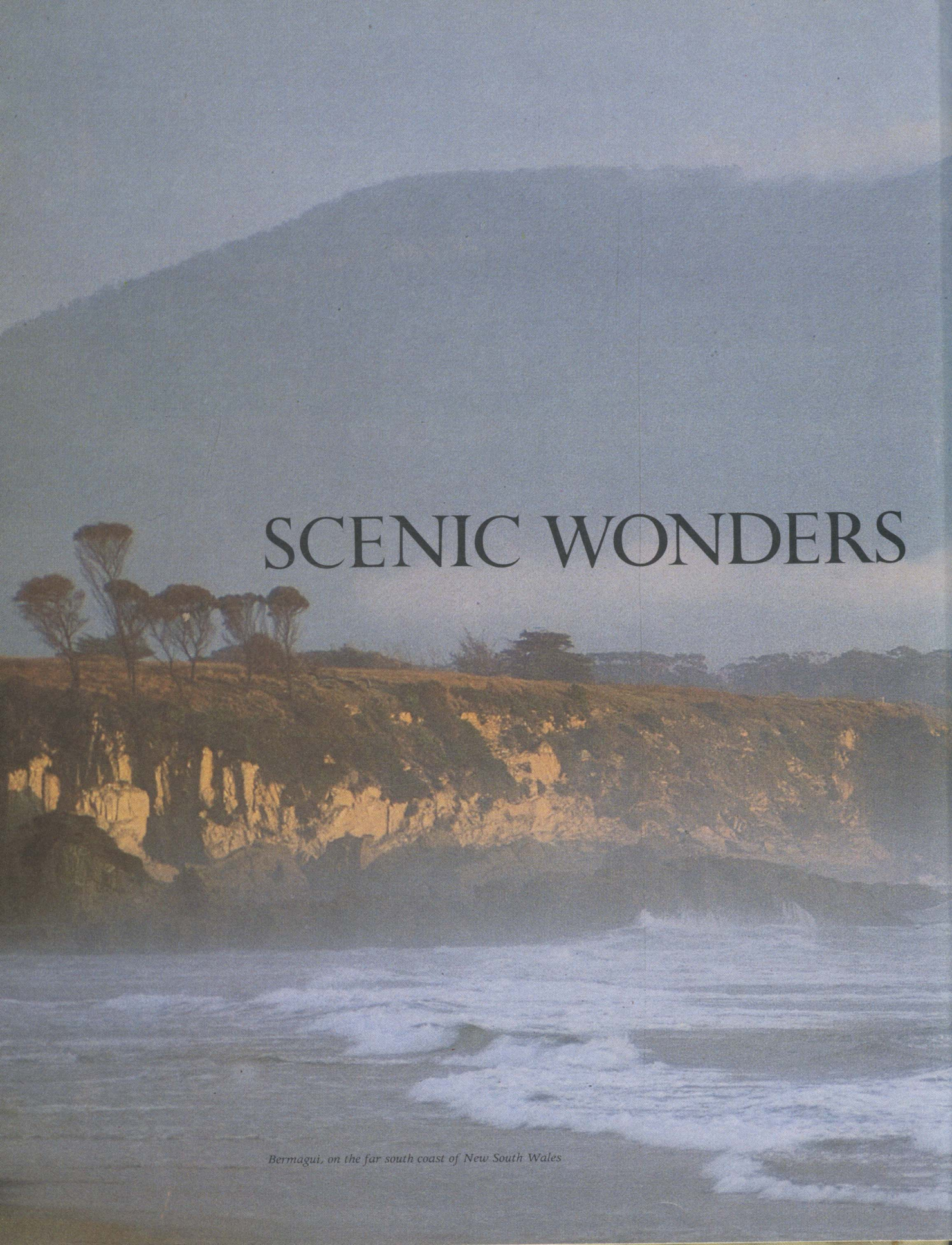
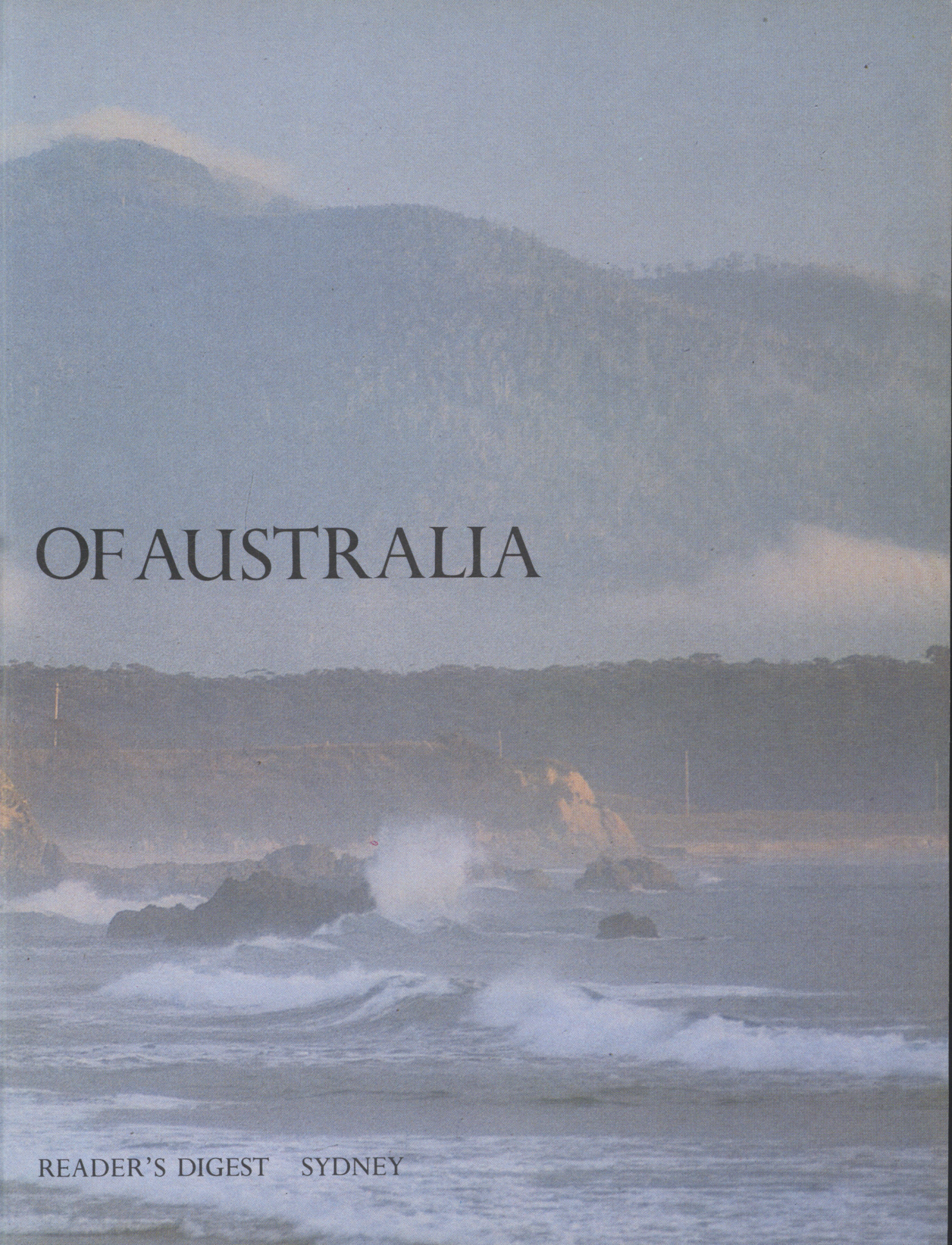
# SCENIC WONDERS OF AUSTRALIA



