Tropical Topics

An interpretive newsletter for the tourism industry

Wet Tropics geology

No. 63 September 2000

Notes from the Editor

It is difficult for us to imagine an apparently static landscape as a dynamic system, constantly on the move. Sometimes a volcano erupts, a cyclone causes a river to seek a new course or our complacency is jolted by an earthquake but, to all intents and purposes, mountains are a symbol of everything in life which is fixed and unchanging. It is a challenge to our imagination to contemplate most geological processes — the gradual formation of the landscape by enormous forces working extremely slowly over a period of time which is beyond our comprehension.

Nevertheless, an understanding of how our landscape was formed gives us an insight into the origins of the features we find there today and the effects the underlying geology has on the environment in which we live.

I would like to thank Geoff Hodgson for his very valuable assistance with this issue. I would also like to thank Gary Wilson, Queensland Herbarium, John Kanowski, Griffith University, and Simon Crouch, Deparment of Mines and Energy.

APOLOGIES to web users for the awkward layout of pages 4 and 5, and the missing southern part of the map. It was too difficult to completely divide the original A3 layout for this page and the missing map section is just a computer mystery beyond the comprehension of this editor!

The geological connection

The geological foundation of the Wet Tropics has a profound effect on the distribution and types of plants and animals found there.

For a start, the position of the mountains dictates the amount of rain which falls. Running roughly parallel to the coast, they intercept rain-bearing clouds moving in from the sea and, by forcing them upwards, make them drop their moisture. However, the exact orientation of the mountains determines whether a particular slope gets a lot of rain or not so much. Those slopes which face the prevailing south-easterlies are the wettest.

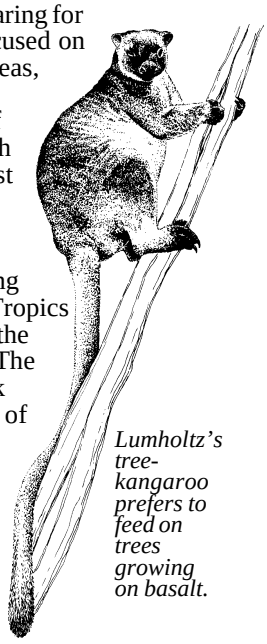
Rock types determine soil types. Rainfall, plant roots, landslides, river action and other factors break down the rock, particularly where fractures make it more vulnerable. Soil builds up wherever the rock particles come to rest.

Soil types, in turn, determine forest types. Basalt creates the most fertile soil. Granites and metamorphic rocks are more acidic and their soils are less fertile. The most complex and diverse rainforest is found where abundant rain falls on basalt soils in areas of high temperatures*.

The soil type also affects the ability of the forest to support animals. John Kanowski, a Rainforest CRC researcher, has found that leaves growing on poorer granite or metamorphic soils are tougher, less nutritious and contain more toxins than those growing on the more fertile basalt soils. This directly affects animals which eat leaves and John's study of the distribution of possums and tree-kangaroos in the Wet Tropics has shown they are definitely more abundant on basalt soil.

This correlation has been observed in other animals too. The reason may simply be linked to better food availability in more diverse forests. For example, strangler fig trees which provide food for a wide variety of birds, fruit bats and other animals, are two to three times more abundant on basalt soils. Even numbers of dung beetles increase due to the greater abundance of animal droppings and researchers' claims that scrub-itch mites and leeches are more numerous on basalt are probably correct.

Unfortunately, clearing for agriculture has focused on the fertile basalt areas, resulting in a widespread loss of those forests which contain the greatest diversity of plants and animals. A disproportionate amount of remaining forest in the Wet Tropics are now found on the poorer soil types. The distribution of rock types — the result of random geological processes — therefore continues to have a profound effect on the forests of the Wet Tropics.



Lumholtz's tree-kangaroo prefers to feed on trees growing on basalt.

*The most ideal conditions are at low altitudes, where temperatures are warmer. However, forest has been cleared from the few places where basalt occurs in the Wet Tropics lowlands.

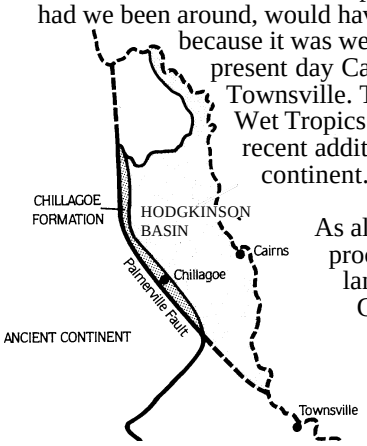
WET TROPICS MANAGEMENT AUTHORITY

Queensland Government
Queensland Parks and Wildlife Service

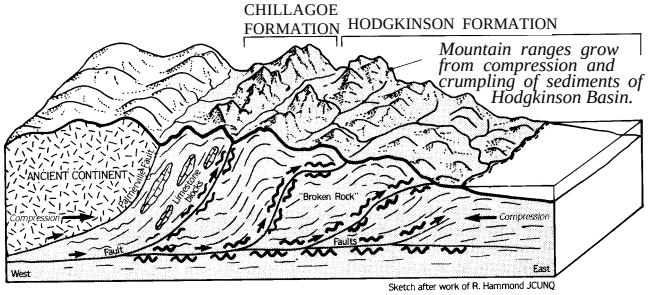
The big picture

The geological history of the Wet Tropics region is one of dramatic changes interspersed with long periods of gradual, but steady transformation.

