Includes a HUGE fold-out tree!

Up in the Canopy

Explore the rainforest layer by layer

James Aldred

Illustrated by
Good Wives and Warriors

BIG PICTURE PRESS

Royal Botanic Gardens Kew

To Bia, Tove, Ernie and Kit, for all the tree-climbing adventures to come – GWAW

For Tarun – Keep climbing wonder boy! Love, Dad x

The Royal Botanic Gardens, Kew carries out vital scientific and horticultural work to protect and restore trees and forests around the world. Kew Gardens is home to 14,000 trees including many that are rare and endangered. Around 40,000 trees grow at Wakehurst, Kew's wild botanic garden in Sussex.

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The Amazon Rainforest

50m

40m

30m

20m

10m

0m

Emergent layer

Canopy layer

Understory

Shrub layer

Forest floor

There are many types of forest on Earth, but none support more life than those growing in the tropics. Wrapped around the middle of our planet like a shining green belt, these sun-soaked rainforests are home to more than half of all life on land. Millions of animal and plant species live here but most of them spend their lives hidden high up in the branches of trees. The Amazon is the ultimate rainforest. Home to 10% of all species on Earth, an estimated 2.5 million insect species, 427 mammal species, 378 reptile species and more than 400 amphibian species live here, as well as around 16,000 species of trees. Like an enormous, beautiful spider's web, all life in the rainforest is connected. Every creature and plant relies on something else for its own survival.

Rainforests can be divided into different levels, or layers, and each one creates its own mini habitat. Some animals spend their entire lives living in one layer, while others move up and down.

A Canopy Adventure

Anyone wishing to understand how a tropical rainforest really works needs to get up into its canopy. But this is not easy. Trees in the Amazon can grow very tall, reaching up to 50 metres – almost the height of 20 storey buildings!

Climbing trees this big can be a real challenge but is not impossible. It just takes a bit of planning and determination! We are about to scale the biggest tree of them all: a giant kapok (Ceiba pentandra) *growing in the heart of the mighty Amazon. With a massive trunk supported by buttress roots 10 metres wide, this kapok is like a giant beanstalk, reaching 70 metres up into the bright sky above us.*

We will need lots of rope, two ***harnesses****, two helmets, a bunch of metal climbing clips called* ***carabiners*** *and plenty of drinking water. But first things first: we will need a slingshot to get the ropes up and over a big, strong branch. And not just any old slingshot. Kapok trunks don't have any branches for the first 40 metres or more, so to be of any use, our slingshot needs to be very big and powerful. Luckily, we've brought just the thing with us, and we'll use this to launch a fishing line with which we can haul up our climbing ropes.*

It's going to be tough. We're going to get dirty, sweaty and bitten by insects. It may even be a bit dangerous. But it will be the adventure of a lifetime. Our mission to unlock the secrets of the biggest rainforest on Earth starts here.

. . . Are you ready?

The Forest Floor

The forest floor is a dark place – hardly any sunlight can get through the dense canopy above. In this twilight world, creatures live in the shadows and scurry between thick layers of fallen dead leaves. The air is heavy and still, filled with the earthy smells of **decay**. The level of **humidity** is high as the heat struggles to escape. It may seem as if there is no animal life down here at all, but this isn't the case. All you need to do is keep quiet and look closer…

Standing in front you is an enormous tree – the kapok tree – which we are about to climb. Peering up through the tangled ***vegetation****, you search for a strong branch high up over which to shoot our fishing line. The slingshot's elastic is thick and strong, so it takes all of our combined strength to pull it down. Stretch, pull… release!*

The Shrub Layer

The shrub layer lies just above the forest floor. Plants here have large, spreading leaves designed to trap every last scrap of sunlight that filters down through the dense understory from above. Sheltered from the strong winds that tear through the forest higher up, some lower-level shrubs keep the same **foliage** for many years. These old leaves often have communities of other small plants growing on their surface. Growing amongst the shrubs are also many tree **saplings**. Some of these are surprisingly old for their small size, growing very slowly and often spending decades waiting for a suitable break in the canopy to appear above them.

Peering up through the dark understory, you see the sunlit canopy high above. It seems a very long way away. The air down here is heavy and humid, and you are already drenched with sweat. You take a sip of water. It's going to be a long climb!

Small Sapling Tree

When a large tree falls over, the space it leaves behind creates a 'light gap'. Small trees that have been patiently waiting for this opportunity now rush to grow in the sunlight. However, light gaps can take years to happen, if at all! If a gap doesn't appear before the sapling's energy reserves run out, the young tree (like this sapling Brazil nut tree) will die.

Great-Billed Hermit Hummingbird

This tiny, great-billed hermit hummingbird flits between flowers. Its wings are beating 70 times a second and are a blur as it hovers in the air, pushing its long beak into the flower to sip the nectar inside.

