culosis in the animal which produces that effect upon man. Lord Basing was the chairman, and the other commissioners were: Prof. G. T. Brown, Sir George Buchanan, Dr. G. F. Payne, and Prof. Burdon Sanderson. After the death of Lord Basing, in October last, the commission was reorganised with Sir George Buchanan as chairman. The report of this commission, upon the evidence and experimental inquiries received since the appointment of the original commission five years ago, was presented to Parliament last week. The general results of the inquiries instituted by the commissions in connection with the matter referred to them, will be found in the subjoined summary appended to the report:—

"We have obtained ample evidence that food derived from tuberculous animals can produce tuberculosis in healthy animals. The proportion of animals contracting tuberculosis after experimental use of such food is different in one and another class of animals; both carnivora and herbivora are susceptible, and the proportion is high in pigs. In the absence of direct experiments on human subjects we infer that man also can acquire tuberculosis by feeding upon materials derived from tuberculous food animals. The actual amount of tuberculous disease among certain classes of food animals is so large as to afford to man frequent occasions for contracting tuberculous disease through his food. As to the proportion of tuberculosis acquired by man through his food or through other means we can form no definite opinion, but we think it probable that an appreciable part of the tuberculosis that affects man is obtained through his food. The circumstances and conditions with regard to the tuberculosis in the food animal which lead to the production of tuberculosis in man are, ultimately, the presence of active tuberculous matter in the food taken from the animal and consumed by the man in a raw or insufficiently cooked state. Tuberculous disease is observed most frequently in cattle and in swine. It is found far more frequently in cattle (full grown) than in calves, and with much greater frequency in cows kept in town cowhouses than in cattle bred for the express purpose of slaughter. Tuberculous matter is but seldom found in the meat substance of the carcase; it is principally found in the organs, membranes, and glands. There is reason to believe that tuberculous matter, when present in meat sold to the public, is more commonly due to the contamination of the surface of the meat with material derived from other diseased parts than to disease of the meat itself. The same matter is found in the milk of cows when the udder has become invaded by tuberculous disease, and seldom or never when the udder is not diseased. Tuberculous matter in milk is exceptionally active in its operation upon animals fed either with the milk or with dairy produce derived from it. No doubt the largest part of the tuberculosis which man obtains through his food is by means of milk containing tuberculous matter. The recognition of tuberculous disease during the life of an animal is not wholly unattended with difficulty. Happily, however, it can in most cases be detected with certainty in the udders of milch cows. Provided every part that is the seat of tuberculous matter be avoided and destroyed, and provided care be taken to save from contamination by such matter the actual meat substance of a tuberculous animal, a great deal of meat from animals affected by tuberculosis may be eaten without risk to the consumer. Ordinary processes of cooking applied to meat which has got contaminated on its surface are probably sufficient to destroy the harmful quality. They would not avail to render wholesome any piece of meat that contained tuberculous matter in its deeper parts. In regard to milk, we are aware of the preference by English people for drinking cows' milk raw—a practice attended by danger on account of possible contamination by pathogenic organisms. The boiling of milk, even for a moment, would probably be sufficient to remove the very dangerous quality of tuberculous milk. We note that your Majesty's gracious commands do not extend to inquiry or report on administrative procedures available for reducing the amount of tuberculous material in the food supplied by animals to man, and we have regarded such questions as being beyond our province."

THE GEOLOGICAL DEVELOPMENT OF AUSTRALIA.

BY the kindness of the Secretary of the Australasian Association for the Advancement of Science, we have been favoured with a complete account of the proceedings of the late meeting at Brisbane. The Hon. A. C. Gregory, C.M.G., the president of the meeting, took as the subject of his address "The Geographical History of the Australian Continent during its successive Phases of Geological Development." The subject afforded Mr. Gregory an opportunity for putting on record the knowledge he has gained from personal inspection of a larger proportion of Australian territory than has been explored by any other investigator. We are glad to be able to give the text of his address.

PRIMARY CONDITION AND FORM OF LAND.