# SCENIC WONDERS

*Bermagui, on the far south coast of New South Wales*



# OF AUSTRALIA

READER'S DIGEST SYDNEY

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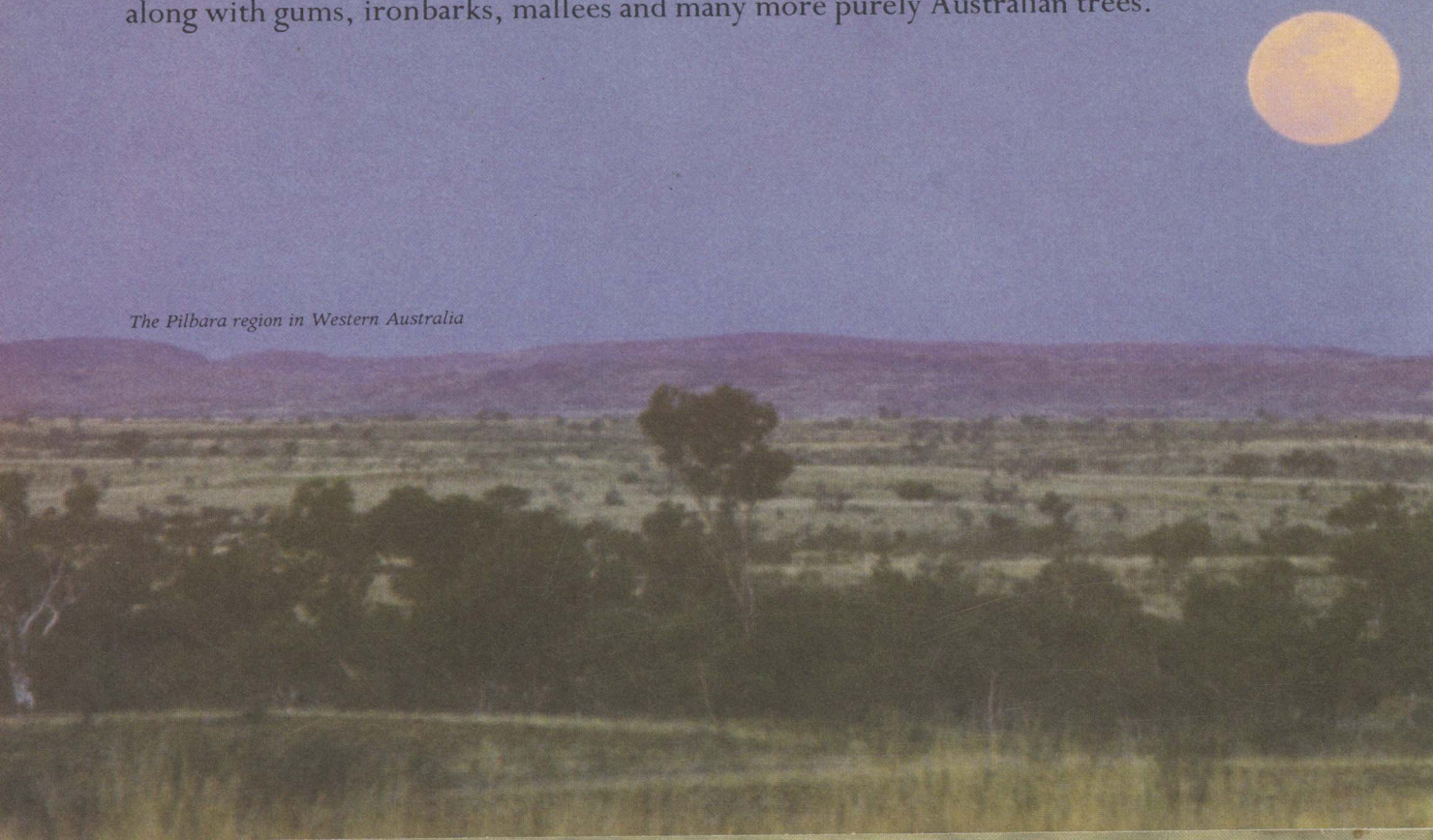
# DISCOVERING NATURAL AUSTRALIA

Australia is an ancient and worn-down continent which includes some of the oldest land surfaces on earth – land that has been continuously exposed above the sea for millions of years. Europeans have lived in Australia for less than 200 years – an instant by comparison with ages over which the land and the plants and animals it supported had evolved – but in that time they have changed the landscape over huge areas. Forests have been replaced by patchworks of farmland, woodlands have been cleared for grazing, swamps have been drained, rivers have been dammed and estuaries have been filled.

But much of the primitive landscape remains, and the purpose of this book is to demonstrate the beauty, richness and variety of this precious wilderness. The first part of the book explains the forces that made the continent what it is and where it is. The second part shows Australia by regions and presents some of the finest surviving natural landscapes, especially those preserved in national parks. The third part gives information and advice on travelling in Australia and seeing the country at its best.

Many plants and animals mentioned in this book are identified by their scientific names as well as their common names. This is because common names often vary. For example, the names blue quandong, blue fig and bracelet tree all refer to the tree that botanists know as *Elaeocarpus grandis*. Common names can be misleading too, particularly when they are shared with quite different species on the other side of the world. Apple, ash, box, oak, poplar and willow are just a few of the names that have been given to Australian trees which in reality belong to very different groups. Mountain ash, for example, belongs in the genus *Eucalyptus* along with gums, ironbarks, mallees and many more purely Australian trees.



*The Pilbara region in Western Australia*

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# The origins

*The MacDonnell Ranges, central Australia*


of the continent

# The birth of an island continent

For more than a hundred years people have speculated that the land masses of the world are moving. Scientists were puzzled by the similarities between many of the plants and animals that early explorers brought back to Europe from different continents in the Southern Hemisphere which were separated by oceans. Some theorised that the continents must have moved, but this belief was not widely accepted because it conflicted with the traditional view that the earth was a rigid, stable mass. However, in the last decade, a revolutionary idea — called global-plate tectonics — has been proposed to explain the origin and distribution of the earth's land masses and oceans.