The story began about 420 million years ago, at a time when Australia was still part of the ancient continent of Gondwana. The Australian land mass was very different then. The east coast was about 120-150km west of the present coastline, running roughly from Cape Melville to west of Charters Towers. A trip to present day Chillagoe, had we been around, would have entailed a boat ride because it was well under the sea — as were present day Cairns, Atherton and Townsville. The coastal section of the Wet Tropics is therefore a relatively recent addition to the ancient Australian continent.

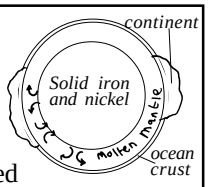


As always in geological processes, a redistribution of land was taking place. Gradually, but persistently, rivers running off the continent were carrying bits of it into the sea in the form of gravel, sand and clay. This material was being deposited in an undersea basin, known as the Hodgkinson Basin which lay off the coast possibly between it and another landmass even further to the east. About 160km wide, this basin stretched 320km from north to south, roughly from Cooktown to Tully. Over a period of about 60 million years, sediments accumulated in this basin, creating beds some 10km thick. Towards the edges, primitive corals and other marine organisms were creating mounds of limestone.

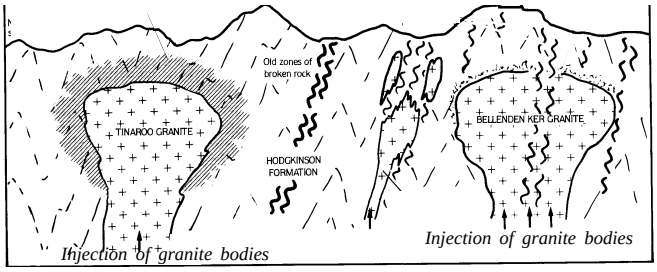


About 360 million years ago the sediments in the Hodgkinson Basin was caught in a squeeze (see above). Major movements in the earth's crust put them under immense pressure as opposing forces pushed in from east and west. The accumulated sediments were compressed, folded and lifted far above sea level, creating a series of mountain ranges that would rival today's Andes or Himalayas in height. Coastal limestone accumulations were pushed up near to the old continent and can be seen today in the limestone formations of Chillagoe. Other sediments — sand, mud and gravel — formed the other mountain ranges, the immense pressure and heat transforming them, in the process, into tougher metamorphic rocks. These are the rocks which form much of the landscape we see in the Wet Tropics today.

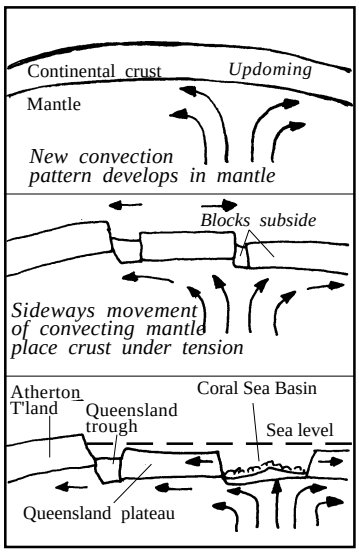
The solid crust of the earth is just a superficial layer, lying on top of a moving molten mass of superheated magma which, in turn, surrounds a solid core of iron and nickel. Currents and movements within the magma affect the hardened crust 'floating' on it.



From about 310 to 260 million years ago, other events deep in the Earth's crust caused further changes in the landscape. It is difficult to imagine rocks acting like liquids, but from time to time large pools of molten rock (magma) pushed up into the crust from as far as 50km below the Earth's surface (see above). Less dense, and therefore more buoyant, than the rocks above them, this magma squeezed up through them. In many places this material did not make it to the surface, but slowly cooled and solidified to form bodies of granite deep underground. In the southern and western parts of the Wet Tropics area, some of magma reached the surface, erupting explosively as volcanoes and spreading volcanic ash, dust and debris far and wide. This cooled rapidly to form hard rock known as tuff.

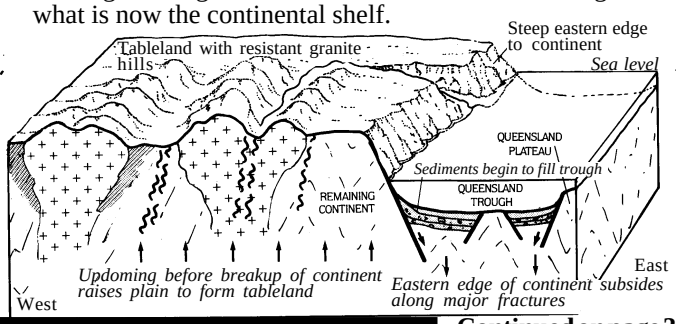


For over 100 million years, there were no dramatic geological changes in the Wet Tropics region. The mountains of the north-east coast continued to rise but were also subjected to the persistent processes of erosion. Rocks were broken down into sediments and carried by rivers to the sea. Gradually the granite, once deep below the surface, was exposed, as rocks covering it were removed.



During this period Gondwana was breaking apart and Australia was drifting north. At that time the Australian continent extended much further east than it does now and included parts of New Zealand.

Then, about 100-65 million years ago, movements in the molten mantle, deep below the earth's surface, stretched the continental crust above. It was pushed up and, like the crust of a cake rising in the oven, it eventually cracked under the strain and broke into blocks. Some of these blocks sank below sea level, one forming the floor to the Coral Sea Basin, and another the Queensland Trough, a deep trench at the edge of the continental shelf. One block, however, was raised well above sea level. The cliffs at its edge formed a sharp escarpment, at the shoreline, running the length of Australia's east coast at the edge of what is now the continental shelf.