Army of Ants

A colony of **nomadic** army ants, made up from almost 15 million individuals, surges through the forest. As they march to new grounds, anything in their path, including other insects, frogs, and even lizards and snakes are caught, chopped up or eaten alive. The colony can get through as many as 500,000 animals a day.

White-Plumed Antbird

More than 200 species of birds specialise in snatching up insects who are trying to escape the marauding army ants. 'Antbirds', including this white-plumed antbird, often join together in large mixed flocks that follow the ant swarms in search of fleeing crickets and cockroaches.

Spectral Bats

With a wingspan of up to one metre, the spectral bat is the biggest **carnivorous** bat in the world. It has huge canine fangs and kills rodents and sleeping birds with a crushing bite. Spectral bats live in small colonies, and the males will carry **prey** back to the roost to feed their young.

Heliconia

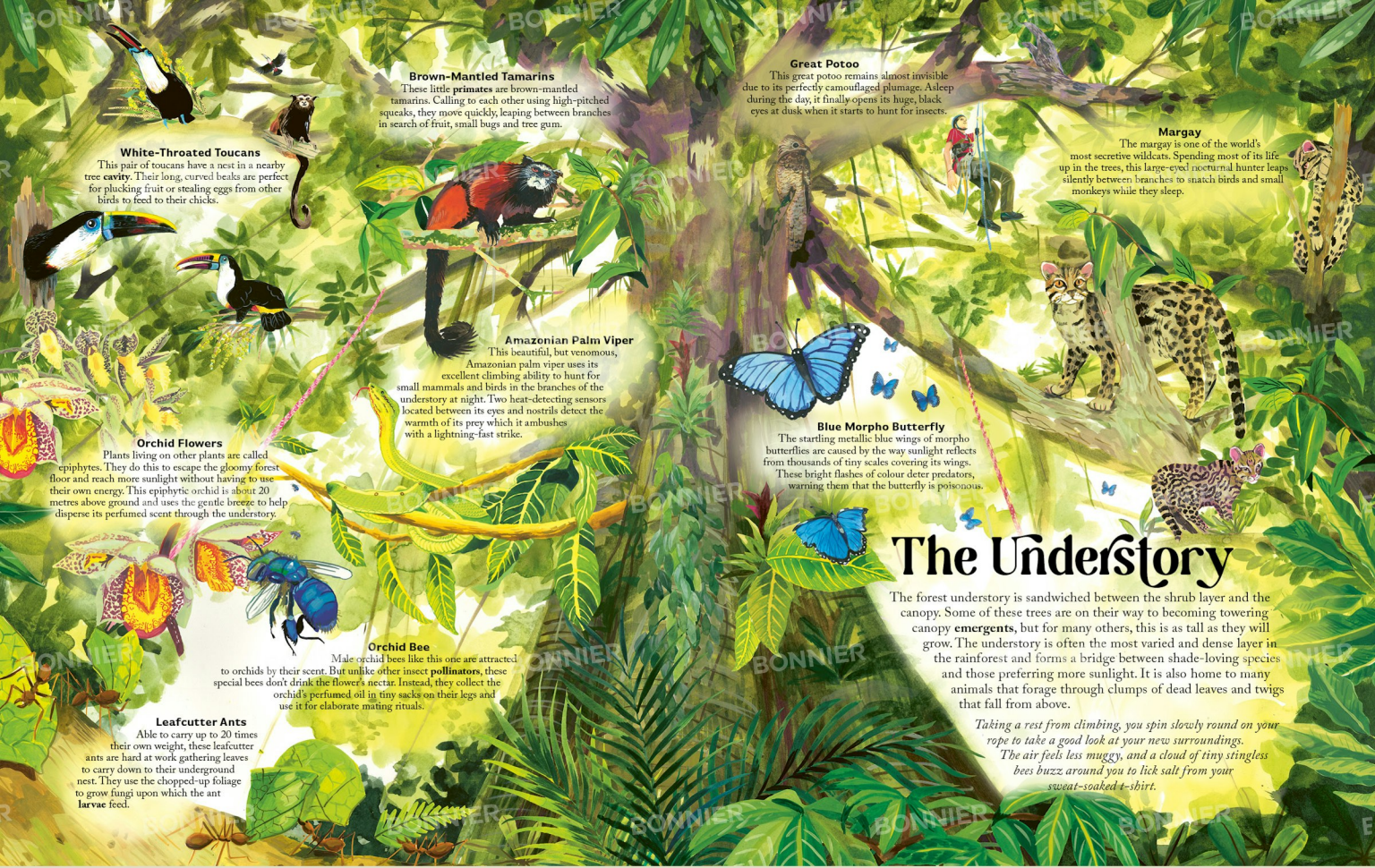
These heliconia flowers use bright colours to attract hummingbirds. In return for a tasty sip of sweet nectar, the hummingbird **pollinates** each flower it visits by transferring pollen between them.