The earth's skin is made up of a series of rigid plates of rock 70 to 150 km thick which overlie the more plastic rock of the earth's mantle. The ocean floor and the land masses rest on these plates, which may move as much as 10 cm a year, carrying the continents adrift, and opening and closing oceans.

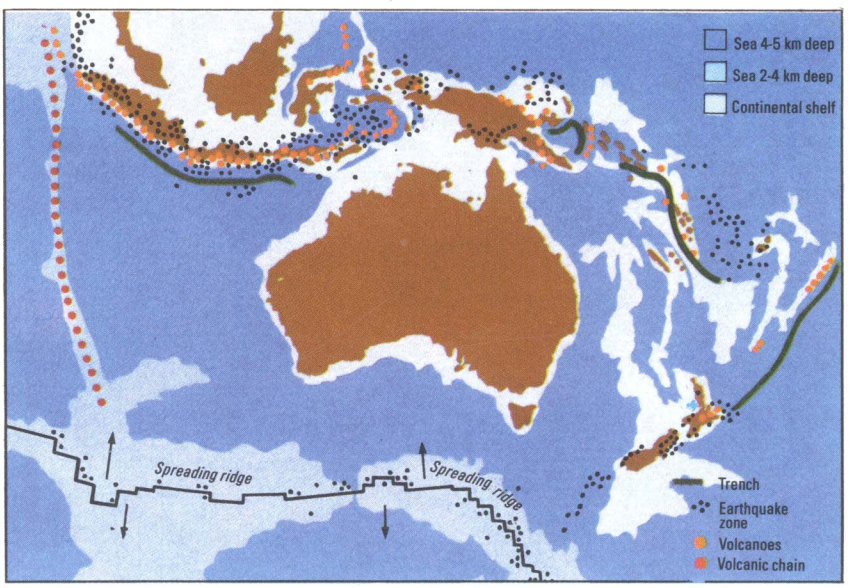
Australia and the Indian sub-continent both rest on the Indo-Australian plate, which is slowly moving northward. In 50 million years, if the direction continues unchanged, Australia will touch south-east Asia.

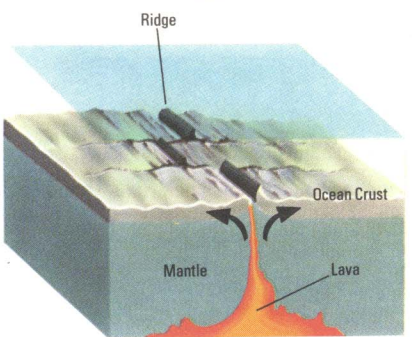
Although the process that causes the plates to move is still a mystery, it is known that the plates grow from mid-oceanic ridges. These ridges form a 64,000 km global, underwater mountain chain, broken by great vertical fractures or faults. Lava rises out of cracks in the mid-oceanic ridges and forms new ocean floor. Thus although all the earth's land masses have rocks more than 3000 million years old, most of the ocean floor is less than 150 million years old.

Ocean floor spreading from the ridges is destroyed where adjacent plates collide and one is forced down into the earth's interior below deep-sea trenches. This descent is accompanied by earthquakes and volcanic activity. The earthquakes are thought to be the result of the movement, and the volcanic arcs are produced when part of the sinking ocean crust melts and rises as lava. As the ocean floor along trenches is consumed, the oceans may close and continents collide, forming mountain-building zones.

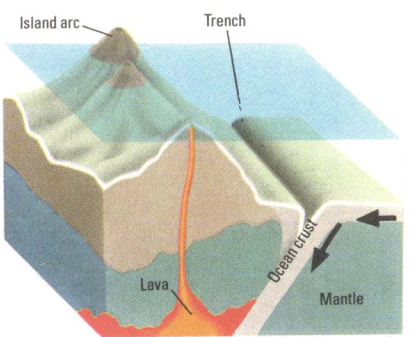
## SLOW DRIFT NORTHWARD ON A MOVING PLATE

*Australia is drifting north on the Indo-Australian plate; this is outlined in black on the globe and a detail is shown on the map. In the south and west, new ocean floor is welling up from ridges. And in the north and east, ocean floor is destroyed*

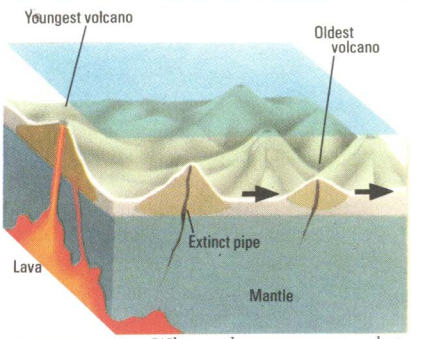



SPREADING RIDGE *Molten rock rises from the earth's mantle and wells out of ocean ridges, forming new ocean floor as it hardens, and spreading the older rock away from the ridge*




DEEP-SEA TRENCH *If plates collide, one may be forced down under the other, forming a trench. The heat of the mantle melts the crust, and lava erupts, building a chain of islands*




VOLCANIC CHAIN *When a plate passes over a hot spot and lava rises to the surface, a volcanic chain may form—on land or at sea. This shows the direction in which the plates move*

### The supercontinents

More than 200 million years ago the earth's continents were probably joined together in a supercontinent called Pangea, a word derived from Greek meaning 'all lands'. Over millions of years this universal land broke up, and its fragments — our continents — slowly drifted to their present positions. The Atlantic, Indian and Southern Oceans were born, and parts of the Pacific Ocean opened. Australia drifted north about 2500 km.

Since the initial break-up of Pangea, mountain ranges have been added to the edges of some continents and collision zones. But if today's continents were reassembled, they would fit together at their continental shelves—the true boundaries of each land mass—like pieces of a jig-saw puzzle.

Most scientists now believe that giant rifts, caused by a change in the earth's interior more than 180 million years ago, split Pangea apart and created two major continents partially separated by the Tethys Sea. The northern supercontinent of Laurasia included the present North American and Eurasian continents. The southern supercontinent of Gondwanaland contained what is now South America, Africa, Australasia, Antarctica and India. And according to recent evidence Gondwanaland probably also included a part of south-western China.

Scientists disagree about the time the continents actually separated, but it is thought that South America and Africa were the first to separate from Gondwanaland. Soon after, India drifted away from Australia, and finally joined Asia. Later the Tasman Sea opened and New Zealand began to move east. Finally Antarctica and Australia split apart.

### Evidence for continental drift

Since 1912 when the German scientist and explorer, Alfred Wegener, assembled the shapes of the continents into a single land mass, which he named Pangea, evidence supporting his theory has grown.

Similar types of rocks of about the same age have been found on the continents. Some of the rock sequences indicate that the continents had similar climatic, biological and volcanic histories.