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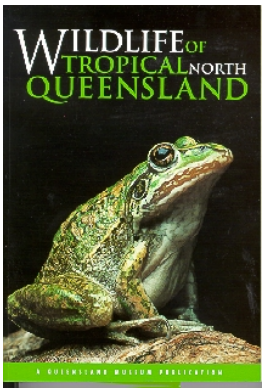
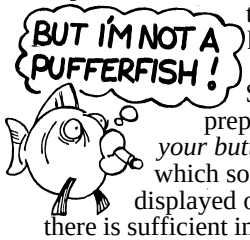
Out and about

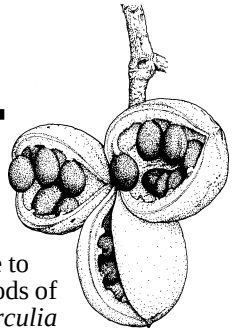


Wildlife of Tropical North Queensland is a new publication of the Queensland Museum. It is an immensely useful book for tour operators in the Wet Tropics. Its 368 pages are packed with 950 colour photos of 850 species of mammals, birds, reptiles, frogs, freshwater and estuarine fish, insects, crustaceans, spiders, snails, worms and the box jellyfish. Each section starts with a page or two of general information and accompanying each species are details of identification, habitat and range, and notes. With so much information packed into one book, this is the most comprehensive guide for operators, and interested locals, to keep handy for consultation. It is available from some QPWS outlets, bookshops and The Queensland Museum Ph: (07) 3840 7645 (Brisbane) and Ph: (07) 4726 0622 (Townsville).

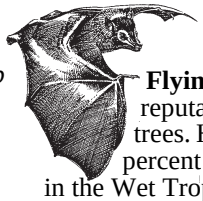
Cigarette butts continue to be a problem. Please encourage your passengers, whether on boats or buses, to dispose of them properly. A particular problem is at stopping spots, such as Alexandra Range Lookout, north of the Daintree ferry, and other points where passengers descend from buses and light up. Visitors are usually open to a request at the beginning of a journey and happy to use a receptacle if it is provided. Point out to them that their butts, which are plastic and take up to five years to break down, contain toxins that they are quickly washed into waterways where they may choke or poison wildlife. Hopefully they will take the message home with them.



Some time ago we prepared a poster, *Keep your butts off the beach*, which some tour operators displayed on their boats. If there is sufficient interest we could prepare other similar posters: *Keep your butts on the bus* and *Keep your butts off the street*. If you are interested, contact the editor, details on the back page.



During the dry season a number of trees drop their leaves and for some of these it is the time to display their fruit. Pods of the **peanut tree** (*Sterculia quadrifida*) are greenish-brown on the outside but split open to reveal a bright orange to vermilion interior which contrasts with the shiny black peanut-sized seeds. Presumably this colouration attracts birds to help with dispersal. Not long after the pods have fallen, the tree produces small greenish-yellow bell-shaped flowers and a new set of leaves. This tree is a member of the flame tree family, Sterculiaceae.



Flying foxes have a bad reputation for targeting fruit trees. However, since over 80 percent of lowland vegetation in the Wet Tropics has been cleared, they may have little choice. One strategy is to plant diversionary plants — native trees which would attract them away from orchards. For example, buff beech, *Gomphandra australiana*, which is a favourite with these bats, fruits at the same time as lychees and mangoes. If you would like a list of plants to grow for flying foxes, contact the editor, address on the back page.

There is great concern over evidence that the numbers of spectacled flying foxes are declining. QPWS, the Wildlife Preservation Society of Queensland and numerous volunteers have been engaged in counts over the past few years. If you would like to become involved contact the editor, address on the back page.

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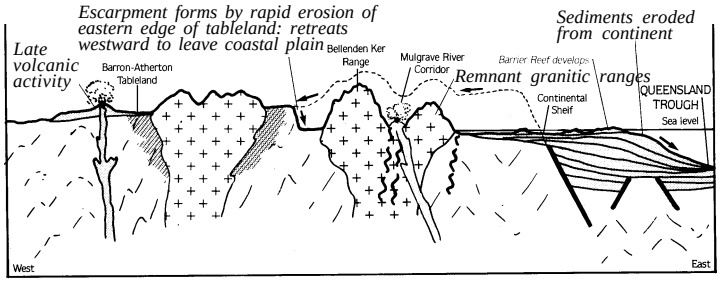


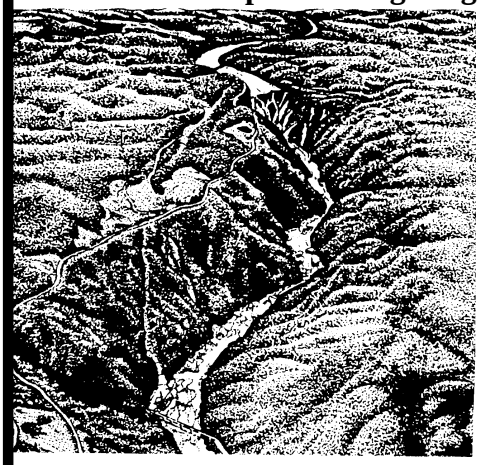
Nothing stands still for long in geological time. Falling over the escarpment, eroding rivers continued their gradual, persistent, reduction efforts. Little by little, as it was eaten away, the position of the escarpment shifted further and further west. Those sections with hard granite rocks withstood the erosion process better than others. As a result the escarpment lost its clear line and became a wandering edge to the upland Tablelands areas. Tougher rocks remained as isolated hills and islands such as the Whitfield Range and Walsh's Pyramid near Cairns, Fitzroy, Hinchinbrook and Magnetic Islands, the Paluma range and Castle Rock in Townsville, to name but a few.

