saw teeth.
- **How do these help the plant?** These help protect the plant from animals that may want to eat its leaves. Plants like this have developed the ability to take up silica (the same material as sand) from the soil and incorporate it into its tissues. Silica is a very hard material and quickly wears down the teeth of animals that chew it. Animals have responded with the adaptation of open rooted molars that can continue to grow as the animal ages.

### **White-handed gibbon**

1. **Can you see any special adaptations that the gibbon has for its life in trees?** very long fingers, good gripping hands and feet, extremely mobile and flexible shoulders, arms that are longer than their legs and eyes at the front of the head for good judgement of distances.

Gibbons have a unique way of moving in trees called "brachiation". They swing from underneath the branch using each arm alternately and with the feet tucked up to the body. They can make amazing acrobatic leaps and turns and cover up to 9 metres in a single leap. This allows them to move freely in the canopy of the forest where they find the leaves, buds, fruit and nuts which are their main foods.

No other mammal has shoulders as mobile as apes and humans. Imagine that you have a bubble surrounding your body. Without turning your body you should be able to touch almost every point on this imaginary bubble. It is probably from an ancestor similar to the gibbon that humans inherited their very mobile and useful arms and hands. Our own bodies are shaped by an ancient life in trees.

### **Wrap-up**

- **Can anyone tell me some ways that animals affect plants?**
- **Can anyone tell me some ways that plants affect animals?**