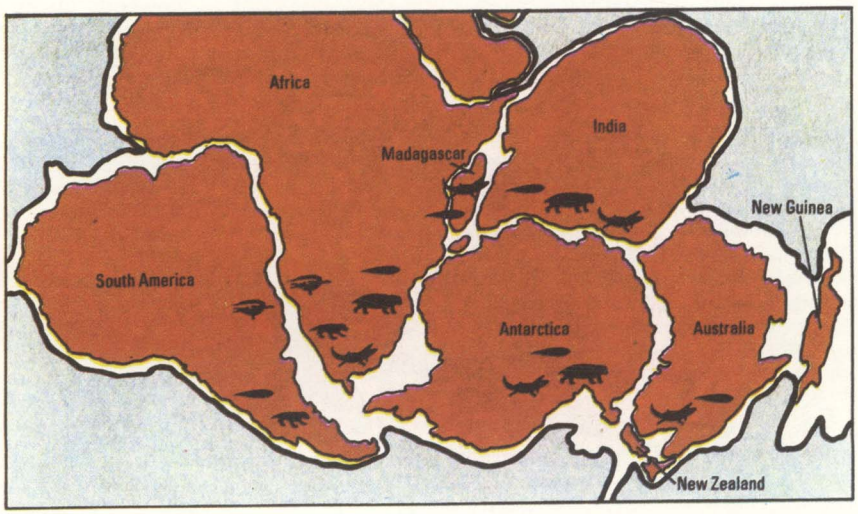
Moreover, by studying the magnetism of rocks, scientists are able to calculate the position of the earth's magnetic poles at the time the rocks formed. These studies of rocks from different continents have shown that ancient magnetic axes coincide only if the continents now separated are joined.

Fossils provide supporting evidence that the continents were linked. Fossils of closely related plants and animals, which could not have crossed the oceans now separating the continents, have been found on all the southern continents.

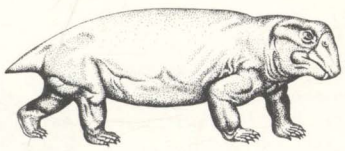

ANCIENT SUPERCONTINENT *This computer fit of Pangea was made along the margins of today's continents at a depth of 1800 m; white lines show the present coasts*

## GONDWANALAND, THE SOUTHERN SUPERCONTINENT

*The fit of the southern continents along their continental shelves, and the distribution of fossils are evidence that these land masses were probably once joined in a southern supercontinent—Gondwanaland*




*The remains of* Glossopteris, *a hardy shrub-like tree, are found on all the southern continents*



*The herbivorous* Lystrosaurus *was about 1.5 m long. It lived in swamps and rivers*

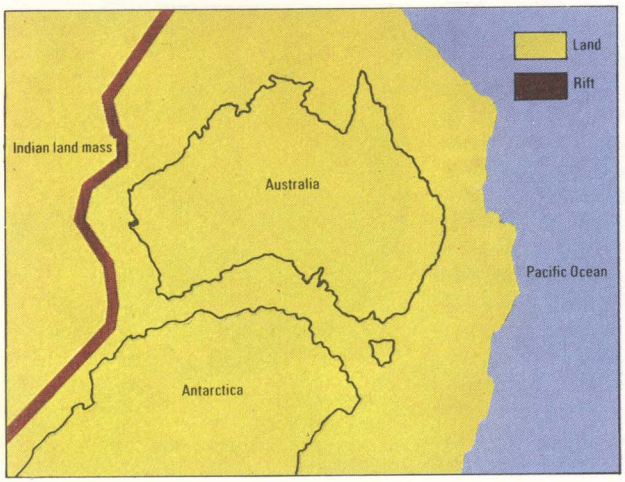
*The first vertebrates to conquer land, the primitive labyrinthodont amphibians spent much of their time in fresh water*

*The freshwater reptile* Mesosaurus *grew to 600 mm. It had a long jaw and needle-like teeth for preying on small fish*

*A carnivorous reptile,* Thrinaxodon, *was probably warm-blooded and covered in hair. It was about 600 mm long*

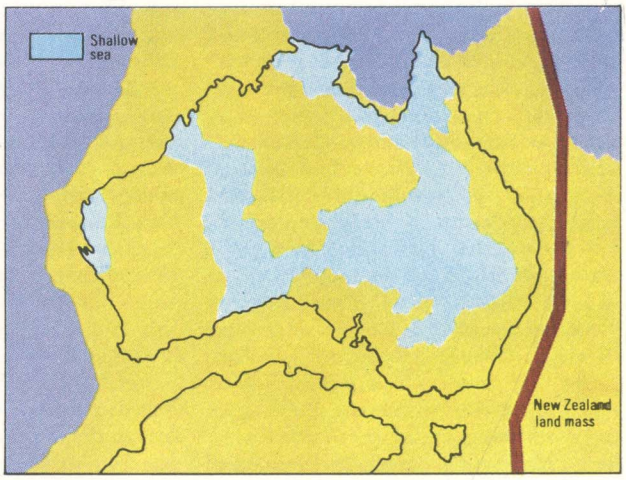
# *The drifting island continent*

ONE HUNDRED AND FIFTY MILLION YEARS AGO




*The southern continents were still joined but rifts, or lines of fracture, had appeared. The precise shape of the Indian land mass is unknown—much of that continent was tucked under Asia when they collided*

ONE HUNDRED MILLION YEARS AGO




*The Indian land mass had drifted away, and the Tasman Sea was soon to open. The rift along which the New Zealand land mass would separate is shown. Shallow seas flooded across inland Australia*

For hundreds of millions of years, or most of its geological history, present-day Australia was part of a huge supercontinent. Although there are some gaps, by examining the rocks and the fossils preserved within them, it is possible to reconstruct even the distant past and see how the surface of what was to become Australia was shaped.

One hundred and fifty million years ago most of today's Australia was above sea level, and large river systems emptied into great freshwater lakes. Giant dinosaurs, the supreme rulers, dominated life on land. Flying reptiles, or pterosaurs, and their competitors the first birds were probably also present but their remains have not yet been discovered in Australia. The dominance of reptiles—animals without internal temperature controls—suggests that the climate must have been tropical or sub-tropical. Primitive conifers, non-flowering plants such as pines and firs and squat palm-like cycads, were widespread across the continent.

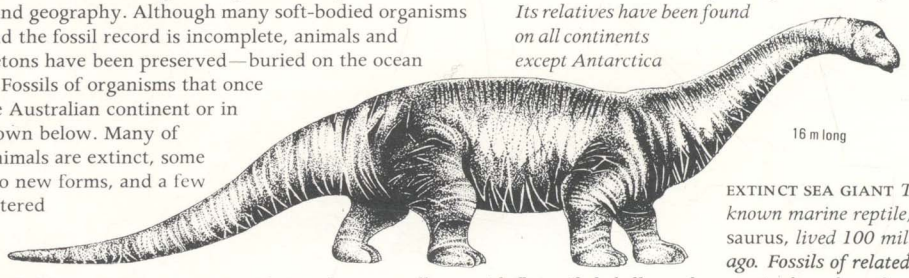
About 100 million years ago shallow seas flooded across Australia, separating it into a group of islands. Reptiles were the dominant group of animals, and large marine animals dominated the sea. Dinosaurs probably still stalked the land but few of their remains have been found. The climate was warm and humid; cycads and conifers flourished, and the first flowering plants, or angiosperms, appeared, marking an important stage in the evolution of plant life.