Sediments eroded from the higher mountains were (and still are) deposited on lower ground. At first, most would have been dumped over the cliff and straight into the sea, but as a coastal plain was created at the base of the mountains, sediments built up on this. The eastern section of this plain, now known as the continental shelf and partly occupied by the Great Barrier Reef, was often dry land. Sea levels have fluctuated dramatically over the last 2 million years, as much of the world's water was captured by the polar ice caps during the various Ice Ages and then released in interglacial periods. The present sea level is one of the highest on record. The actual size of the coastal plain has varied as the shoreline has advanced and retreated according to sea levels.

The next chapter in the geological story of the Wet Tropics was a violent volcanic one which was felt particularly forcefully on the Atherton Tableland. From about 7 million years ago, vast amounts of lava flowed from a number of shield volcanoes, spreading over the landscape and cooling to form a dense layer of basalt. Later events were more explosive creating volcanic cones and craters which are a feature of the landscape today.

Rocky highlights

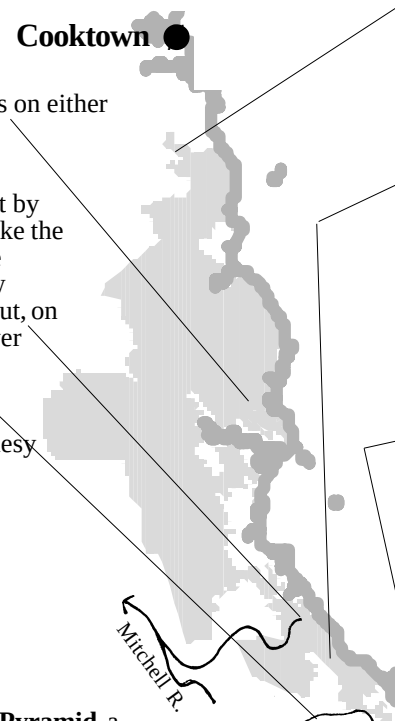
We look here at particular geological features of the Wet Tropics.



Thornton Peak is the highest coastal point in the granite range which runs between the Daintree and Bloomfield Rivers. These rivers have eroded into older and softer rocks on either side of the granite block.

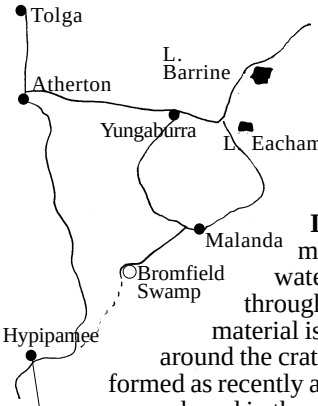
While some rivers in the region take a short cut to the coast by flowing eastwards over the Great Dividing Range, others take the long route, westwards to the Gulf of Carpentaria. In fact the headwaters of the Mitchell River (Rifle Creek) rise just a few kilometres from the Coral Sea coast (inland from Rex Lookout, on Harris Peak), but this water takes the long route, flowing over 400km to reach the Gulf. Nearby, the Barron River takes the short cut to the east coast.

Over time, the **Barron River** 'captured' some of the headwaters of the Mitchell River, such as the Clohesy River, offering them a shorter downhill route. These new contributions strengthened the Barron River, causing it to cut back into its valley, producing the steep, narrow Barron Gorge (above).



Halloran's Hill, Atherton, is one of a number of shield volcanoes on the Atherton Tableland from which lava flowed over the landscape. Other shield volcanoes are Bones Knob, west of Tolga, which erupted about 1.8 million years ago, and McKell's Hill, 12km southwest of Malanda, which at about 3.5 million years old is the oldest of the shield volcanoes. Similar volcanoes, Twiddler Hill and Adler Hill, south-east of Mareeba, poured lava down the valleys of Emerald Creek and Clohesy River.

Walsh's Pyramid, a spectacularly pointed hill, south of Gordonvale, is formed from granite — part of the granitic intrusion which underlies the Bellenden Ker Range. The surrounding older rocks have been eroded away, leaving the harder granite standing alone.

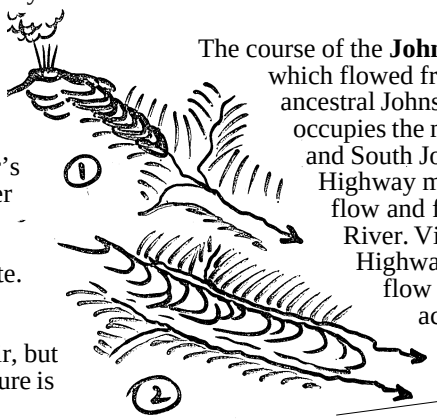


Mt Quincan, and the Seven Sisters, near Yungaburra, are volcanic cones created by explosive eruptions. As vents opened, volcanic materials were hurled into the air, falling to build up cones around them. These were composed of compacted volcanic ash and scoria — light-weight volcanic rocks with gas bubble cavities.

