Victorian Year-Book, 1924-25.

INTRODUCTION.

GEOGRAPHICAL POSITION, AREA, AND CLIMATE.

Area of Victoria.

Victoria is situated at the south-eastern extremity of the Australian continent, of which it occupies about a thirty-fourth part, and it contains about 87,884 square miles, or 56,245,760 acres. It is bounded on the north and north-east by New South Wales, from which it is separated by the River Murray, and by a straight line running in a south-easterly direction from a place near the head-waters of that stream, called The Springs, on Forest Hill, to Cape Howe. On the west it is bounded by South Australia, the dividing line being about 242 geographical miles in length, approximating to the position of the 141st meridian of east longitude, and extending from the River Murray to the sea. On the south and south-east its shores are washed by the Southern Ocean, Bass Strait, and the Pacific Ocean. It lies between the 34th and 39th parallels of south latitude and the 141st and 150th meridians of east longitude. Its extreme length from east to west is about 420, its greatest breadth about 250, and its extent of coast-line nearly 600 geographical miles. Great Britain, exclusive of the islands in the British Seas, contains 88,756 square miles, and is therefore slightly larger than Victoria.

The southernmost point in Victoria, and in the whole of the Australian continent, is Wilson's Promontory, which lies in latitude 39 deg. 8 min. S., longitude 146 deg. 26 min. E.; the northernmost point is the place where the western boundary of the State meets the Murray, latitude 34 deg. 2 min. S., longitude 140 deg. 58 min. E.; the point furthest east is Cape Howe, situated in latitude 37 deg. 31 min. S., longitude 149 deg. 59 min. E.; the most westerly point is the line of the whole western frontier, which, according to the latest correction, lies upon the meridian 140 deg. 58 min. E., and extends from latitude 34 deg. 2 min. S. to latitude 38 deg. 4 min. S., a distance of 242 geographical miles.

Climate.

From its geographical position, Victoria enjoys a climate more suitable to the European constitution than any other State upon the Continent of Australia. In the sixty-nine years ended with 1924 the maximum temperature in the shade recorded at the Melbourne Observatory and the Weather Bureau was 111·2 deg. Fahr., on the 14th January, 1862; the minimum was 27 deg., on the 21st July, 1869; and the mean was 58·4 deg. Upon the average, on only four days during the year does the thermometer rise above 100 deg. in the shade, and on 19·5 days the temperature reaches 90 deg. or over; generally, on about two nights during the year it falls below freezing point. Sultry nights are of rare occurrence. It is only

occasionally that a high minimum is recorded. The minimum reading approximates to 70 deg. on an average on only two nights in any one year. The maximum temperature in the sun ever recorded (*i.e.*, since 1859) was 178·5 deg., on the 14th January, 1862. The mean atmospheric pressure noted, first at the Observatory 91 feet above the sea level, and later at the Weather Bureau 115 feet above sea level, was, during the sixty-seven years ended with 1924, 30·012 inches; the average number of days on which rain fell each year was 137, and the average yearly rainfall was 25·78 inches. The mean relative humidity of the atmosphere is 68 per cent.; on very warm days it is often 12 per cent., and it has been as low as 2 per cent. The severity of the heat is not felt so much as it would be if there were a relatively high wet bulb, as the temperature by such bulb seldom exceeds 75 deg. The average number of hours of sunshine daily is 6·2, and fogs occur, on an average, on only 19 days in the year.

MOUNTAINS AND HILLS, RIVERS AND LAKES.

Mountains and Hills.

The highest mountain in Victoria is Mount Bogong,* situated in the county of the same name, 6,509 feet above the sea-level; the next highest peaks are—Mount Feathertop, 6,306 feet; Mount Nelson, 6,170 feet; Mount Fainter, 6,160 feet; Mount Hotham, 6,100 feet; Mount McKay, 6,030 feet; and Mount Cope, 6,027 feet; all situated in the same county; also the Cobboras, 6,030 feet, situated between the counties of Benambra and Tambo. These, so far as is known, are the only peaks which exceed 6,000 feet in height; but, according to a list which appears in the *Year-Book* for 1915-16, there are 39 peaks between 5,000 and 6,000 feet high, and 40 between 4,000 and 5,000 feet high; it is known, moreover, that there are many peaks rising to upwards of 4,000 feet above the level of the sea whose actual heights have not yet been determined.

Rivers.

With the exception of the Yarra, on the banks of which the metropolis is situated; the Murray; the Goulburn, which empties itself into the Murray about eight miles to the eastward of Echuca; and the La Trobe and the Mitchell, with, perhaps, a few other of the Gippsland streams, the rivers of Victoria are not navigable except by boats. They, however, drain the watershed of large areas of country, and many of the streams are used as feeders to permanent reservoirs for irrigation and water supply purposes. The Murray, which forms the northern boundary of the State, is the largest river in Australia. Its total length is 1,520 miles, for 1,200 of which it flows along the Victorian border. Several of the rivers in the north-western portion of the State have no outlet, but are gradually lost in the absorbent tertiary flat country through which they pass.

* The highest mountain on the Australian Continent is Mount Kosciusko, in New South Wales, one peak of which is 7,328 feet high.

Lakes. Victoria contains numerous salt and fresh-water lakes and lagoons; but many of these are nothing more than swamps during dry seasons. Some of them are craters of extinct volcanoes. Lake Corangamite, the largest inland lake in Victoria, covers 90 square miles, and is quite salt, notwithstanding that it receives the flood waters of several fresh-water streams. It has no visible outlet. Lake Colac, only a few miles distant from Lake Corangamite, is a beautiful sheet of water, 10½ square miles in extent, and quite fresh. Lake Burrumbeet is also a fine sheet of fresh water, embracing 8 square miles. The Gippsland lakes—Victoria, King, and Reeve—are situated close to the coast, and are separated from the sea by only a narrow belt of sand. Lake Wellington, the largest of the Gippsland lakes, lies to the westward of Lakes Victoria and King, and is united to the first-named by a narrow channel. South-east of Geelong is Lake Connewarre, which is connected with the sea at Point Flinders.

A list of mountains and hills, rivers and lakes in Victoria appears in the *Victorian Year-Book* for 1915–16. This was revised by the late Surveyor-General, Mr. A. B. Lang, and contains information in regard to heights, lengths, and areas respectively.

PHYSICAL GEOGRAPHY AND GEOLOGY OF VICTORIA.

By W. Baragwanath, Esq., Director of Victorian Geological Survey.

PHYSICAL GEOGRAPHY.

Roughly triangular in outline, with the 141st meridian for a base and Cape Howe for the apex, and the sides formed on the north by the Murray River and on the south by the waters of the Southern Ocean, the State of Victoria occupies the most southerly portion of the Continent of Australia. Its area is approximately 88,000 square miles, and presents a diversity of topographical and geological features, which compares favorably with that of the larger States.

Medially dividing the State in an east-west direction is the main watershed which separates the streams flowing north to the Murray from those flowing south towards the ocean. A north and south meridian line from Melbourne at the head of Port Phillip Bay reaches the Murray River near Echuca at the narrowest part of the State, which it subdivides into two areas differing widely in physiographical as well as geological features. Eastwards of this line the area of greatest mean altitude occurs with a well-marked "divide" or watershed line, while westwards the mean elevation is considerably lower and the water-partings often ill-defined, especially where they occupy plateau-like areas. The Lower Ordovician strata, containing the principal gold-fields of the State, occupy three-fourths of the area of exposed rocks westwards of the meridian of Melbourne; eastwards similar strata are only known at a few small and isolated localities.

The older volcanic rocks of early tertiary age are more developed in the eastern part of the State, and the underlying and overlying lignitic beds which form extensive deposits eastward of Melbourne are little represented in the western half of the State. The newer volcanic rocks, while conspicuous in the western portion of the State, are but little in evidence in the eastern part.