In dealing with the geological history of Australia, it is convenient to refer to the groups of formation, as the scope of this address is insufficient for the separate consideration of the component members of each group which has taken prominent part in the geographical establishment of sea and land. Like all histories of remote events, the evidence of what was the primary condition and form of the land is necessarily of very limited character, but some evidence does remain for our guidance. The earliest indications of the existence of land within the limits of the present Australian continent consists in the fact that many of the more elevated summits are composed of "granite," which is certainly the oldest rock formation with which we are acquainted.

It is here necessary to state that the term granite is used to indicate ancient or continental granite, and that the granitoid rocks, which are so closely allied in lithological aspect as to pass under the same designation, but are really intrusive masses of more recent date, even as late as the Permo-carboniferous period will be termed intrusive granite. Now the higher portions of the granite ranges show no superincumbent strata, while sedimentary beds fold round their flanks in a manner which indicates that the edges of these strata were formed near the margin of an ancient sea, above which the more elevated masses of granite rose as islands. As an instance of this early existence of land, we find on the present east coast that the granite tract of New England is flanked by Devonian slates and marine beds of spirifer limestones in positions which indicate that their deposition was in an ocean of at least 2000 feet in depth, above which the granite mountains rose to an elevation of 2000 feet. Adopting similar evidence as a basis for the estimation of the area of land at this earlier date, it appears that there existed a chain of islands extending from Tasmania northerly along the line of the present great dividing range, between the eastern and western streams nearly to Cape York, a distance of about 2000 miles, and with a breadth seldom exceeding 100 miles. In Western Australia a much broader area of dry land existed in the form of a granite tableland, the western limit of which, commencing at Cape Leeuwin, extended north for 600 miles, with a straight coast-line rising 500 feet to 1000 feet above the ocean. This land had a breadth east and west of about 200 miles, but its eastern shores were comparatively low and irregular, with probably detached insular portions, more especially on the northern side, as the stratified rocks in which the West Australian gold mines are worked have an exceedingly irregular outline where they overlay the granite. Between these eastern islands and the western land, there probably existed some granite peaks which rose above the ocean, but the evidence is that they were not of important area, and principally located in the northern parts. The remainder of the present continent was covered by an ocean gradually increasing in depth from the western land to the central part, and great depth continued to the shores of the eastern islands.

SEDIMENTARY DEPOSITS

The next step in our history is that the natural decomposition of the granite, both terrestrial and marine, supplied material for sedimentary deposits; and we find a series of imperfectly stratified grit rocks, together with schists and slates, the former the results of the deposition of the coarser drifts, and the latter the more gradual deposit of the finer particles. These rocks, which are classed as Laurentian, Cambrian, and Silurian, did not extend far from the eastern islands, and are principally developed in Queensland to the north and in Victoria to the south, but, being of marine formation, they did not then materially affect the geographical configuration, though they are important features of the present time, and are the chief sources of our tin mines; and silver, lead, and copper also exist in sufficient quantity to afford prospect of future industrial success. There is also a marked characteristic in the abundant occurrence of fluor spar, which is an exceedingly rare mineral in the later formations, while gold does not occur in important quantity except in its upper or Silurian strata in Victoria. Near Zilmantown (lat. 17° 20′ S., long. 144° 30′ E.) there are interesting developments of these rocks, which now form steep ranges with flat-bottomed valleys, in which coralline limestone of the Devonian period rests unconformably, and in places rises abruptly several hundred feet, presenting the form of ancient coral reefs, such as now exist on the great Barrier Reefs. In fact, they indicate that at some remote time a passage existed from the east coast to the southern part of the Gulf of Carpentaria, under similar conditions to those of the present Torres Straits, and that the subsequent elevation of the land has now placed it more than 500 feet above sea-level. This description of the present state of these rocks is, however, a digression in regard to geological sequences of the early period.

More Favourable Conditions.

The Cambrian and Silurian period was succeeded by the Devonian, during which there is little evidence of any great variation in the limits of the sea and land, but organic remains show that the conditions were becoming more favourable for the development of marine life. The rocks consist principally of fine-grained slates, which must have been deposited in a deep sea, and in some places the now visible sections indicate a thickness of 10,000 feet.