Lakes Eacham and Barrine are explosion craters, known as a maars, created when rising lava came into contact with ground water. The resulting steam caused a violent explosion as it burst through the rocks on the surface producing a crater. Little volcanic material is produced by this sort of explosion. It forms a low ridge around the crater. The craters of Lakes Eacham and Barrine may have been formed as recently as 10,000 years ago — their explosive creation are remembered in the stories of local indigenous people. After the explosion, water collected in the craters forming the lakes, which are up to 65m deep. The weight of this water has caused the surrounding rocks to sag, creating a much larger crater and lake. Wherever the water is able to drain out of an explosion crater, a swamp, rather than a lake, forms. Other maars — Lake Euramo, Bromfield Swamp and Lynch's Crater — are up to 200,000 years old.

The upper **Mulgrave River** separates the Bellenden Ker Range from the Tablelands. Cutting into older and weaker rocks (the metamorphosed sediments of the ancient Hodgkinson Basin) between the two tougher granite blocks, it has carved a deep valley which can be seen from the Gillies Highway.

Mt Hypipamee crater is thought to have been created by a massive gas explosion. As the gas rose suddenly through a crack (below, left) to the Earth's surface, pressure on it was reduced and it expanded (rather as scuba diver's bubbles become bigger as they rise to the water surface). The massive explosion as it burst through to the surface (below, right) created a deep cylindrical hole or pipe through the granite. The walls are 55m high and the lake which has formed in the bottom is another 87m deep. The explosion hurled boulders and rocks into the air, but little volcanic material was produced. This feature is known as a diatreme. Mt Hypipamee is the only known example of this in north Queensland.



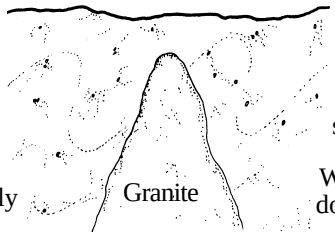
The course of the **Johnstone River** has been affected by lava which flowed from volcanoes on the Tablelands down the ancestral Johnstone River valley (left 1). Basalt lava now occupies the middle of the former valley, parting the North and South Johnstone Rivers (left 2). Today's Palmerston Highway more or less keeps to the centre of the old lava flow and follows the course of the ancestral Johnstone River. Visitors to Crawford's Lookout on the Palmerston Highway can look down the north flank of the lava flow to the North Johnstone River which cuts across the softer rocks below the basalt flow.

The **Tully and Herbert River gorges** were formed in much the same way as the Barron River Gorge when the Tully and Herbert Rivers captured water from other rivers, giving them the power to cut down sharply into the escarpment. Both rivers exploit major northwest-trending fault systems that cut through the area.

At **Mena Creek** a footbridge crosses a waterfall in which basalt rock from a lava flow is well exposed. The near vertical cracks, giving an impression of columns, formed as the lava cooled. This is a common feature of basalt and can be seen at other waterfalls, such as Mungalli Falls, on the southeastern side of the Atherton Tableland.

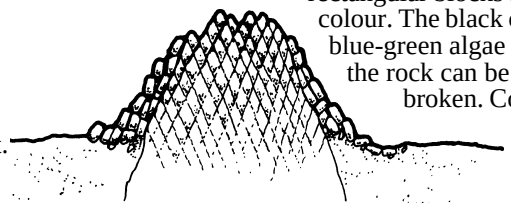
 APOLOGIES to web users for the awkward layout of these pages due to overwhelming difficulties in adapting the original newsletter layout

Black Mountain is an imposing mass of black boulders marking the northern end of the Wet Tropics World Heritage Area (see right).



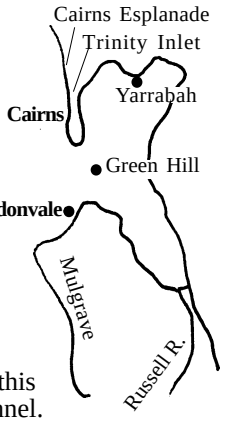
Black Mountain
About 260 million years ago a mass of molten rock (magma) solidified slowly deep below the earth's surface, forming a body of hard granite (see left). Over time, as the surrounding softer land surfaces were eroded away, this granite became exposed.

Weathering removed loosened material along weak fractures extending downward through the rock. More resistant rock remained as large rectangular blocks (see left). The rock is actually a light grey colour. The black colour we see is due to a film of microscopic blue-green algae growing on the surface. The grey colour of the rock can be seen where the boulders have recently broken. Cold rain falling on hot rocks sometimes causes this to happen in a loud, explosive fashion.



The **Macalister Range**, is a relatively low range between Cairns and Mossman. Since it runs almost parallel to the prevailing south-easterly winds, rainfall is lower than in areas to the north and south. For this reason, these hillslopes are covered mainly with sclerophyll woodland, although there are some bands of rainforest.

Central Cairns is situated on a series of sand ridges. Wind, waves and tidal currents built these sand ridges over the last 4000 years or so, following the last rise in sea level. Lying parallel to the shore, the ridges gradually accumulated, building the shoreline out further and further. Swamps formed on mud between the ridges. The foundations for any large buildings must be placed on piles driven into the older, more solid, clays below this sand and mud. The hotly disputed Cairns Esplanade beach, remembered by older residents, was the easternmost sand ridge. However, as the Esplanade foreshore was widened it was built over the sand ridge, covering it completely and leaving today's foreshore of extensive tidal mud flats.