The main physiographical features are—

(1) Central highlands—
  (*a*) The eastern highlands ;
  (*b*) The western uplands.
(2) Southern highlands—
  (*a*) The South Gippsland ranges ;
  (*b*) The Otway ranges.
(3) Great Valley—
  (*a*) The Gippsland Valley ;
  (*b*) The Corangamite Valley.
(4) Murray Valley—
  North-western plains and the Mallee.

The central highlands form the main divide, and the southern highlands are parallel to and 50 to 100 miles distant from it. Between these parallel ridges is the great valley of Victoria ; it extends westward from the Gippsland Lakes, and is, with the exception of a volcanic barrier near Warragul separating the waters of the Carrum and Moe Swamps, traceable to Port Phillip Bay. Westward of Port Phillip Bay the extension of this valley, filled in part with Newer Volcanic rocks and recent sediments, embraces Lake Corangamite, the largest in the State, and numerous small lakes. The northern edge of the great valley passes on south of the Grampians and the Sierra Range to the western boundary of the State.

On the northern side of the main watershed line, the southern edge of an extensive plain, embracing the whole of the north-western portion of the State, leaves the Murray River about 60 miles eastward of the meridian of Melbourne, and follows a general south-westerly course towards the western boundary of the State to a point about 90 miles from the coast.

The Gippsland Valley ranges from 50 to 450 feet, the Corangamite Valley from 300 to 450 feet, and the Mallee Plains from 200 to 450 feet ; but, though all three are at about the same level, they differ considerably in geological features. The Gippsland Valley consists of recent deposits of fluviatile, lacustrine, or estuarine origin ; the Corangamite basin, almost entirely of lava flows with depressions along the margins of or between the coalescing lava streams and the Mallee Plains of sandy ridges of fluviatile or wind-blown origin.

The highlands of the eastern portion of the State are mainly sedimentary and igneous rocks of Ordovician, Silurian, and Devonian age, now forming "razor-back" ridges, at times 2,000 feet above the

neighbouring rivers. The main river valleys are of considerable width, and extend to within a comparatively short distance of the main divide. Following the north and south course of the streams, parallel ridges, due to a combination of folding, faulting, igneous intrusion, and unequal weathering, are well developed.

Evidence of peneplanation at several altitudes is pronounced. Plateaux are of small extent, and owe their preservation to a covering of harder rocks, such as the Dargo High Plains, or to areas where the catchment for denudation is relatively small, as at the Baw Baw Plateau and the Snowy Plains, between the Wonnangatta and the Macallister rivers.

The general altitude of the eastern highlands ranges from 4,000 feet to over 6,000 feet, prominent peaks being Bogong (6,509 feet), Feathertop (6,306 feet), and Hotham (6,100 feet). The Mount Baw Baw granite area, the highest isolated plateau south of the main divide, is 30 square miles in area, and has a mean altitude of 4,500 feet, its highest point being 5,130 feet. The Snowy Plains, consisting of Upper Devonian or Carboniferous flat-bedded rocks, has a general altitude of over 4,000 feet, and connects Mount Wellington to the main divide.

Along the main divide, in the eastern part of the State, several low gaps or "saddles" occur, and of these the Omeo gap south-east of Omeo (elevation 2,400 feet); east of Mount Selma between the heads of the Goulburn and Barkly Rivers (elevation 3,100 feet); east of Mount Matlock between the Red Jacket Creek and the Goulburn (elevation 3,500 feet); and the Narbethong saddle between the Acheron and Watts River (elevation 1,500 feet), are the most important.

The western uplands show the same pronounced meridional arrangement of branch spurs, but, with the exception of the Grampians area, the great difference of altitude between the rivers and the spurs does not exist as in the eastern part of the State. The rocks are chiefly of Older Palæozoic age, in part metamorphosed, and occasional Newer volcanic cappings occurring as defined hills and broad plateaux. On the main divide "saddles" occur at relatively low altitudes. The saddle near Kilmore, through which the Melbourne–Sydney railway line passes, is 1,115 feet above sea, and north-west of Ballarat the divide has an altitude of 1,500 feet. Between these two points the watershed line attains an altitude of 3,000 feet. At 5 miles north of Buangor, the divide between the head waters of the Wimmera and the Fiery Creek, a tributary of the Hopkins, has an altitude of 1,200 feet; eastward and westward of this saddle an altitude of 3,150 feet is attained. Westward of Ararat, on the eastern edge of the Grampians which attain an altitude of nearly 4,000 feet, the watershed between the heads of the western branch of the Hopkins and the Mount William Creek is only 950 feet above sea. West of Mount William, the watershed between Fyan's Creek and the head of the Wannon, the altitude is under 1,400 feet, while further westwards in the Victoria Valley the divide between

the Glenelg and Wimmera rivers is 700 feet above sea. Further west the Black Range rises to over 1,000 feet, and beyond this no watershed is recognized, and the land consists of a low-lying area occupied by numerous lakes with no river system till the boundary of South Australia is reached.

The South Gippsland and the Otway Ranges are composed of rocks of Mesozoic age, and the watersheds show no defined or regular arrangement, steep slopes, narrow ridges, and V-shaped valleys prevailing. In the former area, which comprises two nearly-parallel ridges, an altitude of 1,500 feet is reached along the northern edge, where fault action is evident, within 3 miles of the Gippsland Valley. A general altitude of nearly 2,000 feet is maintained for a length of 30 miles along the main crests of this range. In the latter area similar conditions prevail; there is no regular stream system, and a coastal range 10 to 15 miles from and parallel to the sea-shore shows steep slopes and elevations of nearly 2,000 feet.

Wilson's Promontory, an isolated granite massif with peaks of 2,400 feet, forms the most southerly point of the State. It is connected to the mainland by sand-dunes slightly above sea-level. Between Wilson's Promontory and Tasmania is a submerged ridge only 200 feet below sea-level.

The Victorian lakes have been formed by (1) faulting or crust movements; (2) damming of watercourses by lava flows or the coalescing of lava streams; and (3) marine action. Lake Omeo and Lake Karng, near Mount Wellington, fall outside this category; the origin of the former is uncertain, but the latter has been ascribed to a landslip blocking a mountain stream.

Included within the lakes due to faulting is the typical crater lake of Tower Hill, near Koroit, and many of the Western District lakes appear to occupy sunken areas on the lava flows.

Lakes Burrumbeet, Corangamite, and others were formed by coalescing lava flows.

By tidal action a barrier of sand was thrown up, behind which the Gippsland Lakes developed; they were originally larger, but siltation by river-borne material is in progress. Lakes now infilled occur as swamps scattered over the State, and were revealed in numerous places during the working of the alluvial leads or buried river systems.

GEOLOGICAL HISTORY.

The oldest fossiliferous strata comprise a series of volcanic tuffs and contemporaneous sediments. These are supposed to have been folded to form troughs, in which thousands of feet in thickness of Ordovician and Silurian strata were deposited. The occasional conglomerates and grit beds represent fluctuations of the conditions of deposition; volcanic tuffs occur in the Silurian beds, and at the close of this period the intrusion of granitic rocks, contemporaneous with a general meridional series of main folds, took place.

A lengthy period of denudation followed; the exposed outcrops were worn to a general level prior to the extensive volcanic outpourings of the Devonian period, represented by the Snowy River porphyries in the valley of the Snowy and Macallister, which appear to have occurred in valleys or depressed areas, and by the dacites of Dandenong and Macedon. That part of the surface which, prior to the volcanic activity, was a land area, is seen in the north-eastern portion of the State, where a defined river bed occurs beneath a layer of porphyry.

Following the porphyry and dacite outpourings, layers of conglomerate, often hundreds of feet in thickness, were accumulated. No direct evidence of glacial origin of these is yet available, but this has been suggested. Later deposits of limestone in shallow seas took place, and these were followed by alternating layers of conglomerate, sandstones, and shales, and in part volcanic flows (melaphyres) in the eastern part of the State, while sandstones and shales alone were deposited to form the present Grampian Range.

There is evidence of warping and faulting subsequent to deposition. The folding was on broad lines, the Grampian–Dundas beds forming portion of a broad syncline, while the Avon River–Mansfield series has a general northerly dip; the fossils in the deeper beds of the series as exposed on the Avon River and Iguana Creek have a Devonian aspect, while those of the upper beds near Mansfield have a Carboniferous aspect. The Grampian sandstones are of Carboniferous age.