The upper strata connected with the Devonian series have been classed by geologists as belonging to the Permo-carboniferous, on account of the marine fossils which have been found in the Gympie series of rocks. Some difficulties, however, arise in regard to the identification of Australian rocks with those of Europe on the sole basis of the occurrence of nearly the same species of mollusca, and it may be remarked that in Central North America the appearance of fossil mollusca and plants, which would in Europe indicate a definite horizon, often occurs in rocks which lithologically and stratigraphically are of an earlier date; and the same conditions of the earlier appearance of species and genera seem to obtain in Australia, and if ultimately established would clear away many of the existing difficulties in the comparison of Australian and American fossils with those of Europe. Accepting the classification of the Gympie rocks as Permo-carboniferous, there was no important alteration in the geographical limits during the Devonian period, or in the earlier Permo-carboniferous Gympie beds, but shortly after this there were very decided variations in both the area and altitude of the land. The whole of the present continental area was raised sufficiently to lift large portions of the previous sea-bottom above its surface. The principal elevation was on the eastern coast, where the rise must have been several thousand feet; while on the west it was less pronounced, though the area added to the land appears to have included nearly the whole of what is now Western Australia. And in regard to the intervening space between it and the eastern ranges there is only the negative evidence, of no later marine deposits to indicate that it also was above the ocean. Although the general elevation of the continent appears to have been quiescent in the western and central parts, there were violent disruptions on the eastern coast, and the strata were apparently crushed by a force from the east which lifted them into a series of waves showing the faces of dislocation to the east and strata sloping to the west, the most easterly wave being near the present coast-line, and the succeeding waves more gradual as they recede to the west, both in angle and height, until they merge into the level of Central Australia. It is also probable that the South Australian range was also the result of this compression, causing the strata to rise in abrupt masses on an axis nearly north and south. It was at this stage of disruption and elevation of strata that the more important auriferous deposits of both the eastern and western parts of the continent were formed, and these may be divided into two classes—true fissure veins, or lodes, in which the deposits of ore are found filling fissures in the slate strata, and generally nearly vertical; and floors of ore which occur in sheets dipping at a less angle from the horizontal than the vertical, the including rock being of crystalline character, being, in fact, intrusive granites. The dip of these sheets of ore is in the direction of the huge dykes of intrusive rock in which they occur.

Auriferous Deposits in Lodes.

There was not only great disruption of the strata, but igneous rocks forced themselves into the fissures in the sedimentary beds, and the resulting metamorphism of the adjacent rocks increased the confusion, as beds of slate may be traced through the transformation of their sedimentary character, by the recrystallisation of their component elements into diorites having that peculiar structure of radiating crystals which usually characterise rocks of volcanic origin. As regards the auriferous deposits in these lodes, it appears that first simple fissures were filled with water from the ocean or deep-seated sources; but in either case the powerful electric currents which continually traverse the earth's surface east and west met resistance at the lines of disruption, and electric action being developed, the mineral and metallic salts in the water in the fissure and the adjacent rocks would be decomposed, and the constituents deposited as elements, such as gold and silver, or as compounds, such as quartz, calcspar, and sulphide of iron, all which were in course of deposit at the same time as the angles of the crystals cut into each other. There have been many speculations as to the source from which the gold was derived, but that which best accords with the actual conditions is that the metal exists in very minute quantities in the mass of the adjacent rocks, from which it has been transferred through the agency of electric currents and the solvent action of alkaline chlorides, which dissolve small quantities of the precious metals, and would be subject to decomposition at the places where fissures caused greater resistance to the electric current. One remarkable circumstance is that the character of the rocks forming the sides of the fissures has an evident influence on the richness of the ores in metals where lime, magnesia, or other alkaline compounds, or graphite, enter into their composition; the gold especially is more abundant than where the rocks contain silica and alumina only.

Queensland's Testimony.