Soon after the seas retreated, about 75 million years ago,

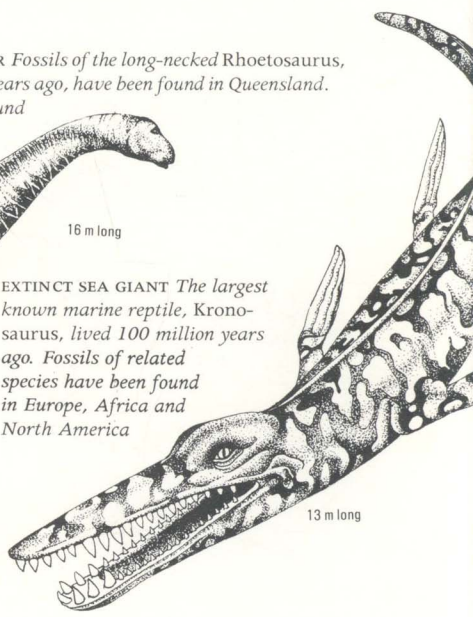
ANCIENT LIFE RECORDED IN THE ROCKS

Fossils are the remains of plants and animals preserved in rocks. They provide a record of life through the ages, and help to determine former climates and geography. Although many soft-bodied organisms have perished and the fossil record is incomplete, animals and plants with skeletons have been preserved—buried on the ocean floor or on land. Fossils of organisms that once flourished on the Australian continent or in its waters are shown below. Many of the plants and animals are extinct, some have evolved into new forms, and a few still survive unaltered

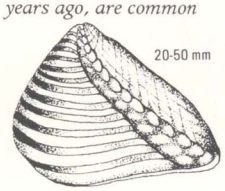
PLANT-EATING DINOSAUR *Fossils of the long-necked* Rhoetosaurus, *which lived 160 million years ago, have been found in Queensland. Its relatives have been found on all continents except Antarctica*



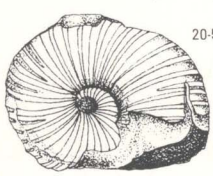

EXTINCT SEA GIANT *The largest known marine reptile,* Kronosaurus, *lived 100 million years ago. Fossils of related species have been found in Europe, Africa and North America*

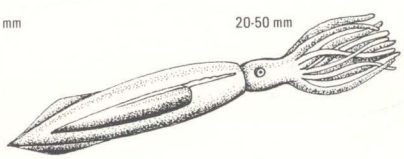



LIVING FOSSIL *Relatives of the mollusc* Trigonia, *which appeared 200 million years ago, are common*

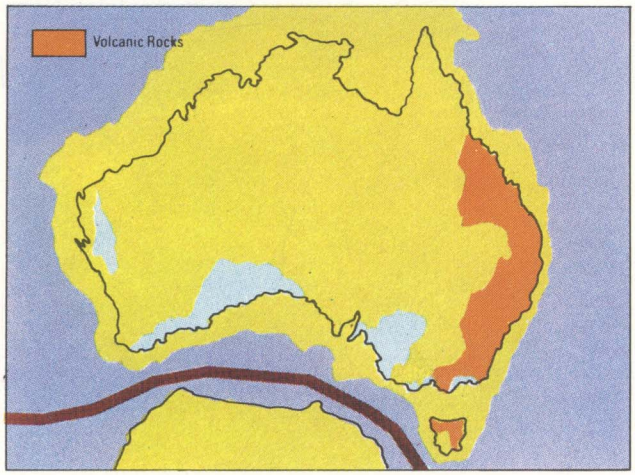



EXTINCT MOLLUSCS *Ammonites, or molluscs with flat-coiled shells, and belemnites, or molluscs with slender internal shells, were abundant 180–80 million years ago*



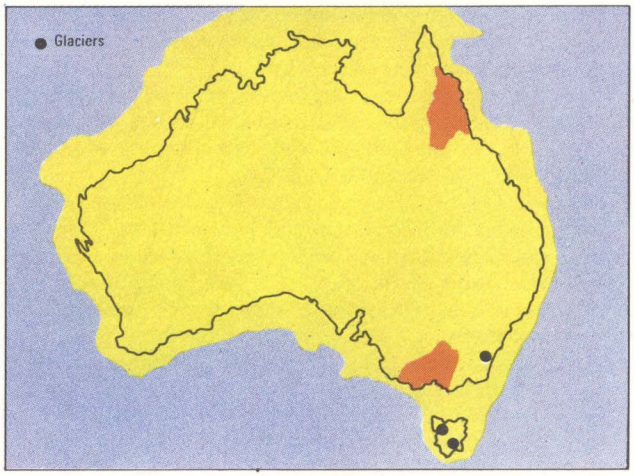



THIRTY MILLION YEARS AGO




*Australia had separated from Antarctica, and was slowly moving northwards as sea-floor spreading pushed Australia across a hot spot, leaving a trail of progressively younger volcanic rocks along the east coast*

THE LAST MILLION YEARS




*During the last ice age, land bridges linked Australia, New Guinea, and Tasmania, but glaciers covered only small parts of Australia. Volcanic activity was restricted to small areas in Vic. and Qld*

the first mammals, small possum-like creatures, entered Australia across Antarctic land bridges.

About 55 million years ago Australia drifted away from Antarctica, and the island continent was formed. Australia's isolation since then has resulted in the evolution of distinctive native flowers and animals: the variety of eucalypt trees has multiplied, and the marsupials have evolved a number of unique forms in the absence of competition from the more advanced placental mammals—animals whose offspring are well developed at birth.

Shallow seas teeming with shelled invertebrates again encroached on the land about 30 million years ago. Some of the marine deposits from this period contain coral reefs, suggesting that the climate was warmer than it is now.

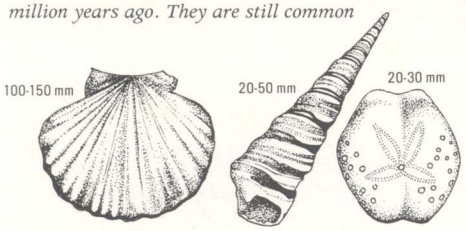
For the last million years Australia has been free of major earth movements, and volcanic activity has been restricted to small areas in the east. The shape of the continent has been much as it is today with one important exception. During the last ice age, about 25,000 years ago, much water was locked in ice in the Northern Hemisphere and this resulted in a worldwide lowering of sea level, which joined Tasmania, Australia and New Guinea.