Climatic changes followed the close of this period, and glacial conglomerates, sandstone, pebbly mudstone, and tillite of Permo-Carboniferous age were deposited. More genial conditions intervened with several successive glacial periods in the accumulation of a few hundred feet of strata, which probably covered much of the western portion of the State. Through subsequent denudation they now only exist in scattered areas, and as remnants faulted against older rocks. These fault movements provided general depressions, in which the thousands of feet of fresh-water felspathic sandstones and mudstones with coal seams accumulated, now forming the Jurassic coal measures of Gippsland, Otway, Casterton, and probably near Wangaratta.

Extensive faulting in the early part of the Tertiary period resulted in a partial elevation of the Jurassic series and a depression of an area to the north and south of it.

At this period portion of the central highlands was in all probability a land surface, and the deep leads of Dargo High Plains were probably contemporaneous with the period of early Tertiary faulting. The early Tertiary period was marked by the deposition of marine Oligocene beds in the western part of the State, and by the accumulation of brown coal beds and marine strata at Altona, and the sub-basaltic lignites in parts of Gippsland.

Volcanic action (the Older Volcanic of the geological survey) took place during this period, as is indicated by the alternating marine beds and basalt flows near Maude.

Elevation and depression of the surface, subsequent to the Older Volcanic period, has resulted in the marine beds being elevated to a considerable altitude in some places, and in others depressed to a depth only ascertainable by boring. In Gippsland the Older Volcanic rocks, although originally resting on a gentle sloping surface, are now seen to be inclined almost vertically in the vicinity of fault lines, and within short distances they have been found at a depth of several hundreds of feet below the level of the original outcrop.

In these depressions, sand, clay, and extensive lignite deposits accumulated in Gippsland and elsewhere. In the Western District the newer volcanic outpourings took place and sealed up the old river systems which contained the alluvial gold deposits.

Faulting, subsequent to the deposition of the lignitic beds and the newer volcanic flows, is revealed by bore sections and mine workings, but the general configuration of the surface has been chiefly affected by the accumulation or removal of superficial deposits.

Founded on sound lines by Dr. A. R. C. Selwyn in 1856, the Victorian Geological Survey has carried out mapping and investigations continuously, except for a few months some 50 years ago. The main geological features of the State have now been mapped out and some areas examined in detail, much assistance having been given by geologists and scientific workers outside the survey. Much still remains to be done, and may complex problems, which depend upon a detailing examination both in the field and in the laboratory, await solution.

The stratigraphical succession of the geological formations is—

Cambrian.—An area of regionally metamorphosed rocks, consisting of quartzites, chloritic, talcose, and micaceous schists, and gneisses, in the valley of the Glenelg and Wannon rivers may be of this age or older, but there is no definite evidence available. At Heathcote a series of sedimentary and igneous rocks occur, and much controversy has arisen as to the age and stratigraphical relation of this Heathcotian series. Certain trilobite-bearing beds have been considered Upper Cambrian, and associated with these beds are cherts and diabases, the latter an altered volcanic tuff, not an intrusive rock. The cherts also are more or less silicified tuffs as evidenced by their contained radiolaria. Interstratified with the cherts there are shales containing graptolites of Lower Ordovician aspect.

At Mansfield an acutely-folded series of sandstones, slates, cherts, and phosphate beds have yielded fossils, now proved to be of Upper Cambrian age by Mr. F. Chapman ; brachiopods (Salterella), crustaceans, and radiolaria occur in the beds. Graptolites of Lower Ordovician type occur with the crustaceans and Salterella.

Near Mount Wellington certain beds in the vicinity of the serpentine area have been identified as Upper Cambrian, Similar lithological associations exist as at Heathcote and near Mansfield. The serpentine of this area is referable to pre-Upper Ordovician age, and may be Cambrian.

Scattered throughout the State there are areas of cherts and diabases regarded on lithological evidence as of similar age, but fossil evidence has not yet been obtained in support of this contention.

In the Howqua Valley, cherts, jaspers, and diabases are associated with Upper Ordovician strata.

From the Heathcotian rocks the alluvial gold of McIvor Creek had its origin. Magnesite, steatite, copper, and manganese occur at Heathcote; corundum, limestone, and chrome iron at Mount Wellington and Heathcote; phosphates of aluminium and calcium near Mansfield and in the Howqua Valley.

Ordovician.—The rocks of this series are chiefly grits, sandstones, and slates. Conglomerates are rare, and limestone occurs in beds only a few inches in thickness. The beds have been intensely folded and in places metamorphosed. Two types of metamorphism, regional and contact, are evident. The former type is widespread. Much of the north-eastern portion of the State is occupied by rocks of this age and character, comprising every gradation from micaceous schists to gneiss and gneissose granite.

At Stawell the metamorphic strata are gneissose, chloritic and graphitic schists, hornblendic gneiss, quartzite, and occasionally thin beds of marble.

The latter type is local, and is confined to areas surrounding intrusive igneous masses.

On fossil evidence the Ordovician strata are subdivided into a lower and an upper series. The Lower Ordovician rocks are confined, with the exception of areas on the Mornington Peninsula, Boolarra, Knockwood, and Loyola, near Mansfield, to the area west of the meridian of Melbourne. These beds have been subdivided into four zones characterized by typical fossils, and are named after the type localities where they were first examined, e.g., Lancefield, Bendigo, Castlemaine, and Darriwill. The chief gold-fields in the western portion of the State occur in the three lower zones. Detailed palaeontological surveys by R. A. Keble have resulted in the Bendigo and Castlemaine zones being divided into sub-zones at Bendigo and in part also at Daylesford.

The Lancefield zones is characterized by gold occurrence of the Indicator class, a feature present at Dunolly, Tarnagulla, Inglewood, Maryborough, Elaine, and, though fossil evidence is wanting, probably at Ballarat.

The Bendigo zone has quartz lodes either bedded as saddle formations or occurring as fissure lodes; these are well developed on the Bendigo, Spring Gully, Castlemaine, Daylesford, and Steiglitz gold-fields. The Bendigo zone has also been identified at Mornington.

The Castlemaine zone, more especially in its lower portions, is noted for rich spurry quartz formations, from which the rich alluvial gold of the Chewton and Fryerstown gold-fields was derived.

The Darriwill zone has not yet been proved in the auriferous areas of the State, but to the east of Bendigo this zone has recently been noted in close proximity to auriferous country.

The Upper Ordovician series occur as meridional belts in the eastern part of the State, outcropping on anticlinal domes, such as exist at Mount Matlock; on the Black River, 12 miles east of Wood's Point; at Phosphate Hill, near Mansfield, resting on Upper Cambrian; Dolodrook River, Mount Wellington; Sandy Creek, west of Bullumwaal; the Upper Murray, through the county of Benambra; and Nowa Nowa.

An area of Upper Ordovician extends through the central portion of Mornington Peninsula and its correlation with the Lower Ordovician beds which occur on a main fold to the westward has been determined. At Bald Hills, westward of Waratah, an area of Upper Ordovician occurs.

Besides the rich quartz and alluvial gold the Ordovician strata contains silver, lead, copper, iron, manganese, wolfram, scheelite, bismuth, antimony, lodes of fluorspar, and veins of turquoise.

