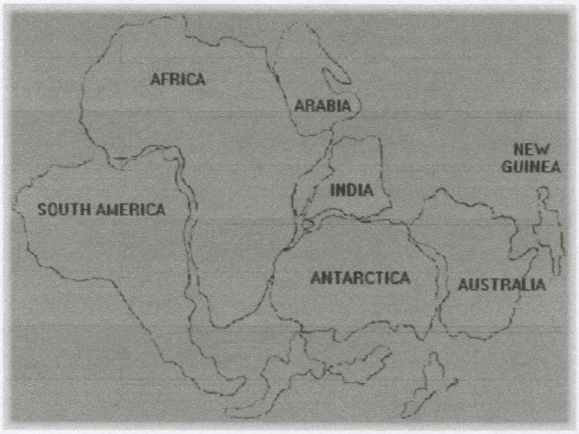
Draft /TOB Gondwana trees in BBG

We have a huge range of trees in the BBG and trying to come to terms with understanding them can be sometimes daunting. Breaking up the range into categories and identifying common features can help us progress. The Gondwana trees are one such group.

This year the Guides will have a monthly presentation in the conservatory on the tree of the month and the focus this year will be on our Gondwana trees. These are the trees that were part of the larger land mass of Gondwana . Between 160 and 65 million years ago Gondwana split up , forming today's southern land masses (Antarctica,South America, Africa, Madagascar, Australia, New Guinea, New Caledonia and new Zealand). As tectonic plates of Gondwana moved to their present position they carried their trees with them and we now have closely related trees and plants with a common heritage in these widely separated land masses.

Gondwana trees are survivors from a far distant past when we had the southern supercontinent. They have survived many changes of climate and positions on our mobile earth and have witnessed the extinction of many species (including the dinosaurs) in the last 90 – 100 million years.

PANGAEA (CONTINENTS) ABOUT 175 mya



GONDWANA (showing current continents)

What plants grew on Gondwana and are represented in Australia today?

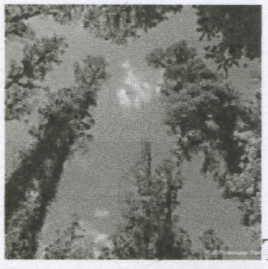
When we refer to Gondwana plants are we referring to plants which were on Gondwana at the time of the split about 130 mya from Pangaea. We have modern representatives of plants such as the gingko and cycads that evolved a lot further back in geological times than 130 mya. Do we include them in our list of Gondwana plants or are we referring to plants that evolved after the split and therefore are unique to Gondwana. We will need to clarify this.

Tree ferns have a lengthy fossil record stretching back to Triassic period (250 – 200 mya). The cycad fossil record dates 280 million years ago. Interestingly although the cycad lineage is ancient the existing species have evolved in the last 12 million years. This is unlike the genus Gingko whose evolutionary lineage dates back about 190 million years ago but fossilized leaf material is very similar or even identical to that produced by modern trees.

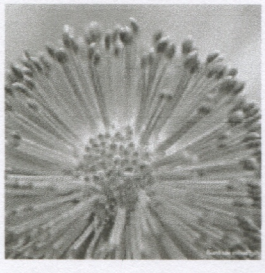
These ancient plants, gingko and cycads, were dominant vegetation over the world (including northern supercontinent) in Jurassic times. The cycads were so abundant and widespread in ancient times that the Jurassic period is often called the age of cycads. Their distribution included the southern supercontinent, Gondwana, and so we need to decide whether they are part of our Gondwana collection.

So what are the Gondwanan trees that were widespread?. We have 4 families.

 The **Araucarians** that contain three genera - **Agathis,Araucaria and Wollemia. .**

 There are the **Podocarps** , a large genus of about 95 species.

 **The Nothofagus, the Southern beeches** .

 **Proteaceous plants**, modern flowering plants, were also to be found on every remnant of Gondwana.

 Gondwanan forests all feature a vast array of **tree-ferns** belonging to two predominant families, the Cyatheaceae and the Dicksoniaceae.but we will have to wait for our new fernery before these representatives are displayed in our garden.

Since the pieces of Gondwana moved to their present positions they have evolved independently. They have had to adapt to varied latitudes and land changes and so have diversified. New evidence however is complicating the picture as many species have

developed rather more recently and are thought to have been dispersed across ever-widening ocean gaps, possibly via now-submerged island chains. Diversification was also occurring even before Gondwana broke up. There are puzzles in the Gondwana story and new discoveries in fossil records and DNA records keep contributing to it. We need to be mindful of the paradigm shifts that occur in our thinking. It was not until the 1960' that the concept of continental drift was accepted

Gondwanan plants give us insights into the evolutionary development of our plants. When the Gondwana southern continents were still joined land vegetation consisted largely of gymnosperms (plants without flowers). When we are talking about trees that dinosaurs roamed through we have Jurassic park images and certainly some of the araucarias with glossy foliage, spindly limbs, leathery leaves and bright green scaliness promote this picture of almost scary primitive plants. Part of the information communicated in"Gondwana tree of the month" will focus on the plant's botany and demonstrate their primitive and evolutionary development.

Rainforests covered most of Australia for much of the 40 million years after its separation from Gondwana and as our continent drifted northward and climate got drier these rainforests contracted to only 1% of Australia by the time of European settlement (and today only a quarter of that 1% remains). These remnants of Gondwana vegetation in Australia are now scattered and fragmented – and hence threatened. They have become mountain refugees. It is also uncertain what effects human – induced climate change will have on these pre-historic survivors. 50 separate rainforest reserves are clustered on the Qsld/NSW border and preserve areas of sub- tropical and temperate rain forest. They have an extremely high conservation value with more than 200 rare or threatened plant and animal species. The largest Gondwanan rainforest in Australia is located in Tasmania's Tarkine wilderness. Few places on earth contain so many plants and animals which remain relatively unchanged from their ancestors in the fossil record.

There was a time when there were no gum trees in Australia (or anywhere else) and in geological terms, it isn't all that long ago. According to recently published analyses the age of the earliest gum is put at about 53mya. Only during the last 50 million years or so, when the Australian continent broke away from Antarctica and the Southern Ocean widened, did this continent assume its distinctive shape and unique biota.

We have a rich heritage in our trees in the Ballarat Botanical gardens. We have trees that show our heritage from Gondwana times and provide an interesting living link to the evolution and spread of Australian. plants over more than 100 million years.