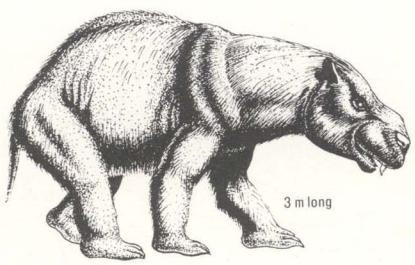
Since the end of the last glacial period there have been several climatic cycles, which may have been responsible for the extinction of a few species of animals and plants. Some became extinct as recently as 10,000 years ago.

FLOWERING PLANT *The Antarctic beech,* Nothofagus, *first appeared 50 million years ago. It still survives in eastern Australia*

EARLY MARSUPIALS *More than 50 million years ago, the first marsupials—small, omnivorous animals resembling possums—entered Australia*

ANCIENT MARINE ANIMALS Pecten, *a scallop-like mollusc,* Turritella, *a snail-like mollusc, and* Lovenia, *a heart-shaped sea urchin, existed 40 million years ago. They are still common*




GIANT MARSUPIAL *Herds of lumbering* Diprotodons *roamed across Australia 10,000 years ago*

SHORT-FACED KANGAROO *Less than three million years ago,* Procoptodon, *a giant browsing kangaroo, first appeared*

# The shaping of the landscape

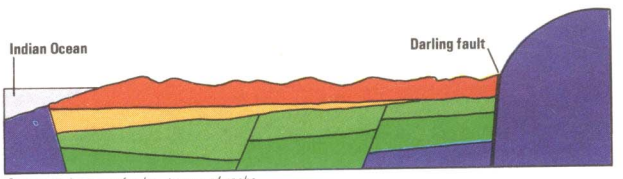
Australia is the flattest and lowest of the continents. Much of it consists of vast plains, and even the highlands take the form of tablelands and plateaux. Mountain peaks are largely restricted to Tasmania, an area once covered by ice.

Unlike other continents, Australia has been free of great earth movements for the last 220 million years. It is this relative stability and the long interval since the last great mountain-building event that makes Australia flat.

Pressure in the earth's crust has uplifted parts of the continent; buckled, or folded, the land into arches or down into basins; and caused blocks of rock to break apart, or fault. But these disturbances of the crust have been localised and have occurred over long periods. In the intervening years the forces of erosion—water, wind and ice—have slowly levelled large areas of the continent to low-lying plains. Today rocks more than 3000 million years old are exposed.

Even small earth movements, however, shape the landscape—by bringing different types of rocks to the land surface where they are exposed to weathering.

The effects these earth movements and forces of erosion have on the landscape can be clearly seen in satellite pictures. These pictures were sent by LANDSAT-1, orbiting 800 km above the earth. The colours are artificial, and highlight vegetation changes. Lush vegetation appears red, exposed rock and sand are green, and ripening crops and dry grazing land are yellow.

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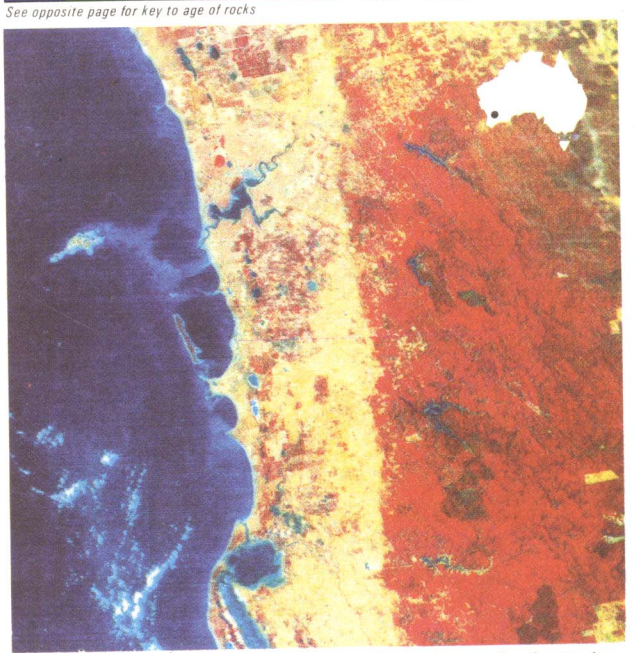
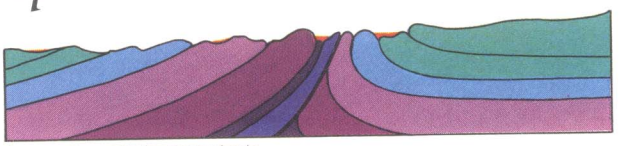
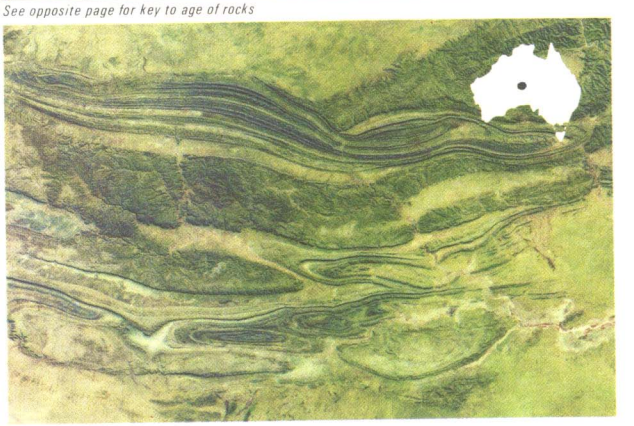


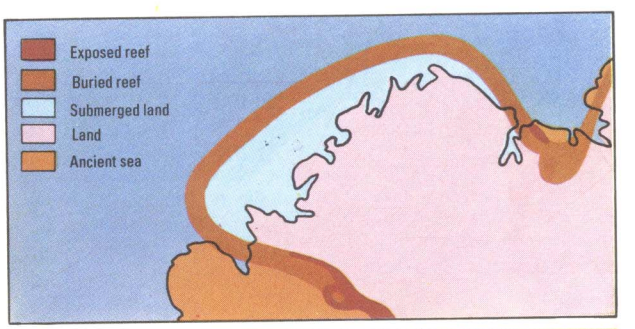
FAULTING *The Perth coastal plain is bounded in the east by the Darling Fault, a fracture in the earth's crust more than 950 km long. The fault which coincides with a change in vegetation shows up in this satellite picture. The ancient rocks underlying the Darling Plateau are now buried under younger sediments on the coastal block*