Silurian.—The rocks of this formation are conglomerate, breccia, grits, quartzites, phyllites, schists, slates, and shales, intercalated limestone and marble, and occasionally volcanic tuff. Like the Ordovician the beds are acutely folded and metamorphosed where intruded by igneous masses. Structurally, the Silurian beds form a large arc with a centre near Port Phillip. This is well shown by tracing the fossiliferous beds at Waratah Bay, strike N. 30° E., through Turton's Creek. Westward of Walhalla similar strata strike N. and S. Further north near Wood's Point the strike is west of north and continues so to the granite of the Strathbogie Ranges. Near Benalla the strike is northwesterly, but at Rushworth the continuation of the arc shows with an east and west strike, and Silurian fossils are well represented in this vicinity. On fossil evidence the Silurian beds are divided into three series—the Melbournian, Yeringian, and Tanjilian; the last named may require revision of evidence. These rocks cover a large part of central eastern Victoria. The gold-fields of Rushworth, Whroo, Walhalla, Wood's Point, Foster, Tanjil, Warrandyte, and Reedy Creek are in Silurian rocks. Gold-antimony ores occur at Costerfield, Ringwood, and Thornton; limestone at Lilydale, Cooper's Creek, Waratah, and Howe's Creek, near Mansfield; and phosphate of lime at Howe's Creek. Copper and small quantities of manganese, nickel, cobalt, and platinum are recorded from dykes intrusive into this series.

Devonian.—Acutely-folded sedimentary strata of Middle Devonian age occur in the vicinity of Taberraberra, west of Bullumwaal, and are apparently conformable to the underlying Silurian and Upper Ordovician. This area has recently been examined and will afford an interesting section showing the relationship.

Towards the close of the Devonian period extensive volcanic accumulations, such as tuffs, conglomerates, lavas, and porphyry masses were formed in the Snowy River and Macallister–Wonnangatta valleys, and apparently contemporaneous with them extensive limestone beds

were deposited. As these and later beds have not been subjected to the intense folding of the pre-existing formations in which the granites and granodiorites occur, the latter intrusions are classed as of Devonian age. In the Grampians area certain granite intrusions have been assigned to a later period.

Excepting a small rich gold occurrence near Briagolong, the Devonian strata have not proved gold-bearing. Silver, lead, copper, manganese, iron, baryta, felspar, and building stones, such as marble, freestone, porphyry, and granite are the chief economic products.

Carboniferous.—The massive sandstones, with occasional shales, forming the Mount William, Sierra, and Dundas ranges in the west, and the purplish-red sandstones, mudstones, conglomerates, and impure limestones at Mansfield and near Whitfield are Lower Carboniferous. On the Avon River the red and yellow sandstones containing the fossil *Lepidodendron* probably belong to this series, although the underlying beds at Iguana Creek have a flora with a Devonian aspect. Both the Mount Wellington and the Grampians areas present a remarkable variety of scenery—canyons, bluffs, and gorges often several hundred feet deep.

In the Grampians a granodiorite-porphyritic intrusion in the Carboniferous sandstones is recorded, while the granitic mass of Mount Hump (Gippsland) is apparently older than the Avon River sandstones.

The Carboniferous formation only provides building stone, some of the freestone being of good quality.

Permo-Carboniferous.—Glacial conglomerate, pebbly mudstone, and tillite occur near Bacchus Marsh, in the valley of the Werribee, at Greendale, Wild Duck Creek (near Heathcote), near Kyneton, Coleraine, Carisbrook, Pitfield, Poseidon, Wangaratta, and other localities in the north-east district, and are apparently scattered remnants of glaciation more or less directly connected. Northward of Greendale an area of glacial beds occurs on the northern or upthrow side of the Greendale fault at an elevation considerably above the highest portion of the corresponding formation southward. At Bacchus Marsh several species of the fossil *Gangamopteris* were discovered in shale, intercalated with the glacial conglomerates, and on this evidence the beds have been provisionally classed as of Permo-Carboniferous age; recent observations by Mr. F. Chapman have revealed Triassic fossils in the uppermost beds of the series. In a small outcrop of strata near Yandoit fossils of Triassic age have also been identified.

Jurassic.—A thick bed of conglomerate, glacial in part, forms the base of the Jurassic formations, and is followed by a series of felspathic sandstones, thick beds of mudstones, and thin seams of coal; these occur in South Gippsland, on the Latrobe River, in the Otway Ranges, and the Valley of the Wannon. The black coal seams, though small, furnish portion of the supplies of the State. The coal seams are much faulted and frequently intersected by doleritic dykes. Quartz reefs occur in the Jurassic strata of the Otway district, but so far they have

not proved auriferous. Freestones, dyke stones, useful for road material, shales suitable for tile manufacture, calcite, baryta, and black coal are the chief economic products of the Jurassics.

Lower Tertiary.—Marls and limestones of Oligocene age, containing a representative molluscan fauna outcrop at Mornington and Muddy Creek, Hamilton, and occur at a depth at Altona and Sorrento. At Altona they rest on brown coal, which in turn rests on sands. At Mornington they are either in contact with or in close proximity to the Older Basalt.

Fluviatile deposits underlying the Older Basalt at Berwick contain an abundant fossil flora, including such genera as *Eucalyptus*, *Lomatia*, *Fagus*, &c. In the fluviatile beds, under the Older Basalt at Dargo, *Gingko* is found. The predominant species in the brown coal deposits appears to be a *Cupressinoxylon*, or cypress wood.

Middle Tertiary.—Miocene marls and polyzoal limestone of Miocene age are represented by a considerable thickness of beds at various localities. They outcrop at several places in the western portion of the State, and the main water-bearing beds of the Mallee–Riverina basin are of this age. At Pitfield, during mining operations, fossil fruit were found in fluviatile beds, which seemed to merge into estuarine and ultimately into marine beds, containing molluscan fauna. At Maude and Curlewis there are two flows of basalt with a marine bed between them, and another resting below the lower lava flow. The lower marine bed is regarded by Mr. Chapman as Miocene, and by the late Dr. R. S. Hall and Dr. Pritchard as Eocene. The brown coal phase, which commenced in the Lower Tertiary, probably extends upwards into the Miocene.

Upper Tertiary.—Lower Pliocene shell marls and sands occur at the Gippsland Lakes, on the shores of Port Phillip Bay, at Muddy Creek, Hamilton, and the Mallee. The period is characterized by coarse marine and freshwater sedimentation. In the fossil fauna the remains of some gigantic mammals are found. Upper Pliocene clays, sands and limestones outcrop at the Glenelg and Moorabool rivers, and are known to exist at a depth in the Mallee. The extensive volcanic plains of Western Victoria, comprised of lavas and tuffs, range in age from the Pliocene to within comparatively recent times. Many of the craters are perfect.

Recent.—Loam and sand deposits, dune sands, recent beaches, lake sediments, &c., in process of formation comprise the Recent deposits.

Tertiary deposits have been responsible for a large quantity of the gold found in Victoria, particularly for the large nuggets, which have made Victorian gold-fields famous. Stream tin, a moderate amount of wolfram and monazite, a considerable tonnage of pottery clays, sands for a variety of purposes, building stone, including basalt (much used locally for construction, paving, and macadam), lime, bauxite, iron ore, pigments, paper clays, jarosite, and chalk occur in the Tertiary deposits of the State.

Extensive deposits of brown coal have been proved in the vicinity of Morwell, Traralgon, Rosedale, Hedley, westward of Altona Bay, Lal Lal, and Bambra, and several of these areas are now receiving attention.

FLORA OF VICTORIA.

By J. W. Audas, Esq., F.L.S., F.R.M.S. (National Herbarium, Melbourne).

INTRODUCTION.

Perhaps no subject in the past has received more exhaustive treatment than the indigenous flora of Victoria. After the work of Dr. Robert Brown on his voyage with Flinders, and of a few other botanists, we had the comprehensive work of our first Government botanist, Baron von Mueller, a unique record of botanical research.

Supplementary contributions have since been published by Messrs. G. Weindorfer, C. A. Topp, M.A., Professor A. J. Ewart, D. Sc., and others, serving further to increase our knowledge, and direct our study of the flora of Victoria, so that in a general consideration of the subject there seems to be little available to add to their work.

CLASSIFICATION.

In the State of Victoria there are 580 genera and 2,053 species of Exogenous and Endogenous plants systematically arranged under the natural orders as adopted by Baron von Mueller.

DICOTYLEDONAE.

Choripetalae hypogynae.

