

Rainforest – a description

'I never beheld so fair a thing; trees beautiful and green and different from ours, with flowers and fruits each according to their kind ...'

This description of the tropical rainforest on Haiti, written by Columbus on reaching the New World in 1492, expresses the wonder of the earliest European travellers on seeing the exotic lush vegetation of the equatorial regions for the first time. Today, the rainforest is still a source of wonder: incompletely understood, but overwhelmingly beautiful in its immense diversity of plants and animals.

Where are the tropical rainforests found?

Most rainforests lie in a belt around the Equator between the Tropics of Cancer and Capricorn (22°N and S), covering a total area of 2,000 million hectares; Latin America holds 58 per cent, Asia 23 per cent and Africa 19 per cent. The largest areas of rainforest are concentrated in lowland Amazonia, the Congo basin of Africa and South-East Asia with small pockets located in other areas including Australia and India. In these areas around the Equator, the climate is more or less constant throughout the year with very little seasonal variation. Temperatures (average 27°C), rainfall (not less than 2,000 mm per year) and humidity remain high throughout the year, providing hot steamy conditions which are ideal for plant growth.

Most tropical soils are based on ancient rocks, and although they are deep they have been weathered over many millions of years so that they are now very poor in nutrients. The natural vegetation of the humid tropics is rainforest, a system which cycles the available nutrients very efficiently. By far the largest proportion of nutrients in the system is contained in the vegetation itself.

Fossil records suggest that the first rainforests appeared 60-100 million years ago. Some 45 million years ago, this type of vegetation covered much of the earth's surface; fossilised pollen grains of rainforest trees have been found as far north as the Isle of Sheppey.



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Above: **An aerial view of the beautiful rainforest in Brunei.**

What does the rainforest look like?

Seen from above, the tree canopy provides a continuous cover with a few emergent species towering overhead. Generally, the flat-crowned canopy trees reach 30-40 m in height whilst emergents may be up to 70 m tall. The canopy provides a protective buffer for the lower vegetation, filtering the heavy rainfall of the violent tropical storms so that the force of the large drops is reduced and much of the water reaches the ground as a fine mist. Underneath the canopy are layers of smaller trees and shrubs with large climbing plants clambering through the vegetation, using trees as support and linking the different levels of the forest. The lowest layer is in deep shade (only 2 per cent of the light falling on the canopy reaches the ground) with very little air movement. Only a few seedlings and scattered herbaceous plants grow at ground level. This open vegetation bears little resemblance to the dense impenetrable 'jungle' of early travellers' tales which occurs only at the edge of the rainforest. The forest floor is covered with a thick layer of rapidly decaying plant material. Within the rainforest each of the levels provides different habitats, all with their own set of environmental conditions, for plants and a multitude of animals.

The predominant characteristic of the rainforest vegetation is its diversity. For example, a single hectare may contain up to 300 tree species, whereas the same area of temperate woodland holds only 10-15 species. The United Kingdom has 1,443 different plant species whilst Costa Rica, which is five times smaller in size, contains over 8,000 species, and similarly Panama has as many plant species as the whole of continental Europe.

Within the rainforest, however, individuals of the same species are widely separated, often being spread over a large area.



Above: **The forest canopy is composed of a wide variety of species.**



What do the plants of the rainforest look like?

Most rainforest trees are broad-leaved species with straight unbranched trunks (making them particularly valuable for timber) and buttress or stilt roots providing additional support. Their leaves have drip tips and hairless surfaces, probably to prevent rainwater accumulating. They may also have jointed stalks so that they can adjust their position according to the light. New leaves are often soft, drooping and brightly coloured and those of young trees may also differ considerably in form from those of mature individuals, probably in response to the difference in conditions above and below the canopy.

Most trees depend on animals, usually insects, birds or bats, for pollination, employing diverse methods of attracting their pollinators, such as highly scented or brightly coloured flowers. The white or pink flowers of Cocoa (*Theobroma cacao*) are borne in clusters directly on the woody trunk (cauliflory) where they are highly visible. The pollination system is often extremely complex, relying on a single insect whose lifestyle depends, in turn, on other plants or animals. One example is Brazil Nut (*Bertholletia excelsa*), which is pollinated by several species of bee that require certain chemicals produced by an epiphytic orchid for mating and reproduction.

Seeds of rainforest plants are dispersed in various ways. Those which rely on the wind are light (orchids produce millions of dust-like seeds), or have wings (as in the important family of timber trees, the Dipterocarpaceae) or a parachute of hairs. Animal dispersed seeds are often produced in brightly coloured fleshy fruits, as in the Avocado (*Persea americana*) and the Durian (*Durio zibethinus*). In cauliflorous plants, the fruits are borne on the woody trunk which can support considerable weights. The Breadfruit (*Artocarpus altilis*), for example, may weigh up to 2 kg: it contains large seeds with the sizeable food reserves necessary for germination on the forest floor.

Some plant species depend on the trees for support, using them to reach the light. Perching on tree branches, these epiphytes (they are not parasitic) are adapted to a high-level lifestyle, particularly with regard to obtaining and retaining water. Tropical epiphytic orchids have thick fleshy leaves to reduce water loss whereas urn plants (*Aechmea* spp.) of the pineapple family have leaves tightly rolled into a funnel shape, forming a tank to hold rainwater.

Many herbaceous plants at ground level have large thin leaves to provide a large light-absorbing surface. Several such plants, notably *Fittonia* and *Maranta*, have become very popular as houseplants because they can survive in the dim light available indoors.

Climbers germinate on the forest floor, growing upwards by attaching themselves to or twining around neighbouring trees. In this category are the rattans, climbing palms which are harvested to provide canes for furniture manufacture, and the Swiss Cheese Plant (*Monstera deliciosa*) and the Sweetheart Vine (*Scindapsis* spp.), both known as house plants. 'Stranglers', such as the Strangler Fig (*Ficus* spp.), start life as epiphytes whose roots grow downwards interlacing around their support. Eventually the host dies as it is shaded out, leaving the strangler supporting itself.

At ground level very few plants can survive, except some which obtain nutrients from decaying plant matter (saprophytes), and various parasitic species living on the roots of other plants, notably the Stinking Corpse Lily (*Rafflesia arnoldii*) of South-East Asia. This only appears above ground in the form of a flower, but is the largest flower in the plant kingdom – up to 1 m across and weighing 7 kg or more!

Below: **Far below the canopy, some species thrive on the forest floor, such as *Licuala valida*, a palm whose leaves are used for matting, wrapping food and thatching temporary shelters in the forest.**



Below: **Many tree species have buttress roots for added support.**