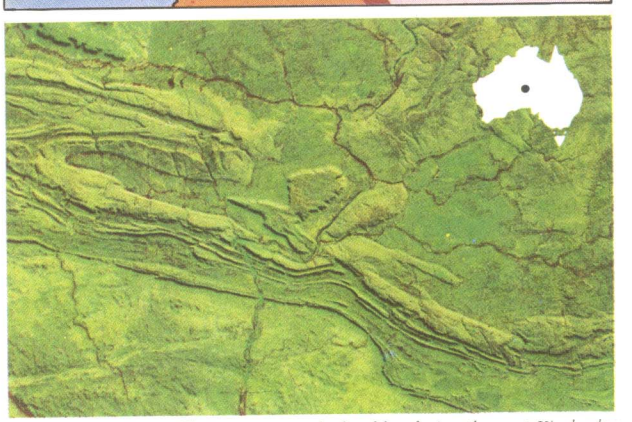


See opposite page for key to age of rocks



FOLDING *The Amadeus Basin in central Australia was shaped millions of years ago when intense pressure and heat in the earth's interior folded, or buckled, layers of sedimentary rock. The forces of erosion have revealed the ancient fold structures*



UPLIFT *About 360 million years ago, the land bordering the west Kimberley area in north-western Australia lay beneath a shallow sea which was fringed by a barrier reef. Since then erosion and uplift have exposed the limestone reefs, and today they stand out as ranges above the adjoining plain. Not only is the shape of the reef complex visible, but the limestone also contains some of the best-preserved animal fossils in the world. The reefs stretch for more than 280 km and are thought to extend beneath the sea around the north-west coast of Australia where they join another complex in the Bonaparte Gulf*

There are three types of rocks—sedimentary, igneous and metamorphic. They are classified according to the way in which they were formed.

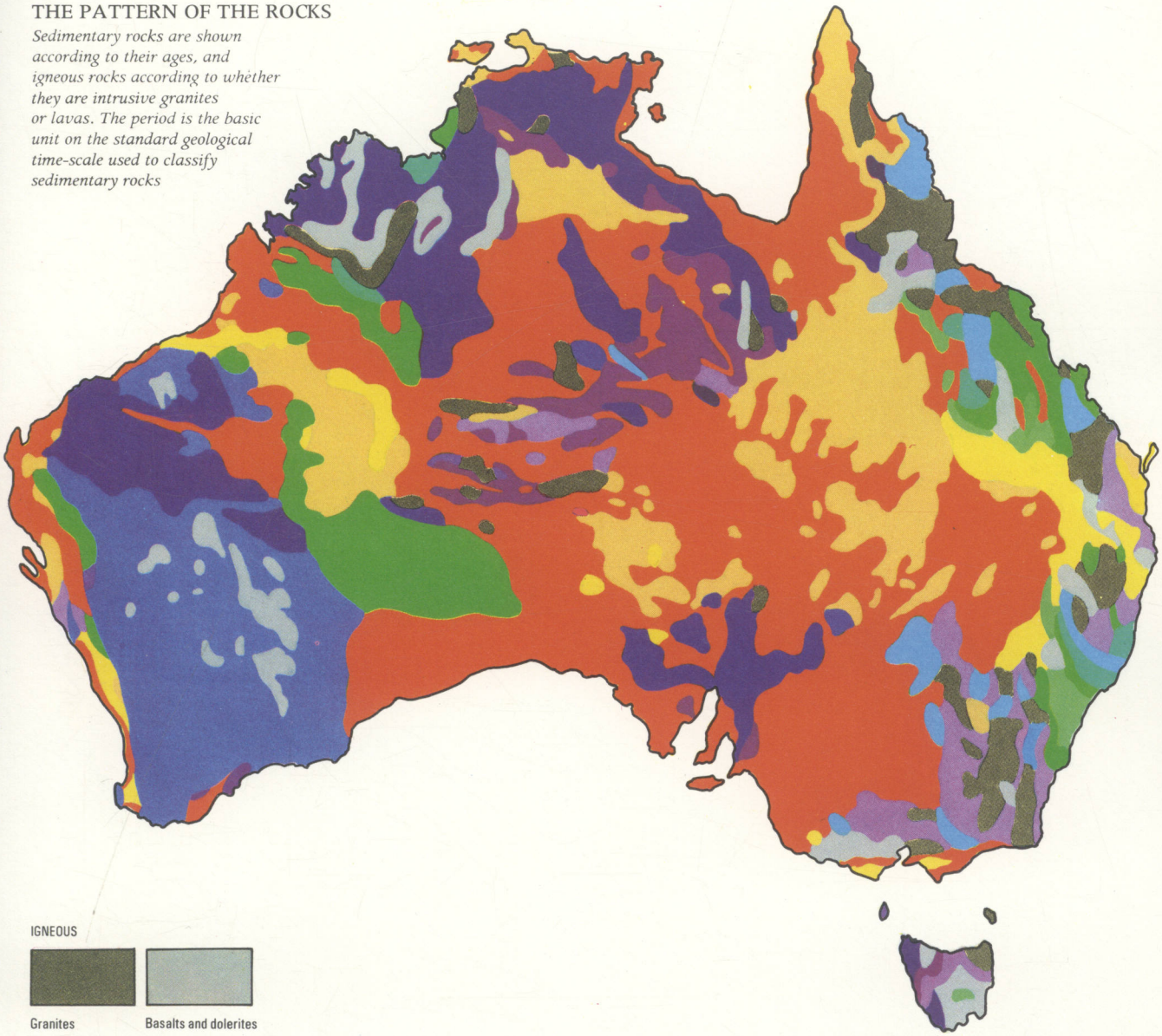
Sedimentary rocks, such as limestone and shale, form when layers of sediment are consolidated. The sediment is derived from the accumulation of organic debris; from chemical precipitation; and from the breakdown of existing rocks by water, wind, ice and living matter.