Ranunculaceae
Dilleniaceae
Magnoliaceae
Monimieae
Lauraceae
Papaveraceae
Cruciferae
Violaceae
Pittosporeae
Droseraceae
Elatineae
Hypericineae
Polygaleae
Tremandreae
Rutaceae
Zygophyllaceae
Lineae
Geraniaceae
Malvaceae
Sterculiaceae
Tiliaceae
Euphorbiaceae
Urticaceae
Cupuliferae
Casuarineae
Sapindaceae
Stackhousieae
Frankeniaceae
Plumbagineae
Portulaceae
Caryophylleae
Amarantaceae
Salsolaceae
Ficoideae
Polygonaceae
Phytolacceae

DICOTYLEDONAE—*continued*.

Choripetaleae perigynae.

Leguminosae	Halorageae
Rosaceae	Myrtaceae
Saxifrageae	Rhamnaceae
Onagreae	Araliaceae
Salicarieae	Umbelliferae

Sympetaleae perigynae.

Santalaceae	Cucurbitaceae
Proteaceae	Compositae
Thymeleae	Campanulaceae
Rubiaceae	Candollaceae
Caprifoliaceae	Goodeniaceae

Sympetaleae hypogynae.

Gentineae	Scrophularinae
Loganiaceae	Lentibularinae
Plantagineae	Asperifoliae
Primulaceae	Labiatae
Jasmineae	Verbenaceae
Apocyneae	Myoporinae
Convolvulaceae	Ericaceae
Solanaceae	Epacrideae

Apetaleae gymnospermeae.

Coniferae

MONOCOTYLEDONAE.

Calyceae perigynae.

Orchideae	Hydrocharideae
Irideae	Amaryllideae

Calyceae hypogynae.

Lilliaceae	Alismaceae
Typhaceae	Xyrideae
Lemnaceae	Junceae
Fluviales	Restiaceae

Acalyceae hypogynae.

Cyperaceae	Gramineae

ACOTYLEDONEAE.

Acotyledoneae vasculares.

Rhizospermae	Filices.
Lycopodinae	

(1) The first great division of Exogens, the *Choripetelae hypogynae* presents to notice the representatives of 36 natural families, and, although not comprising very many of the larger trees, it includes many shrubs which are well known to the horticulturist. Perhaps as a family the Rutaceae affords some of the most elegant shrubs in this division of the vegetable kingdom, especially the genera Correa, Boronia, Crowea, Eriostemon and Phebalium. There are many species of Eriostemon but there are few species of Phebalium to be met with in gardens, although several of the species are decidedly ornamental. Some of the prettiest shrubs belonging to the rutaceous order are Boronia pinnata, *B. anemonifolia*, and many other species of the same genus are abundant in the spring of the year.

The Dilleniaceae comprise several species of Hibbertia, but, with the exception of *H. dentata*, with its yellow bright petals, they could hardly be regarded as suitable for horticulturists, owing to the fugacious nature of the petals, which drop off almost as soon as they are gathered. The native Cruciferae are neither numerous nor important; they comprise fourteen genera. Of the Pittosporae there are five genera. Pittosporum undulatum—a tall sweet-scented shrub—is well adapted for a shrubbery or as a hedge plant. *P. phillyraeoides*—a graceful tree with seed vessels containing red seeds—occurs generally in the Mallee. *Cheiranthera linearis* is a small shrub with showy blue flowers. The three species of Billardiera have a twining habit with pale yellow flowers, and small edible berries. The Salsolaceae embrace 14 genera and 62 species. In many parts of the Mallee, where from the nature of the soil or the dryness of the season, the grasses afford a very inadequate pasture for stock, the salt-bush family takes the place of the grasses, and the species are so numerous that probably no other part of the world can produce a more varied stock of them. The plants best known as salt-bushes are *Rhagodia parabolica* (Mealy Saltbush), *R. hastata* (Saloop Saltbush), *Atriplex leptocarpum* (Slender Fruit Saltbush), *A. limbatum* (Spreading Saltbush), *A. semibaccatum* (Berry Saltbush), *A. angulatum* (Angular Saltbush), *A. nummularium* (Old-man Saltbush), *Kochia villosa* (Silky Bluebush), and *Kochia pyramidata* (Shrubby Bluebush).

Violaceae.—The indigenous plants of the violet family do not bear comparison with the exotic species; but, though destitute of scent, our violets may admit of hybridization, and under cultivation be rendered available for the purpose of the garden. The same would be applicable to our Geraniaceae. *Pelargonium australe* (Austral Stork's Bill), which greatly improves under cultivation, may yield interesting horticultural varieties.

(2) *Choripetalae perigynae.*—This section contains ten families, but the species are much more numerous and contain some of the most useful and important trees of the State. The Leguminosae, comprehending the divisions Mimosae and Papilionaceae, comprise 36 genera and 195 species. The Mimosae, which contain the Acacias,

are esteemed for the beauty and fragrance of their flowers, and also for the tannic properties of their bark. The bark of these plants is astringent, and a great quantity of it is used in tanning, and it is also sometimes employed medicinally as a remedy for dysentery, whilst the wood of *A. melanoxylon* (Blackwood) is much esteemed by cabinet-makers, being hard, dark in colour and finely veined. Few of the division Papilionaceae assume a tree-like appearance, most of them being small shrubs. In the months of September and November the species of Daviesia, Dillwynia, Platylobium, Bossiaea, Swainsona, Indigofera, Goodia, Gompholobium and Pultenaea enliven the bush by the brilliance of their flowers, but the showy appearance is too transient in its character to produce anything more than a temporary effect on the landscape.

The most important order in the State is the Myrtaceae. Nearly all the trees of the forest belong to it and also many beautiful shrubs. Although not containing quite so many species as the Leguminosae, it gives a tone and attraction to the bush on all sides, and, in the spring of the year, not merely the banks of creeks, but the forest itself is ornamented by myrtaceous blossoms. The most spectacular of the Myrtaceae are the various species of Callistemon, but the genera Leptospermum, Kunzea, Melaleuca, Baeckea, Calytrix, Lhotzkya, Micromyrtus and Thryptomene present many beauties to the admirer of nature. Amongst the larger trees, two shrubs of Leptospermum, and one of Melaleuca might be mentioned as affording timber for rough buildings and firewood; but the Eucalyptus far surpasses them in importance. Of the genus there are upwards of 80 well-defined species in Victoria, which under the various vernacular names of Messmate, Yellow, Red and White Stringybark, Bloodwood, Silvertop, White Mountain Ash, Woollybutt, Grey Box, &c., afford the principal timber for building material and cabinet-making, &c. Many of the Eucalypti are of immense importance, whether considered in regard to the value of their timber, the medicinal properties of their barks and resins, or the essential oil of their leaves, and the huge dimensions and towering height of some species are perhaps unrivalled in the world. Experiments have proved that the volatile oils contained in the leaves are highly valuable, and the wood will yield charcoal, vinegar, tar and non-condensible gases.

(3) The group *Sympetalae perigynae* contains ten families—the Compositae, the most numerous, having 52 genera and 231 species. This order, though not distinguished by any particular beauty, contains many species that are of a dry and coarse texture, and resemble what are popularly termed "Everlasting flowers." It might be easily imagined that such plants can stand a great amount of heat, and that they can exist long after the grasses have perished. To the general observer most of the composites present very little interest, and perhaps a few of them are looked upon as troublesome weeds, but, regarded from a scientific point of view, they throw much light on the character

of the soil where they abound, and also demonstrate their peculiar adaptation to seasons of aridity.

The Proteaceae has ten genera and 54 species indigenous to the State, the most prominent genera being Conospermum, Persoonia, Hakea, Grevillea, Telopea, Lomatia, Banksia. The latter genus is named after the distinguished naturalist, Sir Joseph Banks. We have *B. integrifolia, B. serrata, B. marginata, B. collina, and B. ornata* indigenous to this State. The first three are trees the wood of which is used for the knees of boats, and the others are ornamental shrubs. The genus Hakea is remarkable for its long, thorny leaves, hard woody seed vessel, and winged seeds. There are twelve species indigenous to Victoria, which, although differing in foliage and habit, may be easily recognized by their woody follicles, which after a time split in half and display two black seeds with a long broad wing at one end of them. The order is divided into (1) Numentaceae, or nut producing; and (2) Folliculares, or having a follicle—e.g., a one-valved, one-celled capsule opening lengthwise. Of the first division we have Conospermum, Persoonia and Isopogon; and of the second Hakea, Grevillea, Telopea, and Banksia.

