



Tasmania's geodiversity has contributed directly to the islands biodiversity, that is the numerous and varied plant and animal species. The States geodiversity is a result of continental drift, ice ages, humid hot conditions and earthquakes occurring over many millions of years.

A very brief and summarised account of Tasmania's geological history is outlined below. Keep in mind that although Tasmania is referred to frequently throughout these notes, it was not until about 70 million years ago that Tasmania began to look like it does today, an island to the south of the Australian mainland.

Precambrian

1,000 to around 600 million years ago.

Life was restricted to the oceans & land was an extensive desert.

The oldest rocks in Tasmania are estimated to be of Precambrian age and occur mainly in the west, extending from Port Davey in the far south west to the Rocky Cape in the north coast. The harder rocks form the mountains and ridges, while the softer Precambrian rocks, such as schist, occur in the valleys.

Examples of these ancient metamorphic rocks can be seen in the Arthur and Frankland Ranges, Frenchmans Cap and other sites on the west coast.

Precambrian rocks were deposited so long ago that there was no life on land it was an extensive desert and only single cell life could be found at sea. Plants had not evolved and the rocks were left unprotected from strong wind and rain.

The **quartzites** (found in the south-western ranges) and other Tasmanian Precambrian rocks are thought to have been deposited in a shallow sea, originally as sand, mud and silt.

Sequences of rock known as **dolomite** (aged at around 800 million years) contain Tasmania's oldest fossils. The fossils are single celled stromatolites and have changed very little over millions of years- living examples can still be found in some parts of Western Australia.

The Precambrian is a mysterious part of the Earth's geological history as far as animal life was concerned. Very few fossils have been found, due to the lack of animals with hard body parts which had not evolved yet. The softer organisms were less able to be preserved as fossils because the softer parts decomposed.

Cambrian

600 - 500 million years ago

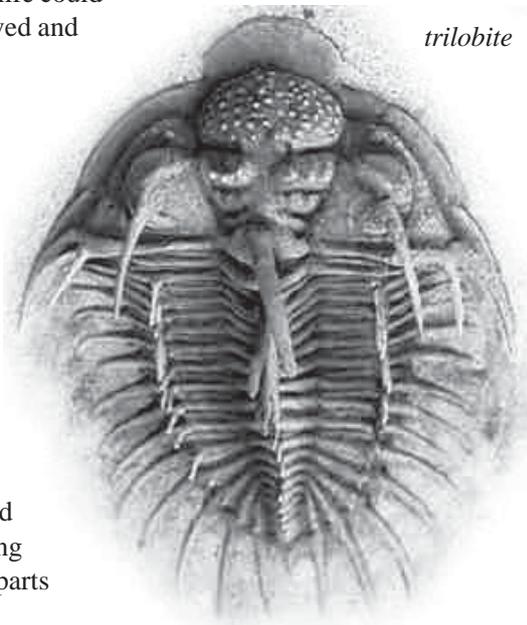
Volcanoes and the explosion of life on earth

The Cambrian period is renowned around the world for the explosion of life in the seas. It has been argued that at this time there was greater diversity of life in the seas than currently exists on earth. However this (life) explosion was followed by major extinctions.

Tasmania has some small fossils from this time, including (small) trilobites which are extinct relations of crayfish and crabs.

Tasmania entered a period of stretching. Earthquakes and faulting produced depressions and left higher areas. The depressions were covered by sea water and the highlands remained as a chain of islands. The highland areas provided the raw material for erosion during the Ordovician.

Eventually the stretching times were replaced by periods of squeezing. Chains of volcanoes formed across Tasmania. The volcanoes occurred intermitantly for millions of years. Many of the rocks on the west coast of Tasmania were produced by volcanoes and some of these are known as the Mt Read Volcanic Belt, a highly significant mineralised belt.



Ordovician

500 - about 400 million years ago

Highlands, erosion and migration

The start of the Ordovician period was a major period of mountain destruction in Tasmania. They were subjected to extensive erosion and deposition of these sediments which were then compressed to form the sandstones and conglomerates that are obvious today around Queenstown, in the West Coast Range and the Denison Range.