In Queensland, Gympie affords some instructive examples of fissure lodes. In some, large masses of rock have fallen into the fissure before the ore was deposited, and have formed what miners term "horses," where the lode splits into two thin sheets to again unite below the fallen mass. The Mount Morgan mine may also be cited as a case where several fissure lodes rise to the surface in close proximity. The ore was originally an auriferous pyrites, but the sulphide of iron was largely decomposed, leaving the gold disseminated through the oxide of iron. In other cases the sulphur and iron have both been dissolved out, and left cellular quartz, with gold in the cavities or as fragments of gold, mixed with minute crystals of quartz, presenting the aspect of kaolin, for which it has been mistaken. The auriferous deposits, which occur in the intrusive granites, appear under conditions differing from the true lodes in sedimentary rocks, as the intrusive granitoid rock forms dykes which fill fissures in the older true granites, and also cut through the sedimentary slates. It bears evidence of intrusion in a state of fusion, or, at least, in plastic condition and subsequently crystallised, after which there has been shrinkage, causing cavities as the sides of the dyke were held in position by the enclosing rock. The vertical shrinkage being greater than the horizontal, the cavities were nearer the horizontal than the vertical, and being afterwards filled with ore, formed what are called "floors," one characteristic of which is the tendency to lenticular form, or a central maximum thickness with thinner edges. The Charters Towers goldfield exhibits a good illustration of this class of auriferous intrusive granite. Here the intrusive granite appears as a dyke of great thickness, exceeding a mile, with a length of twenty miles; the rock is well-crystallised quartz and felspar, with very little mica or hornblende. One shaft has been sunk 2000 feet to a floor showing gold, and similar to the floors that outcrop on the surface. The dip of these floors is north, about 30 degrees from the horizontal, and the strike across the direction of the dyke. There are, however, no good natural cross-sections, as the watercourses are small, so that the length and breadth have to be estimated to some extent by the character of the soil derived from the decomposed rock, it being more fertile than that of the other rocks in the locality. The exploratory shafts which have been sunk are in positions selected for the purpose of reaching known sheets of ore at greater depth, or under the impression that the ore deposits were true fissure lodes, and would have extension in the direction of the discovered outcrops, and therefore not calculated to extend our knowledge of the auriferous deposits. The most instructive instance of the occurrence of auriferous intrusive granite exists in the valley of the Brisbane River, near Eskdale, where a granitoid dyke, fifty yards wide, cuts through a slate hill for a distance of three miles, and in places shows thin sheets of quartz containing gold; the strike is at right angles to the length of the dyke, and the dip is 30 degrees. Some of the quartz sheets have been traced across the dyke to within an inch of the slate which encloses it, but there is no trace of any variation in the sedimentary slate opposite the end of the quartz. A small watercourse cuts through the dyke and exposes arsenical pyrites and iron oxide, with small particles of gold. A more accessible instance of intrusive granite is exposed in the cutting for the bywash of the Brisbane Waterworks, at Enoggera, where the igneous rock has intruded between the strata of the slate.

Permo-carboniferous Rocks.

From the middle to the close of the Permo-carboniferous period the dry land teemed with vegetation, of which the Lepidodendron was a conspicuous type, along the eastern division, for though this plant was most abundant in Queensland, it is also found in Victoria, and on the Philips River, in West Australia, where the later Permo-carboniferous rocks are found on the south coast, extending from Albany eastward to Israelite Bay, forming the Stirling Range, with an elevation of 3000 feet, the Mounts Barren, and Russell Range. The age of these rocks is determined by the occurrence of large fragments of carbonised vegetation, the aspect of which closely resemble Lepidodendron stems. This formation is limited to the coast district, as, at a distance of fifty miles inland, the granitic plateau is reached with its partial colouring of Devonian slates. On the northern coast the Permo-carboniferous rocks are developed in the valley of the Victoria River for a hundred miles from the sea. Also on the Kimberley goldfield, to the south-west of Victoria.

Geographical Features.

The geographical features of this period appear to have been a continent somewhat similar in form to that of the present Australia. There was an elevated range along the east coast which attracted moisture, and a climate favourable to vegetation, and also by rapid degradation of its rocks supplied suitable soil for tropical growth. The central interior was not favoured by such a climate, and there are few traces of either deposit or denudation. The western interior enjoyed a moderate rainfall, and the detritus was carried down towards the north and south coasts, where it was deposited in regions where the carboniferous flora flourished, though not to the same degree as in East Australia, where it laid the foundation of the great coalfields of New South Wales and Queensland.

Further Elevation of Continent.