The *Sympetaleae hypogynae* embraces sixteen families. The Epacridaceae is, on many accounts, an interesting order, principally, however, because it is almost peculiar to Australia, and occupies the same place here that the heathworts or Ericaceae do in other countries, and they give a tone and character to the flora where they abound. *Epacris impressa*, or "Common Heath," which is so common in some of our scrubs and along the sea coast, has long been a great favorite with the horticulturist. Its crimson and white flowers are very attractive. Some species of Styphelia are also very beautiful, as also are those of Leucopogon with the bearded segments of their flowers. *Astroloma conostephioides* (Flame Heath), *A. humifusum* (Cranberry Heath), and *Styphelia adscendens* (Golden Heath) are well known as having edible drupes.

Of the Gentianeae two little plants appear in the early part of the summer and spread over cultivated fields, e.g., *Erythraea australis* (Austral-Centaury) and *Sebaea ovata* (Yellow Centaury). They are valuable for the bitter properties they contain, and are often collected for use in rustic pharmacy. The former is the more powerful, and, although not used professionally, is a valuable local medicine.

Monocotyledoneae.

Calyceae perigynae.

The herbaceous plants in Victoria most suitable for cultivation belong principally to the families of Orchideae and Liliaceae. Of the Orchids *Dipodium punctatum* (Hyacinth Orchid), *Gastrodia sesamoides* (Potato Orchid), *Thelymitra grandiflora* (Great Sun Orchid), and *Caladenia*

Patersonii (Common Spider Orchid) would be the most likely to arrest the attention of the cultivator; but many of the smaller species, from the peculiar structure of their flowers, and the rarity of their occurrence demand some notice, especially the crimson and irritable *Caleana major* (Large Duck Orchid), the sweet-scented leaf of *Glossodia major*, the fantastic labellum of *Acianthus caudatus*, and *Calochilus Robertsonii* (Old Man Orchid) the edible bulbs of Diuris and the helmet of the diminutive *Corysanthes pruinosa*. The Liliaceous plants, *Dianella laevis* (Smooth Flax Lily) and *Thysanotus tuberosus* (Common Fringe Lily) relieve the eye of the observer by their delicate tints of blue and lilac respectively.

Acalyceae hypogynae.

The Gramineae as a family of plants are the most extensive as well as the most important to mankind. They contain nearly a sixth of the whole vegetable kingdom, cover the globe to a large extent with an almost perpetual freshness of green, and nourish by far the greater number of animals serviceable to the whole human race. There are 136 species of grasses arranged under 49 genera native to Victoria, and they are fairly well distributed over the State. Amongst the most valuable and nutritious grasses, the following occur in Victoria:—Fifteen species of Panicum, all of which are splendid fodder grasses; eight of Andropogon, including the famous "Blue Grass" and other excellent grasses; seven of Deyeuxia, which include some good pasture grasses; seven of Eragrostis, some of which are remarkable for their drought resisting qualities; four of Glyceria, including the Giant Mountain Grass; two of Themeda, which are colloquially known as Kangaroo and Oat grasses respectively; two of Chloris, including the Windmill or Star Grass; two of Diplachne, one of which thrives well in moist situations; four of Poa, one of which would be of use in the manufacture of paper; three of Sporobolus, one of which would prove serviceable for paper-making. There are several species of the following genera:—Cynodon (Couch Grass), Microlaena (Weeping Grass), Pollinia (Brown Top), Setaria (Pigeon Grass), Pappophorum (Nigger Head), Festuca (Fescue Grass), Eleusine (Finger Grass), Trisetum (Spiked-Oat Grass), Eriochloa (Woolly Grass), Deschampsia (Tufted Hair Grass), Anisopogon (Oat Spear Grass), Amphipogon (Bearded Heads), Agropyrum (Common Wheat Grass), Alopecurus (Bent Foxtail Grass), Hierochloe (Scented Holy Grass), Dichelachne (Plume Grass), Arundo (Reed Grass), and Tetrarrhena (Wire Grass).

UNDESIRABLE GRASSES.

The most objectionable grasses native to Victoria belong to *Stipa elegantissima, S. flavescens, S. teretifolia, S. eremophila, S. setacea, S. Luehmannii, S. aristiglumis, S. scabra.* (The Stipas are commonly known as Spear Grasses). Another genus is the Aristida, comprising

A. arenaria, A. Behriana, A. leptopoda, A. vagans, A. ramosa, A. calycina, (These Aristidas are known vernacularly as Three-awned Spear Grasses). A very objectionable grass is the False Spinifex (*Triodia irritans*). which is dreaded mostly on account of its sharp-pointed leaves. Although the number of indigenous undesirable grasses in Victoria does not exceed twenty, in some places they cover large areas, and depreciate their stock-carrying capacity.

Acotyledoneae.

Acotyledoneae vasculares.—The Pteridophyta, or Fern Family, contain 37 genera and 75 species indigenous to Victoria. They consist of flowerless plants, furnished with fronds or leaves which bear on the same part of their surface, usually the lower or under one, the spores or seeds by which they are propagated. Although ferns have no flowers, they bear great abundance of seed-like bodies, which are contained in sporangia or spore cases. These cases are generally surrounded by an elastic band or ring, which, when they have reached maturity, bursts by an irregular fissure and the seeds or spores, in the shape of fine dust, are scattered to the winds in countless numbers. Perhaps there is no order of plants which has more attractions for the general observer than that of ferns. The extreme elegance and extraordinary variation of their forms, as well as the facility with which many species can be obtained and dried, tend to make the study of ferns highly interesting. The better known species of tree ferns found in this State are the following, e.g., *Dicksonia antarctica* (Soft Tree Fern), *Cyathea Cunninghamii* (Slender Tree Fern), *C. medullaris* (Black Tree Fern) *Alsophila australis* (Rough Tree Fern), *Todea barbara* (King Fern).

The order has been divided into the following sub-orders, viz :—

(1) Hymenophyllaceae, (2) Cyatheaceae, (3) Polypodiaceae, (4) Gleicheniaceae, (5) Schizaeaceae, (6) Osmundaceae, (7) Salviniaceae, (8) Marsileaceae, (9) Ophioglossaceae.

Noxious Weeds.

Owing to the alarming increase and spread in recent years, Victoria is bestirring itself to the necessity of eradicating its many noxious weeds, which are becoming exceedingly dangerous to our pasturage, and all agricultural pursuits. While much has been done thus far to place the farmer in a position to recognise and cope with the danger, the problem grows in seriousness and the present time, when new tracts of country are being made available for settlement, appears to be particularly favourable for urging the need of a systematic and united effort by all engaged in the tilling of the soil, to endeavour in every possible way to eradicate these pests from their holdings.

Their eradication is of paramount interest to all engaged in agrarian pursuits in every part of Victoria, and the fact that many are striving to overcome the pests is manifest from the frequent inquiries made at the National Herbarium, Melbourne, for advice as to their eradication and suppression.

NEW PLANTS RECORDED DURING 1924–1925.

Six introduced plants have been recorded as growing wild for the first time, viz. :—

Bromus rubens L., " Red Brome Grass " (*Gramineae*)—This grass has been introduced from the Mediterranean regions. It has slight fodder value when young, but is practically useless when older. The sharp awns of the flower-head may cause irritation to the gums of stock.

Corydalis capnoides Wahl., " Corydale " (*Papaveraceae*). It is a native of Europe, Asia, and has no known economic value.

Erodium botrys Bert., " Needle Stork's Bill " (*Geraniaceae*). A native of the Mediterranean regions. It has slight fodder value.

Heliotropium supinum L., " Prostrate Heliotrope (*Borraginaceae*). An introduction from Europe, North Africa and Asia. It is a useless plant, but has no deleterious properties.