Big river systems carried large loads of boulders, cobbles, gravels, sands and clays wearing down the mountains. Large alluvial fans formed at the foot of mountain slopes. The rivers carried fine sediments, into the oceans where abundant animal life occurred. Similar processes are still occurring today in areas of active mountain building and erosion such as the Himalayas.

In the middle of the Ordovician, Tasmania was covered by sea, shallow in some areas, deep in others. The times were very warm and due to continental drift Tasmania was part of a much larger land mass situated near the equator. Warm seas provided the ideal environment for the accumulation of marine debris and limestone deposits, from waters that were quite deep to those that were shallow and tidal.

The Gordon Limestone (2 km deep), formed from these marine and limestone deposits (known as calcium carbonate), is one of the most complete carbonaceous (limestone) sequences in the world. It outcrops in parts of the Franklin and Gordon River valleys and around Mole Creek.

Devonian

400 - 300 million years ago

The building of mountains and very quiet times

The Devonian were very quiet times to start with. Sediments accumulated on the edges of seas. It was about this time that life started to invade land.

Tasmania had two discrete geological provinces up to this time - separated by a major fault known as the Tamar Fracture System. In many ways it may have resembled the San Andreas Fault system. This fault was the boundary between two continental plates along which there was considerable lateral movement.

The major collision of the two continental plates occurred along the whole of south east Australia - the Great Dividing Range is the eroded legacy of this event. This was a major mountain building event and it generated a tremendous amount of heat resulting in widespread melting in the crust deep below the surface.

The heat produced magma (molten rock), which gradually cooled at considerable depth below the surface. It is this cooled magma that has formed the spectacular granites extending from the Tasman Peninsula to Wilsons Promontory in Victoria.

Permian & Triassic

300 - 200 million years ago

Glaciers, fossils and swamps

Newly formed mountains to the north west, the result of the collision of continents, were again subject to erosional processes. The eroded material was deposited in what is known as the Tasmania Basin.

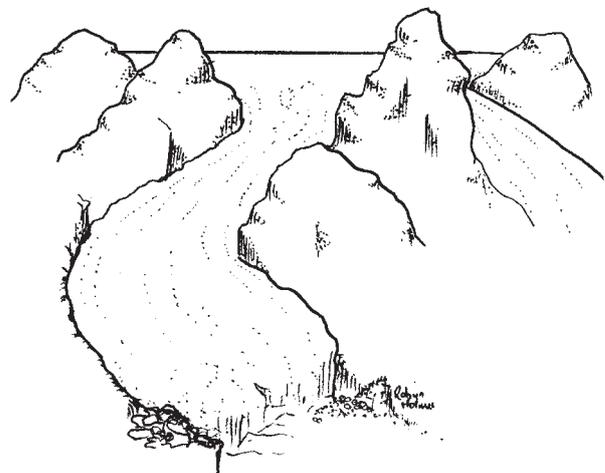
The Tasmania Basin covered a large part of central and eastern Tasmania. Some of the deposits indicate glacial times as Gondwana had again drifted south. Many other Gondwanic continents have similar rock sequences.

Fossil Cliffs on Maria Island is one of the best examples in the world of fossils from this time. The dense fossil shell deposits, mark one of the biggest extinctions since the Cambrian. The site contains large drop stones (granite) in layers near the fossils, indicating that glaciers or icebergs were melting and dropping the eroded material.

As the sea retreated and the climate warmed up, the Tasmania Basin was drained by broad meandering river systems.

These were the times of dinosaurs, though interestingly dinosaur fossils have not been found in Tasmania.

The Permian and Triassic periods are well represented throughout Tasmania at sites such as Maria Island (Fossil Cliffs and Painted Cliffs), Tasman Peninsula (Tessellated Pavement and Tasman Arch), throughout the Cradle Mountain- Lake St Clair National Park and Mt Field National Park.