About the end of the Palæozoic or the commencement of the Mesozoic periods there appears to have been a further elevation of the continent, especially in the eastern part, for though in many places the deposits of the strata show little interruption, in others there has been considerable disturbance and unconformity of succession, with indications of an increase in the elevation of the land, which, with a contingent increase of rainfall, accounts for the luxuriant growth of the carbonaceous flora and its extension much further to the west. The artesian bores which have been made show that the cretaceous beds rest on the carbonaceous at a depth of 2000 feet below the present ocean level, and the fresh-water beds of the coal series are not less than 3000 feet in thickness, showing that the terrestrial level of the mountains has been decreased 5000 feet, or, in other words, they were 5000 feet higher during the Mesozoic period. On the western coast the elevation is not so well defined, but the land was at a greater height above the ocean than at present, as fragments of coal and its accompanying minerals have been washed up from the deep sea, and may be found embedded in the Tertiary limestones of the coast. There is thus proof that on the west coast the land extended further, and was covered with Australian fresh-water flora of the coal period; but this area is now submerged, and, taking into consideration the great depth of the ocean on this coast, the height of the land must have exceeded its present level by a thousand feet. Examining the ocean depths around the present Australian coast, even 5000 feet would make little difference in the limits of the west, south, and south-west shores; but on the north and east the land would extend to the Great Barrier Reef. Papua would have been annexed, and even the Arafura Sea and Island of Timor might have been brought within the limits of *Terra Australis*.

Vegetation of Australia.

The mountain ranges of the east coast would be connected with those of Papua and form a magnificent series of summits of 10,000 feet elevation, a configuration that must have arrested the moisture from the Pacific Ocean, and resulted in a moist tropical climate, well calculated to support the luxuriant growth of the vegetation of the coal period so far as East Australia was affected, though it might also have had the effect of rendering the climate of Central and West Australia so dry as to render the land a desert during the continuance of this carbonaceous period. East Australia has thus, on its lower levels, accumulated stores of fuel for use in ages long subsequent. The luxuriant vegetation necessary to the production of coal was limited to the area east of the 140th meridian, except in a portion of South Australia, which seems to have been favoured by the overflow of some large rivers draining the western slopes of the Great Range, and had their outlet through Spencer's Gulf. The vegetation of Australia at this period, however well adapted for the formation of coal deposits, was not such as in the present would be suitable for the maintenance of mammalian life, as it consisted of ferns, cycadea, palms, and pine-trees, of which only the *Araucaria Bidwillii* has left a living representative, and its silicified wood from the coal formation presents exactly the same structure as the tree now growing on the ranges. Australian geography underwent little change during the Mesozoic period, but at the commencement of the Cretaceous a general subsidence of the whole continent began. The coal deposits ceased, and a fresh-water deposit known as the Rolling Downs formation accumulated, the constituents being soft shales, which in the earlier period supported a growth of ferns and pine timber. The land continued to subside until the ocean invaded a large portion of the lower lands, but only as a shallow sea, or possibly in the form of estuaries, as the fresh-water vegetation appears intercalated with marine limestones containing Ammonites and other mollusca of the Cretaceous epoch.

The Cretaceous Period.

The depression during the Cretaceous period must have been gradual and of long continuance. The ocean apparently first covered the land near the Great Australian Bight on the south, and Arnheim's Land on the north, as in each of these localities there are extensive deposits of thick bedded limestones, which may have continuity across the continent under cover of the ferruginous sandstones of the latter part of the epoch. On the east coast the ocean rose from 100 feet to 200 feet above its present level in Queensland, as the margin of the Cretaceous rocks is visible close to South Brisbane, and there is a belt along the coast from Point Danger to Gladstone. Further north there are extensive patches of Desert Sandstone belonging to this period, though the designation seems to have been applied to two distinct beds of sandstone, one belonging to the close of the Mesozoic, and the other to the last part of the Cretaceous.

Great Depression and Eruptions.