Onopordon acaulon L., " Stemless Onopordon " (*Compositae*). A native of the Mediterranean regions, introduced into Victoria, probably from South Australia, where it has been growing for several years. The leaves of this thistle lie flat on the ground, the flowers sessile in the centre of the rosette of leaves. As the plant belongs to the same genus as the proclaimed plant *Onopordon acanthium* " Scotch Thistle," it is quite likely it will spread if not speedily eradicated.

Sieglingia decumbens Bernh., " Heath Grass " (*Gramineae*). A native of Europe, North Africa, and West Asia. This grass has fodder value, and grows on poor soil in England.

NEW RECORD OF NATIVE FLORA.

During the period fifteen species not previously recorded for this State have been added to the list of Victorian flora, viz. :—

Borya nitida Labill., " Shining Borya " (*Liliaceae*) ; *Eucalyptus agglomerata* F.v.M., " Grey Stringybark " ; *E. Dalrympleana* Maiden, " Mountain White Gum " ; *E. phellandra* Maiden, " Mountain Peppermint " (*Myrtaceae*) ; *Pterostylis truncata* Rogers (*Orchideae*).

Ten ferns not previously recorded for Victoria have been added to the list, viz. :—

Adiantum capillaris-veneris L., British Maiden Hair Fern."

Alsophila Cooperi F.v.M., " Cooper's Tree Fern."

Asplenium adiantoides C. Chr., " Maiden Hair Spleenwort."

Blechnum laevigatum Cav., " Smooth Fern."

Blechnum serrulatum Richards, " Saw-leaf Blechnum."

Cyclophorus rupestris C. Chr., " Rock Polypody."

Dryopteris Queenslandica Domin., " Queensland Shield Fern."

Dryopteris tropica Domin., " Tropical Shield Fern."

Gleichenia flabellata R. Br., " Fan Fern."

Polystichum aristatum Presl., " Bristly Shield Fern."

DISTRIBUTION.

Taking the Dividing Range generally as a boundary in regard to the distribution of flora, Mueller apportioned Victoria into five districts, each having distinctive features : The North-west—a dry area with moderate rainfall, including the Mallee, and its xerophytic character linking up the flora with that of similar areas towards South Australia ; the South-west, comprising a good deal of country with a surface soil showing the results of volcanic activity, as well as part of the forest area west of Cape Otway ; the Southern, including the coastal area of Port Phillip and adjacent plains, and extending from the vicinity of Cape Otway to the western boundary of Gippsland ; the North-east, to the Upper Murray, including the alpine regions which link it in some measure with Tasmania and Antarctica in the character of the flora ; then, excluding the alpine portion, the definite area of Gippsland in the East with types of vegetation intrusive along the Pacific seaboard from the warmer and more humid northern areas in New South Wales. This division of Victoria has proved useful and convenient, and follows well-defined natural features of the configuration of the State, tending to evolve certain differences in vegetation.

Grampians Flora.

Special mention may be made of the Grampians flora, which in variety and beauty of its flowers is exceptionally notable. Probably owing to the Grampians being a residual formation of what was originally a geological measure of great extent, and partly owing to its comparative isolation, which is more marked on account of the ranges being at right angles to the great watershed from the central mountain system, its flora has a character of its own, and some plants are wholly restricted

to its area. Thus among others may be mentioned *Caleana Sullivani* F.v.M. (Spectral Duck Orchid), *Grevillea Williamsoni* F.v.M. (Serra Grevillea), *Bauera sessiliflora* F.v.M. (Showy Bauera), *Pultenaea Benthami* F.v.M. (Grampian Bush-pea), *P. Luehmanii* Maiden (Thready Bush-pea), *P. costata* (Ribbed Bush-pea), *Correa aemula* (Hairy Correa), *Trymalium ramosissimum* J. W. Audas (Broad-leaf Trymalium), *T.D'Altonii* F.v.M. (Narrow-leaf Trymalium), *Hibbertia humifusa* F.v.M. (Mountain Guinea Flower), *Eucalyptus alpina* Lindl. (Grampian Gum), *Halorrhagis meziana* Schindl. (Hairy Raspwort), *Leucopogon thymifolius* Lindl. (Thyme Beard Heath), *Brachyloma depressum* Bth. (Spreading Heath), *Prostanthera debilis* F.v.M. (Slender Mint Bush), *Stylidium soboliferum* F.v.M. (Bristly Trigger Plant).

East Gippsland.

In Eastern Gippsland the influence of sub-tropical conditions is prolonged along the Pacific Slope, the eastern aspect, the protection of the coastal range, and probably the warm East Australian Ocean Current conducing to the extension in range of many plants ordinarily found in warmer latitudes. Thus, e.g., we have *Angophora intermedia* (Gum Myrtle), *Livistona australis* (Austral Cabbage Palm), *Acronychia laevis* (Yellow Wood), *Telopea oreades* (Gippsland Waratah), *Eucalyptus corymbosa* (Bloodwood), *E. botryoides* (Mahogany Gum), *E. ligustrina* (Dwarf Stringybark), *E. Maidenii* (Spotted Blue Gum), *E. fastigiata* (Cut-tail Stringybark), *E. paniculata* (Grey Ironbark), *E. pilularis* (Blackbutt), *E. radiata* (River White Gum), *E. maculata* (Spotted Gum). *E. numerosa* (Peppermint Gum), *E. Baueriana* (Fuzzy Gum), and *E. Bosistoana* (Gippsland Box), and many other plants of northern origin not found elsewhere in Victoria beyond the Gippsland lake district. Added to this is great exuberance in growth and the presence in moist sheltered valleys with a southern aspect of a jungle flora of much interest as so far removed from its usual range. A further instance of this southern trend and favourable conditions is seen on the coastal bays in the presence of *Avicennia officinalis* (White Mangrove) in Corner Inlet and Western Port. The coastal flora now disappearing from the vicinity of Melbourne has a most important function in staying the sand drifts, and in resisting encroachment of the sea on the land, Tea trees, Acacias, Casuarinas, Banksias, above a lesser scrub vegetation being notable in this connexion.

FOREST DESTRUCTION.

The Gippsland and Cape Otway districts have been famous for the extraordinary beauty of their fern gullies, and their extensive forests formerly containing, as in Gippsland in the Mountain Ash (*Eucalyptus regnans*), probably the highest trees in the world. Unfortunately, right from the first occupation of the forest country, much of which should have been rigorously reserved from encroachment and destruction has

resulted in complete denudation of valuable forest areas, and ruthless destruction of the trees by fire and axe, so that the character of the country has been completely altered, new climatic conditions created, and the soil exposed to the action of atmospheric agencies causing rapid deterioration and irreparable diminution of our timber resources. Despite many warnings during the last 70 years as to the result of such an unwise policy, and notwithstanding the disastrous results shown from pursuing similar destruction in other countries, the forestry problem, of such outstanding importance to the State, has in the past received little if any attention. It is only now, when the most valuable forest areas have been devastated and the absolute necessity of conservation, selection, and protection of the depleted areas still existing has been tardily recognised through the increasing shortage in the world's timber supplies, that more vigorous action has been taken by the State and an effort made to cultivate a forest conscience in the people, Afforestation and reafforestation should be wisely, widely, and unremittingly carried on throughout the State.

DETRIMENTAL AGENCIES TO FLORA.