Blue-Backed Manakin

Manakins have some of the most elaborate courtship displays of all birds. By jumping up and down and hopping back and forth in a well-practiced dance routine, these two males hope to attract the attention of a passing female.

Pale-Winged Trumpeter

Looking like small black turkeys with white bottoms, these trumpeter birds use ear-splitting alarm calls to warn others of danger.



The Understory

The forest understory is sandwiched between the shrub layer and the canopy. Some of these trees are on their way to becoming towering canopy **emergents**, but for many others, this is as tall as they will grow. The understory is often the most varied and dense layer in the rainforest and forms a bridge between shade-loving species and those preferring more sunlight. It is also home to many animals that forage through clumps of dead leaves and twigs that fall from above.

Taking a rest from climbing, you spin slowly round on your rope to take a good look at your new surroundings. The air feels less muggy, and a cloud of tiny stingless bees buzz around you to lick salt from your sweat-soaked t-shirt.

The Canopy

Spreading like an umbrella high above the forest floor, this hidden kingdom is the richest zone in the rainforest. Up to 90% of all jungle life can be found up in the trees, and the volume and diversity is staggering. The tropical canopy is one of our planet's most important producers of oxygen and plays a vital role in creating rainfall and keeping global weather systems healthy.

Pushing up through the dense foliage you emerge into a lush, leafy world, flooded with hot tropical sunshine. Exhausted, you stop climbing and stare around you in wonder. The air hums with insects, and everywhere you look small brightly coloured birds flit between leaves. No two trees look the same, and the fragrant smell of flowers hangs in the air. Never before have you felt so completely and wonderfully immersed in nature.

The Emergent Layer

Welcome to the emergent layer – the rainforest's best-kept secret!

Like this kapok, some of the largest trees in the Amazon stand head and shoulders above the main canopy. Forming the topmost layer of the rainforest, these emergent trees are exposed to very different conditions to those lower down. The air is a lot drier, and the sun is a lot hotter up here, making it feel more like a desert than a rainforest. Water can be surprisingly hard to hold on to due to the high levels of **evaporation**. In addition, tall trees are often exposed to fierce storms. Lightning strikes are a constant threat, and huge branches the size of entire understory trees are often ripped away by high winds. This is the most extreme environment in the rainforest and any plant or animal that lives here must have special adaptations to help them survive.

Reaching the top of your rope, you are rewarded with far-reaching views, dappled shade and cool breezes that quickly dry your sweaty clothes. The kapok's huge branches sway gently in the breeze, and you take your climbing helmet off to feel the wind in your hair. The enormous branch next to you is the perfect place to rest, so lifting a leg over, you scramble into a sitting position. Settling back to eat a sandwich, you immerse yourself in one of the best views anyone could wish for. You've made it!

A Note from the Author

Well done on completing your first ever ascent into the rainforest canopy!

The Amazon really is a magical place isn't it? I first visited the Amazon canopy 25 years ago, when I went to film a documentary in a region called Tambopata. Standing on the topmost branches of the tallest tree I could find, I closed my eyes and heard nothing but the sounds of nature all around me. But when I visited that same place years later, I sat in the same high canopy and heard the distant whine of chainsaws and the muffled thud of gunshots. The first loggers and hunters had arrived. Returning to the same location for a third time only recently, I was shocked to find a dirt road leading into the heart of the jungle. Most of the big trees either side of the road had been felled.

An ancient tree like the kapok you just climbed can take centuries to grow but minutes to destroy. If they disappear, so do all of the living creatures that depend on them for their survival. These ecosystems have taken millions of years to evolve and cannot be easily replaced. Simply replanting trees on the broken soil ruined by heavy bulldozers won't work. Trees need shade beneath which to grow. They require special nutrients that have taken millions of years to accumulate. They require pollinators to help them reproduce. But most of all, they require lots of other trees around them. Just like us – trees can only thrive when they are part of a wider community.

So, what can WE do to help the Amazon?

We can make sure that we (and our family and friends) do not buy goods containing tropical hardwoods, eat foods made from crops grown on cleared rainforest soils or support global companies that invest in unregulated industries that pollute the environment. But most important of all is the need to raise awareness for what we stand to lose should rainforests like the Amazon disappear.

Of course, I'd also love to think that some readers might go on to study forest ecology or learn the ropes. You could even combine the two skill sets to become a future canopy explorer. Take it from me: you will be AMAZED where a passion for the natural world and a desire to climb trees can take you!