Trinity Inlet is an estuary without a river. The ancestral Mulgrave River once flowed to the sea here but it eventually choked on its own sediments. Fast flowing rivers tumbling down steep mountain gorges have a high energy and can carry large amounts of sediments. These are dropped when the river reaches the coastal plain and its flow rate slows. Over time these sediments build up and eventually the river must wander through them to reach the sea. For this reason, the Mulgrave River separated into various channels, some flowing north into Trinity Inlet and some flowing south to join forces with the Russell River. At one stage, while the main river was flowing south, there was a fall in sea level which caused this channel to become the main one. The river cut deeper and from then on was trapped in its new channel.

Cairns

Mulgrave R.

Green Hill, south of Cairns, close to the Yarrabah Road, is a volcano. It erupted about 900,000 years ago. The crater is higher on the northern side, possibly because the prevailing south-easterly winds blew debris from the eruptions towards this side. Contrary to popular belief, Green Hill did not divert the Mulgrave River from Trinity Inlet. Drilling has revealed river sediments 35m thick above the volcanic flows, proving that the river continued to flow north after the volcano erupted.

Innisfail

Mount Bartle Frere, Queensland's highest mountain (1622m) is a rugged granite peak at the southern end of the Bellenden Ker Range.

Stephens Island is the remains of a volcano which erupted about a million years ago. Along with Sisters Island and Clump Point, on the coast just north of Mission Beach, it consists of volcanic ash. Layers of tuff (consolidated volcanic ash) with embedded volcanic bombs — broken pieces of the more ancient metamorphic rocks which were hurled up into the air during the explosions — can be seen clearly on the coast of Stephens Island. In places, bands of basalt have cut through the layers of tuff. Pumice fragments can be found on most beaches in the area.

From the **Cardwell Lookout**, a granite outcrop 3km from Cardwell on the forest drive, you can get a good view of the mountains of Hinchinbrook Island. Like the Walter Hill and Tully Ranges to the north, Goold Island and the Palm Islands, these mountains are composed of granite similar in age to the Bellenden Ker Range (300-275 million years).

Cardwell

The **Paluma Range** marks the southern limit of the Wet Tropics. A grey, volcanic rock called rhyolite, occurs here. It can be seen near sea level to the top of the Paluma Range suggesting it is up to 900m thick. It is part of a widespread sheet of volcanic ash that was produced by huge and violent volcanic eruptions, perhaps about 350 million years ago. Between the layers of this rock are other layers of sediments which show that rivers, lakes and swamps formed between different eruptions. There is also erosion-resistant granite which has intruded into the rocks.

Townsville

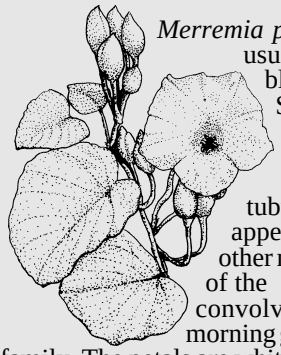
Sedimentary rocks are formed from sediments deposited by wind or water and later consolidated. This includes limestone, accumulated from the bodies of marine creatures.
Volcanic rocks are the result of molten rock from under the Earth's crust forcing its way to the surface. These include basalt and rhyolite, common on the Atherton Tableland.
Plutonic rocks formed from magma which didn't reach the Earth's surface but hardened within the crust. The most common is granite which forms the Bellenden Ker range and other high mountains.
Metamorphic rocks are formed when existing rocks are transformed by heat and/or pressure. Much of the Wet Tropics region is formed from the Hodgkinson meta-sediments — sedimentary rocks in the Hodgkinson Basin (see page 2)which were metamorphosed.

. Apologise also for the missing southern part of the map.

Questions & Answers

Q What is the vine which is climbing over many of the trees in the Cape Tribulation area?

A It is a native vine called *Merremia peltata*. This plant is a member of the morning glory family (Convolvulaceae). It is often mistaken for an exotic vine because it grows so vigorously. It is present throughout the forests and can be seen growing over trees affected by wind damage between Cairns and Babinda. Cyclone Rona, in February 1999, opened up the canopy in many places at Cape Tribulation providing ideal conditions for this vine to grow. Rangers have been removing some of it near the ramp to the toilets at the Kulki boardwalk to keep access open and protect some fan palms. However, there are no plans to do this elsewhere. It is part of a natural process and although it takes a while, other plants and trees will eventually take over.



Merremia peltata usually blooms in September. Its flowers have a similar tubular appearance to other members of the convolvulus/ morning glory family. The petals are white on the inner surface but an unusual silver-grey colour on the outer surface. The leaves are heart-shaped, often over 30cm long in diameter.

Q During the winter I noticed a pied imperial pigeon in my garden in Cairns and about three were apparently frequenting the northern beaches. I understand that these birds migrate to New Guinea in winter so I am puzzled.

A Sometimes a few birds just don't bother to migrate. This happens with many species. For example, a number of whimbrels stay here during the winter. These non-breeding juveniles have no good reason to make the journey to the breeding grounds in the northern hemisphere. Pied imperial pigeons breed here in summer and migrate to New Guinea in winter, presumably when fruit is less abundant here. Some young PIPs were taken into care when thrown from their nests by Cyclone Steve at the end of February but were not mature enough to be released at migration time. Some of these may have escaped, but bird experts think this is unlikely to account for the ones you have seen.