Ultimately the dry land was reduced to the eastern ranges from Cape Howe northerly to lat. 15°; the eastern side nearly the same as the present coast-line, and extending from 100 to 300 miles westerly, while the Mount Lofty Range in South Australia existed as an island. This great depression was accompanied by dislocations of strata and also the eruption of porphyritic masses, the age of these eruptions being easily determined as they rest on the Ipswich coal strata. At Mount Flinders the base of the mountain consists of coal shales with abundant impressions of *Pecopteris*, while there is a more instructive instance near Teviot Brook, where in a deep ravine there is a dyke of porphyry cutting through a bed of carbonaceous shale with *Pecopteris* and the silicified stems of pine-trees embedded. The dyke itself is dark-coloured and highly crystalline, but where it spreads out into a flat sheet on the top of the hill it assumes the same appearance as the light-coloured porphyry of Brisbane. This porphyry forms the Glass-house Mountains, which are so conspicuous from the entrance of Moreton Bay, and also Mounts Warning, Leslie, Maroon, and Barney.

The central and western parts of the continent were almost entirely submerged in the ocean, but not to any great depth, as the higher granite peaks of the north-west do not show traces of submergence, though the sedimentary deposits approach closely to their bases. The Stirling and Mount Barren Ranges on the south coast were only partially covered, as there is an ancient sea beach on the south side of middle Mount Barren, about 300 feet above the present sea-level. The interior tableland, though now of greater altitude than Mount Barren, was submerged, as evidenced by the extension over the whole of the rest of West Australia of soft sandstones and claystones in which salt and gypsum are of common occurrence. On the northern coast the submergence was greater, as the sandstones and shales have a thickness of more than a thousand feet.

The Cretaceous Deposits.

One characteristic of the later part of the Cretaceous deposits is that in the lower part they consist chiefly of white, blue, and pale red shales, which readily disintegrate, while the upper portion consists of variegated sandstones of a harder character, with a comparatively thin covering of ferruginous concretionary pebbles or nodules, often with a nucleus of organic origin. On the west coast (latitude 29°), on Moresby's Flat-topped Range, these features are well developed, and in the upper part a bed of limestone, containing Ammonites and other mollusca of the Cretaceous series. And it was from this locality that the first proofs of the existence of the Cretaceous formation in Australia were furnished to Prof. M'Coy. Closely associated with these limestones are ferruginous sandstones, containing casts of large accumulations of fragments of wood and vegetable débris, such as may be found after floods on the margins of rivers, indicating an estuarine system, where fresh and salt water alternated.

Australia an Island.

The Mesozoic period closed with Australia reduced to the area of a large island on the east coast and some small islands on the south-west and north-west of the present continent, and then the connection with Papua was severed

A New Elevation.

Early in the Tertiary period a new elevation of the land commenced, but the rise was not attended by any great disturbance of the strata, as in almost every instance where the Upper Cretaceous rocks remain they are remarkable for their horizontal position. The elevation of the continent on this occasion was nearly equal in all parts; the ultimate altitude was at least 500 feet greater than at present, and the geographical effect was that Australia assumed nearly its present limits.

Features of the Continent.

The features of the continent at this time appear as high ranges on the east coast and a nearly level tableland extending to the west coast, but the whole of the interior with a general incline towards Spencer's Gulf. Short watercourses flowed direct to the sea, but far the greater area was drained by much longer streams towards Spencer's Gulf, while a secondary series occupied the basin of the Murray and Darling Rivers. The climate evidently differed greatly from that now existent, as the denudations of the tableland removed tracts of country many hundreds of square miles, each forming immense valleys bounded by flat-topped hills and ranges representing the marginal remnants of the original surface. Enormous quantities of the finer-grained portions of the degraded shales must have been swept into the ocean by the rivers, but the coarser sands have been left in what is now the desert interior, where the wind drifts it into long steep ridges of bright red sand, having a northerly direction near the south coast, but spreading out like a fan to the east and west in the northern interior.

Valleys and River Systems.

The interior rivers formed a grand feature of the country so long as the rainfall continued sufficiently copious to maintain their flow, but in the arid climate which now obtains it does not even compensate for the evaporation. The river channels have been nearly obliterated, and some parts of the wider valleys changed to salt marshes or lakes, such as Lakes Amadeus and Torrens, while the entrance to Spencer's Gulf is choked with sand. It was during this period when the great valleys of the river systems were being excavated that a great proportion of the outbursts of volcanic rock in the form of basalt occurred. The age of these basalts is established by their superposition on cretaceous rocks. Thus, at Roma, the Grafton Range is a mass of basalt, resting on the cretaceous sandstones and shales. Mount Bindango is a similar instance. On the Upper Warrego there is a deep ravine through cretaceous rocks partly undermining a basaltic cone. On the Victoria River a large basin has been eroded in the cretaceous rocks and then several hundred square miles flooded by an eruption of basalt, through which watercourses have cut instructive sections, showing the subordinate sandstones baked and fused by contact and the cracks filled by the covering basalt.