Glaciation

Jurassic

160 million years ago

GONDWANA- the break up of the large land mass

The break up of Gondwana is a much talked about event and it had major implications for the geological development of Tasmania.

In a relatively short space of time about 165 my ago approximately, 1500 cubic kilometres of dolerite magma intruded into the earths crust just below Tasmania.

The dolerite cooled from incredibly hot temperatures, solidified and contracted, producing the columnar jointing so often apparent today forming dolerite cliffs.

Tertiary

65-7 million years ago

TASMANIA- as we know it today

It was at about this stage that Tasmania started to look something like it does today. Antarctica and mainland Australia broke free, about 45 million years ago.

The breakup of the supercontinent produced enormous tension in the Earth's crust resulting in faulting which created the early mountain ranges and valley systems we see today. These have been moulded continuously by water and occasionally by ice to reduce the landscape we see today.

Pleistocene

The last 2 million years

Glaciations, rivers and oceans, all over Tasmania

The last 2 million years has seen a number of different glaciations occur in Tasmania. The most obvious impacts are on the high mountain areas in the form of erosional changes, caused by ice and snow.

Areas of lower altitude, being less effected by ice and snow, did not encounter such obvious changes, except that the effects on sea levels were quite significant. The sea level dropped sufficiently on some occasions to create the land bridge between Tasmania and mainland Australia.

Lakes and swamp deposits from these times now provide important information on the climatic history.

As the ice retreated and glaciers melted the sea levels rose to a level similar to today. Sand that was transported landwards by rising seas and down rivers, accumulated along seashores producing spectacular landforms such as the isthmus features on Bruny Island, Maria Island and at Freycinet Peninsula as well as many other coastal land forms.

How do we know about continental shift?

In the 1940s, similar rocks in a number of Southern Hemisphere countries alerted Alfred Wegener to the possibility of a super continent.

Wegener was able to show that 300 million year old ice deposits in the southern Hemisphere had a rational distribution when plotted on a reconstruction of Gondwana land.

Rocks can be simple!

One can look at the types of rocks throughout the world and divide them into 3 broad classes;

igneous, sedimentary and metamorphic

Igneous Rocks:

were formed from melts deep below the earth. They are rocks made up from molten material, which forms crystals as it cools. The rocks moved, bouyantly, closer to the Earths surface and are known as 'intrusions' or 'extrusions'. The surface material must be eroded from the 'intrusion' before the igneous rock can be exposed. While extrusive igneous rocks are those which reach the surface before they cool. Igneous rocks vary depending on their crystal size, which is relative to the rate of cooling of the molten rock.

Igneous rock include: granites, basalt and dolerite

Examples of **granites** can befound at Freycinet Peninsula.

Examples of **basalts** can be found in the north west of Tasmania.

Examples of **dolerites** can be found throughout the Central Plateau and in the east of Tasmania.

Sedimentary Rocks:

are very common and are the accumulation of other rocks that have been broken down by weathering processes such as running water, frost and ice. The breakdown often results in the deposition of mineral fragments in thick layers in areas such as flood plains, lakes or at sea. Sedimentary rocks are obvious by the layering effect which is a result of the deposition of materials.

Sedimentary rocks include: *mudstone, sandstone, limestone, coal, shale, and conglomerates (rounded pebbles)*. Great examples of sedimentary rocks can be found throughout eastern Tasmania.

Metamorphic Rocks:

Metamorphic means 'changed form' and metamorphic rocks are derived from sedimentary and igneous rocks that have been changed through processes involving extreme heat and pressure. Metamorphic rocks are formed by the alteration and renewal of pre-existing rocks and therefore have many similar properties to the minerals from sedimentary and igneous rocks and can be found throughout western Tasmania.

Metamorphic rocks include: *slate, schist, quartzite and marble*.

Further information

This notesheet was created with input from the Nature Conservation Branch, *Department of Primary Industries, Water and the Environment* and the Parks and Wildlife Service, *Department of Tourism, Parks, Heritage and the Arts*.

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