Q How can I see a cassowary at Cape Tribulation? I see plenty of signs, but none of the birds!

A It would seem that the cassowaries have become more wary about crossing roads. They seem to have learned that it is more sensible to wait until there is no traffic, and may cross mainly in the early morning. (In any case, as a general rule, birds tend to be less active in the middle of the day.) A QPWS ranger in the area who travels by bicycle sees cassowaries on a regular basis and his impression is that they are cautiously checking the road before venturing into view. So if you want to see a cassowary on the Cape Tribulation road, cycle!

Please drive carefully on this road. Many animals are killed by vehicles, including, recently, a Bennet's tree-kangaroo.

Tourist talk

ENGLISH	GERMAN	JAPANESE	
geology	Geologie	chishitsu gaku	地質学
rocks	Steine	ganseki	岩石
soil	Erde	tsuchi	土
granite	Granit	kakou gan	花崗岩
basalt	Basalt	genbu gan	玄武岩
erosion	Verwitterung	shinshoku	侵食
gold	Gold	kin	金
volcano	Vulkan	kazan	火山
lava	Lava	you gan	熔岩
explosion	Explosion	bakuhatsu	爆発

Facts and stats

The oldest rocks in the Wet Tropics region date back about 420 million years. By contrast the rest of the continent is much older. Rocks to the southwest of Chillagoe have been dated to 1500 million years ago and rocks 4000 million years old have been found elsewhere in Australia. These are some of the oldest rocks in the world.

Almost 3000 million years ago the Australian part of Gondwana drifted close to the south pole and an ice cap covered most of the continent. Cairns would then have been about the same latitude as Hobart today and not at all tropical.

About 250 million years ago conditions in the area were suitable for the formation of coal measures which now contain fossil plants.

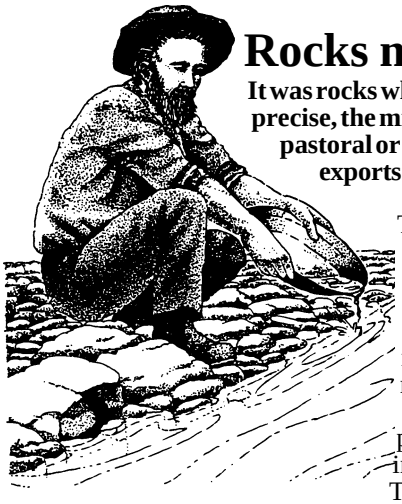
Over 24 million ounces of gold have been mined or discovered in north Queensland since 1867.

Geological processes do not stop. Australia is speeding north about 5-6cm a year, which is the rate at which our fingernails grow. Eventually the Wet Tropics area will reach the equator.

Valuable mineral ore deposits, such as copper, lead and zinc, are often found in a zone where heat and pressure from intrusive granite has affected surrounding rocks. Often a chemical reaction takes place between the two bodies of rock. Superheated limestone recrystallises to form marble, such as at Chillagoe. Gold, copper and silver minerals may be found where volcanic material has pushed through the marble.

Davies Creek National Park is situated on granite which has been smoothed into picturesque boulders by the creek. The section of road between the turn-off from the Kennedy Highway and the national park boundary, however, crosses metamorphic rock of the Hodgkinson Formation.

Basalt creates alkaline (basic) soils which are rich in iron and magnesium but not in silica. The black rock weathers to create fertile chocolate-red soils. Rocks which have a high silica content, such as granite, rhyolite and many metamorphic rocks, produce acidic soils. High acidity locks up nutrients in the soil making them unavailable to plants and also often produces a poor soil texture. In alkaline soils nutrients are more readily available, they are less likely to be leached away by rain and the texture good. They are therefore more fertile. On the down side, *Phytophthora*, the disease which kills rainforest trees, is only found on alkaline soils.



Rocks make history

It was rocks which first drove large numbers of Europeans to north Queensland. Or, to be more precise, the minerals found within them. Metals attracted more early settlers to Queensland than any pastoral or agricultural activity. From 1873 to 1906 Queensland's metal exports exceeded wool exports in value.

The first gold discovery in Queensland was in 1857, north of Gladstone. To encourage settlement of north Queensland, a reward of £1000 was offered to the person who found gold in the Townsville region. Then, in 1872, Queensland's richest alluvial gold deposits were discovered on the Palmer River, south-west of Cooktown. Nearly a million ounces were produced in five years, leading to an enormous influx of miners. Chinese immigrants, the majority, numbered 17,000 by 1877. Deposits in the Hodgkinson Gold Field, near Dimbulah, were discovered in 1876 and finds on Croyden Goldfield in the 1880s led to a new gold rush to that area. From time to time, a number of smaller deposits were found in the Wet Tropics, notably in the valleys of the Mulgrave and Johnstone rivers. The Goldfield Trail was made in the 1930s by prospectors eager to reach a small amount of gold on the slopes of Mt Bartle Frere. Many of the coastal towns sprang up to service the mining centres.

As the gold mining boom eased, many prospectors turned to tin, silver and copper. Tin was first discovered near Maytown, west of Palmer River, in 1873. The next discovery was in the Wild River area, near Herberton, in 1875 and in 1880 a huge deposit was found in the area. This led to an influx of people and the founding of the town of Herberton. Just eight years later, Queensland's richest tin yield was discovered at nearby Irvinebank. The Kuranda railway was built originally to service this tin field. Copper mining caused a boom in the Chillagoe and Cloncurry areas at the beginning of the twentieth century.