It does not appear that the eruption of basalt has materially affected the geographical outline of the coast, but there were considerable variations of level and important tracts of fertile country formed by the basaltic detritus, such as Peak Downs and Darling Downs in Queensland, and to the west of Melbourne in the south.

Large Animal Period.

It was not till after the convulsions which attended this outflow of basalt, and lakes, marshes, and rivers had been formed, and produced a luxuriant growth of vegetation, that the gigantic marsupials gave any decisive evidence of their advent, as their fossil remains are found in the drifts of watercourses mixed with basaltic pebbles and detritus. The physical conditions of the country during the period of the Diprotodon, Nototherium, and associated fauna, differed materially from that which now subsists, for the structure of the larger quadrupeds would render them incapable of obtaining a subsistence from the short herbage now existing in the same localities, and it is evident that their food was of a large succulent growth, such as is found only in moist climates and marshy land or lake margins. This view is also supported by the fact that on the Darling Downs and Peak Downs the associated fossils include crocodile and turtle, so that what are now open grassy plains must have been lakes or swamps, into which the streams from the adjacent basaltic hills flowed, and, gradually filling the hollows with detritus, formed level plains.

Enormous Rainfalls.

That this gradual filling up of lakes actually occurred is shown by the beds of drift which are found in sinking wells and in sections exposed by erosion of watercourses; but in all these instances there is evidence that the ancient rainfall was excessive, as even our present wettest seasons are inadequate to the removal of the quantities of drift which have been the result of a single flood in the ancient period. On the ridges around the lakes there existed a forest growth, as many species of opossum have left their bones as evidence; but the timber evidently differed from the present scanty growth of eucalypti. Whether the same abundant rainfall extended far into the western interior is uncertain, but the rivers evidently maintained a luxuriant vegetation adapted to the sustenance of these gigantic animals, as the discovery of a nearly complete skeleton of Diprotodon on the shore of Lake Mulligan, in South Australia, shows that these animals lived in this locality, as it is not probable that their bodies could have floated down the Great River which drained the interior of the continent through Lake Eyre.

Another Change.

It is evident that the climate gradually became drier, that the rivers nearly ceased their flow, and the lakes and marshes became dry land, while the vegetation was reduced to short grasses that no longer sufficed for the subsistence of the huge Diprotodon and gigantic kangaroo, though some of the smaller may still survive to keep company with the dingo, who, while he left the impressions of his teeth in the bones of the Diprotodon, has shown a greater facility for adapting himself to altered conditions. Is this the survival of the fittest? It was in these days that some of the rivers flowing direct to the coast cut through the sandstones into the softer shales beneath, and by their erosion formed considerable valleys bounded by rocky cliffs, and when the land was subsequently depressed the sea flowed in and formed inlets, of which Sydney Harbour and the entrance to the Hawkesbury River on the east coast, Port Darwin and Cambridge Gulf on the north-west, and the Pallinup River on the south-west of the continent may be cited as examples.

Conclusion.

Thus Australia, after its first appearance in the form of a group of small lands on the east, and a larger island on the west, was raised at the close of the Palæozoic period into a continent of at least double its present area, including Papua, and with a mountain range of great altitude. In the Mesozoic times, after a grand growth of vegetation which formed its coal beds, it was destined to be almost entirely submerged in the Cretaceous sea, but was again resuscitated in the Tertiary period with the geographical form it now presents. Thus its climate at the time of this last elevation maintained a magnificent system of rivers, which drained the interior into Spencer's Gulf, but the gradual decrease in rainfall has dried up these watercourses, and their channels have been nearly obliterated, and the country changed from one of great fertility to a comparatively desert interior which can only be partially reclaimed by the deep boring of artesian walls.