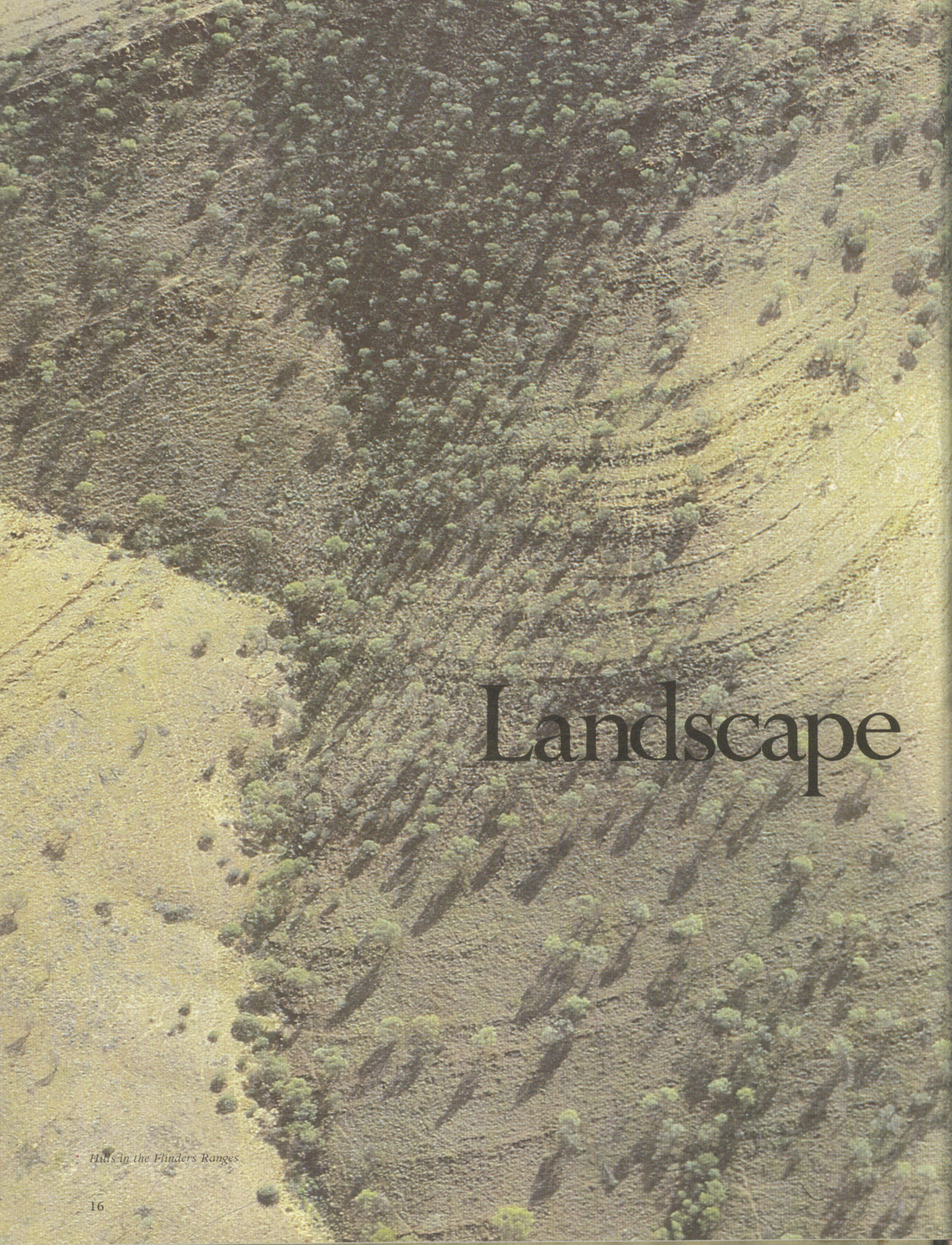
Igneous rocks form when molten rock from the earth's crust, rises and cools. Intrusive igneous rocks such as granite form when magma cools underground, and igneous lavas such as basalt when the magma cools on the earth's surface.

Metamorphic rocks are sedimentary or igneous rocks which have been altered by heat, pressure or chemical action in the earth's crust.

## THE PATTERN OF THE ROCKS

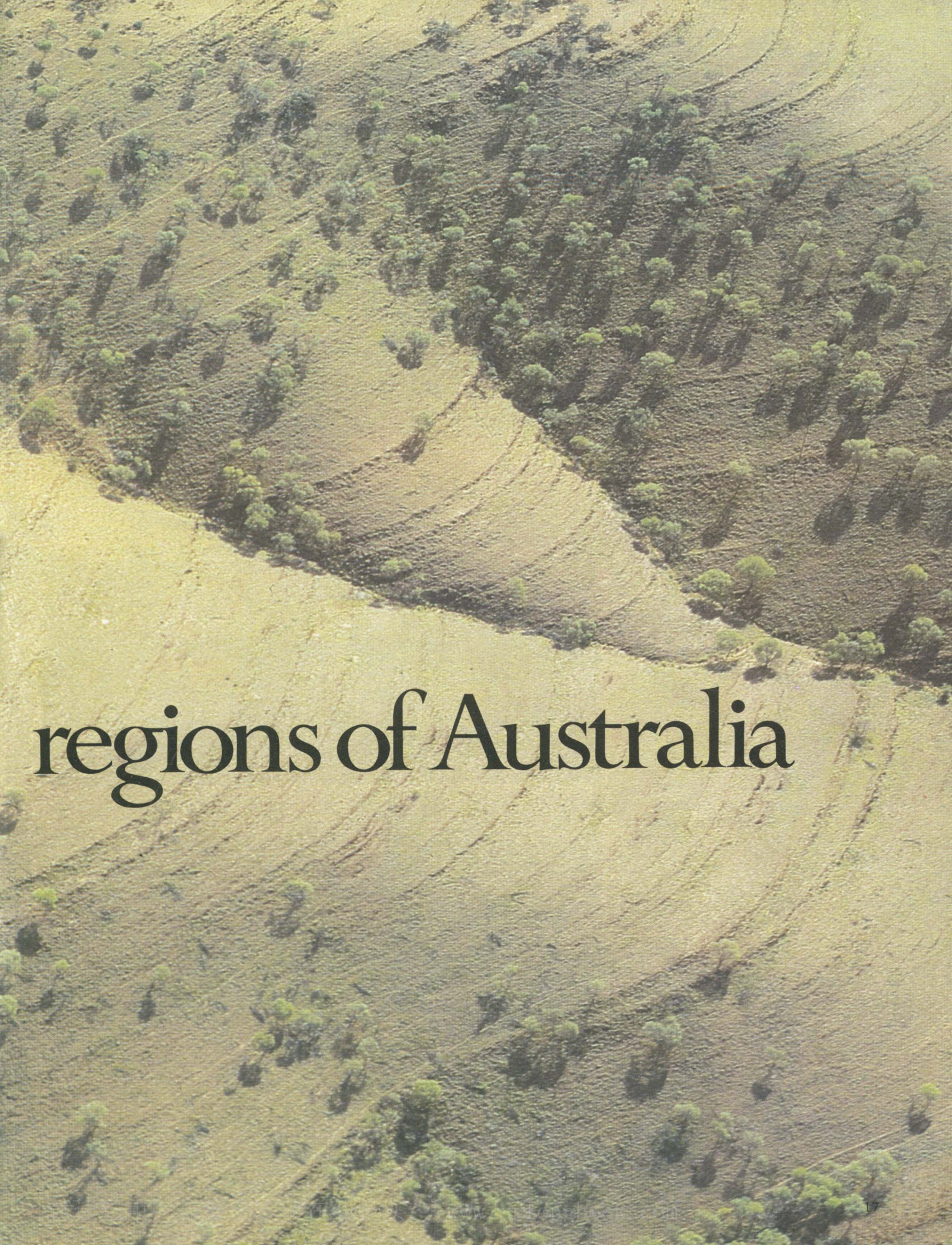
*Sedimentary rocks are shown according to their ages, and igneous rocks according to whether they are intrusive granites or lavas. The period is the basic unit on the standard geological time-scale used to classify sedimentary rocks*





# Landscape

*Hills in the Flinders Ranges*



# regions of Australia