Where is the gold?

Gold often occurs in association with quartz. The reasons belong to a period when very hot magma from the earth's mantle was pushing into the rock of the crust, forming bodies of molten granite. As this material cooled, different components solidified at different rates. Quartz was one of the last to crystallise. However, as it did so, other fluids were drawn towards it. One of these was gold, but silver, zinc, lead and other metals behave in the same way. They may have had their origins in the granite, or in the surrounding rocks which had been melted by the heat of the event. Gold is therefore associated with granites which are rich in silica — the element which forms quartz.

When the rock in which gold has accumulated is eroded by weather, it is washed into the rivers. Being heavier than most other materials gold sinks to the river bed, along with similarly heavy metals such as iron and titanium. Most of Queensland's alluvial gold was mined on the Palmer River.

Plants indicate minerals

Canny geologists have turned to botany to help them find mineral deposits.

Serpentine is a common metamorphic rock in north Queensland which can contain nickel, cadmium, tin and gold. Soils derived from this rock, however, are low in essential plant nutrients and high in toxic elements so very few plants can grow on them. Nevertheless, as is often the case in nature, some plants have adapted to this unlikely environment. Rather like mangroves which have found a way to live with salt, they flourish in difficult circumstances where competition from other plants is reduced. Some are even unable to grow elsewhere.

These plants often have distinctive features. For example, the world's only purple-flowered acacia, *Acacia purpureipetala*, grows around Irvinebank, near Herberton, but has defied attempts by the nursery industry to propagate it. Elsewhere in Queensland, the little herb *Stackhousia tryoni* which normally has blue flowers, produces pink ones when growing on serpentine. Certain cycads, a plant which copes well with toxins, also flourish on these soils.

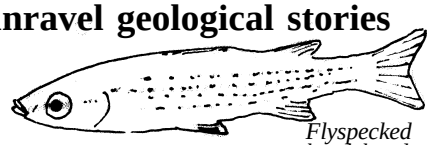
Mining companies now look for these particular plants when searching for minerals. While this is a useful indicator, there is concern that these unusual plants, with limited distributions, may be threatened by the valuable nature of the rock on which they have managed to develop.

Bioregional ecosystems

Queensland has been divided into a number of bioregional ecosystems, described in *The Conservation of Queensland's Bioregional Ecosystems.*

Classification is based on particular landscape patterns, geology and landforms, and vegetation, and acknowledges the interplay between these factors. This classification is useful for land use planning and management. There are 13 bioregions, one of which is the Wet Tropics bioregion. The regions are further divided according to land zones. Within the Wet Tropics there are 105 regional ecosystems.

Fish help to unravel geological stories



Flyspecked hardyhead

Genetic studies of freshwater fish in Wet Tropics streams are helping to piece together a picture of geological events. Rainforest CRC researcher, Dugald McGlashan, has been studying samples from three species. Fish in freshwater streams are often isolated from each other. Even if they live just a short distance apart, if there is no waterway connecting them, they are likely to become genetically different if isolated for long enough.

Dugald found that flyspecked hardyheads living in the lower reaches of the Johnstone River were similar to those in the lower reaches of other rivers, but that they were very different from those living in the upper reaches. This suggested that the development of waterfalls had prevented the upland and lowland fish populations from mixing for a very long time. He also found that one group living on the Atherton Tableland was similar to those living in the upper Barron while another completely different group, also on the Atherton Tableland, was in turn similar to those in the upper Herbert River.

These findings indicate that some waterways, now separate, were once joined in the not-too-distant past.

Bookshelf

Rocks and Landscapes of the Cairns District
W.F. Willmott and P.J. Stephenson
Queensland Department of Mines 1989

This excellent booklet, part of a series, makes geology comprehensible for the layperson. It is essential reading for anyone interested in the geology of the Cairns region and has been of great use in putting this Tropical Topics together. These booklets are available from the Department of Mines and Energy and in some bookshops and tourist outlets.

Other booklets in the series are:
Rocks and Landscapes of the Townsville District
D.L. Trezise and P.J. Stephenson
Queensland Department of Mines 1990

Rocks and Landscapes of the Chillagoe District
W.F. Willmott and D.L. Trezise
Queensland Department of Mines 1989

The Conservation of Queensland's Bioregional Ecosystems
Paul Sattler and Rebecca Williams, eds
Environmental Protection Agency 1999

This is the book described on page 7. It is useful for anyone wanting in-depth knowledge about relatively small scale variations in vegetation types according to geology, landscape and climate. For more details call QPWS Brisbane on (07) 3227 8187.

North Queensland Geology &
Atlas of North Queensland Geology
J.H.C. Bain and J.J. Draper (Eds)
AGSO & Dept. Mines and Energy (1997)

At 600 pages the book is a densely-detailed tome. The accompanying atlas maps various geological characteristics.

Rainforest CRC leaflets:
These leaflets are available from Rainforest CRC on Ph: (07) 4042 1246; e-mail: crctrem@jcu.edu.au
Marsupials in the mist — a home with a view, or declining mountain-top refuge?
February 1999
A report on John Kanowski's investigation into the distribution of leaf-eating marsupials.

Fishy genes tell us about the past
August 1999
A report on Dugald McGlashan's genetic testing of freshwater fish

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WET TROPICS MANAGEMENT AUTHORITY

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service