Among other agencies affecting our indigenous flora is the introduction of alien plants, some of which finding exceptionally favourable conditions for growth have flourished to the detriment and, in some cases, extinction of certain indigenous plants. Mention may be made of such noxious plants, e.g., the Blackberry (*Rubus fruticosus*), St. John's Wort (*Hypericum perforatum*), the Tutsan (*H. androsaemum*), Furze (*Ulex europaeus*), Sweet Briar (*Rosa rubiginosa*), &c. As in the case of plants, animals introduced by accident or design, have also had an effect upon our flora, e.g., the rabbit in the dryer areas, borers, scale insects, beetles on our native trees and shrubs. The great degree to which Victoria is a pastoral country has greatly affected the existence of our native flora, the grazing of cattle and sheep, especially the latter, tending to the restriction or the gradual disappearance of many species, whilst settlers themselves, to benefit their pastures, have not scrupled, in some case unlawfully, to destroy the natural covering of trees and scrub. Other factors causing change and modification in our flora are the growth of settlement, replacing, sometimes disastrously, the indigenous by the introduced plants, as in the case of grasses and trees; cultivation, subdivision, drainage and irrigation of the land all have far-reaching effects in altering the natural conditions under which the native flora persists, or in causing its complete disappearance. Thus forest land may become a grazing area, morass and swamp, a pasturage, shallow watercourses, a reservoir of water, springs may cease to flow, fern gullies may disappear, and dry areas may receive supplies of moisture by irrigation. In each case there is a serious reaction on the flora. Everywhere there is a vital disturbance and an introduction of factors inimical to the preservation of indigenous plants, however useful or attractive.

RESERVATIONS AND SANCTUARIES.

Such being the case it is a wise provision and a duty of the State, in accordance with the long-neglected policy of preservation of forest areas for national purposes, to set apart suitable areas in which, as far as possible, our distinctive flora and fauna also can be preserved under natural conditions of growth. The reservation of Wilson's Promontory—101,000 acres—as a National Park, and of other smaller areas in different parts of the State, is a commendable step, but such reservations should be greatly extended, and include comparatively large areas in Eastern Gippsland, the Mallee, the Grampians, the Otway district, and Yarra watershed respectively, each with typical flora of its own. In the advocacy of such sanctuaries worthy of preservation for future ages, the societies concerned with the study of nature and of science in Victoria have done excellent and commendable work.

THE FAUNA OF VICTORIA.

An article on the "Fauna of Victoria," by the late T. S. Hall, M.A., D.Sc. (University of Melbourne), and J. A. Kershaw, Esq., F.Z.S., Curator of the National Museum, Melbourne, appeared in the *Year-Book* for 1916–17, and addenda thereto by Mr. Kershaw in the *Year-Books* for 1918–19 and 1920–21.

THE HISTORY OF VICTORIA.

An article on this subject contributed by Ernest Scott, Professor of History in the University of Melbourne, appeared in the *Year-Book* for 1916–17, pages 1 to 31.

CHRONOLOGICAL TABLE OF LEADING EVENTS.

The *Year-Book* for 1916–17 contained, on pages 31 to 50, a chronological table of leading events in Victorian history for the years 1770 to 1900 inclusive, and of leading events in Victorian and other history for the years 1901 to 1916 inclusive. The leading events in the seven years 1917 to 1923 were given in the volumes relating to those years.

Some of the principal events in Victorian and other history during 1924 are given in the table which follows:—

1924.	21st January	..	A motion of no-confidence in the Baldwin Government was carried in the House of Commons. A Labour Ministry, with Mr. Ramsay MacDonald as Prime Minister, assumed office.
	3rd February	..	Death of Dr. Woodrow Wilson, President of the United States, 1913–21, aged 68 years.
	26th February	..	It was announced that the New South Wales Government had accepted the tender of Dorman, Long and Co. for the construction of a bridge across Sydney Harbour at a cost of £4,217,721.

1924.	28th February ..	The appointment of Mr. G. Fairbairn as Agent-General for Victoria announced.
	17th March ..	A British Special Service Squadron arrived in Port Phillip Bay. It was composed of two battle cruisers—H.M.S. *Hood* and H.M.S *Repulse*—and five light cruisers. Vice-Admiral Sir Frederick Field was in command of the squadron.
	6th April	Death of Sir J. E. Mackay, Speaker of the Legislative Assembly.
	12th April ..	H.M.A.S. *Australia* was sunk in 900 feet of water, 24 miles off Sydney Heads, in accordance with the terms of the Washington Naval Treaty.
	15th May ..	Sir J. A. M. Elder, of Melbourne, appointed to succeed Mr. Donald Mackinnon, as Commissioner for Australia in the United States.
	26th June ..	General elections for the State Legislative Assembly held.
	18th July ..	Resignation of the Peacock Government after being defeated on a no-confidence motion in the Legislative Assembly.
	18th July ..	A Labour Ministry, with the Hon. G. M. Prendergast as Premier, assumed office.
	18th August ..	Conference of statistical officers of the Commonwealth, Australian States and New Zealand opened at Adelaide.
	8th October ..	The British Labour Ministry defeated in the House of Commons by 364 votes to 198. A dissolution was asked for by the Prime Minister (Mr. MacDonald), and was granted by His Majesty the King.
	November ..	Elections for the House of Commons were held, and resulted in the defeat of the Labour Party. The Conservative Party came back with a large majority, and a Ministry, under the leadership of Mr. Stanley Baldwin, assumed office.
	November ..	Mr. Coolidge elected President of the United States.
	12th November ..	The Prendergast Ministry defeated in the Victorian Legislative Assembly by 34 votes to 28. A new Ministry was formed by Mr. Allan, of the Country Party, with Sir A. J. Peacock in the office of Treasurer.
	23rd December ..	The Prime Minister of the Commonwealth (the Hon. S. M. Bruce) announced that the Federal Ministry had decided to continue the existing policy regarding the sugar industry for three years from 31st August, 1925.

PROGRESS OF STATE SINCE 1850.

The following table has been prepared to illustrate the advance made by the State since 1850—the year immediately preceding the separation of the Colony from New South Wales. The subsequent years are census years except the last :—

STATISTICS OF VICTORIAN PROGRESS, 1850 TO 1924.

——	1850.	1861.	1871.	1881.	1891.	1901.	1911.	1921.	1924.
Population, 31st December ..	76,162	541,800	747,412	879,886	1,157,678	1,209,900	1,339,893	1,550,686	1,657,095
Revenue .. .. £	259,433	2,592,101	3,734,422	5,186,011	8,343,588	7,712,099	9,372,637	19,054,475	23,075,968
Expenditure from Revenue £	196,440	3,092,021	3,659,534	5,108,642	9,128,699	7,672,780	9,362,291	18,941,698	23,050,968
Public Funded Debt £	..	6,345,060	11,994,800	22,426,502	43,638,897	49,546,275	57,983,764	97,317,831	124,108,326
Gold produced .. oz.	..	1,967,453	1,355,477	858,850	576,400	789,562	542,074	114,602	74,638
Wool produced .. lbs.	16,345,468	22,640,745	37,177,646	45,970,560	76,503,635	73,235,138	101,803,644	90,250,571	82,513,361
Butter produced .. ,,	..	..	..	..	16,703,786	46,857,572	86,500,474	64,938,458	86,888,723
Agriculture—									
Land in cultivation acres	52,341	427,241	793,918	1,582,998	2,512,593	3,647,459	5,386,247	6,425,250	6,976,441
Wheat .. .. bushels	556,167	3,607,727	4,500,795	8,714,377	13,679,268	12,127,382	34,813,019	39,468,625	37,795,704
Oats .. .. ,,	99,535	2,136,430	3,299,889	3,612,111	4,455,551	6,724,900	9,699,127	10,907,191	9,366,105
Wine .. .. gallons	4,621	47,568	713,589	539,191	1,554,130	1,981,475	1,362,420	2,222,805	2,177,127
Live Stock—Horses No.	21,219	84,057	181,643	278,195	440,696	392,237	472,080	487,503	486,075
,, Cattle ,,	378,806	628,092	799,509	1,286,677	1,812,104	1,602,384	1,547,569	1,575,159	1,591,367
,, Sheep ,,	6,032,783	6,239,258	10,002,381	10,267,265	12,928,148	10,841,790	12,882,665	12,171,084	11,059,761
,, Pigs .. ,,	9,260	43,480	177,447	239,926	286,780	350,370	333,281	175,275	259,795
Total Imports—Value £	744,925	13,532,452	12,341,995	16,718,521	21,711,608	18,927,340	28,150,198*	..	..
,, Exports—Value £	1,041,796	13,828,606	14,557,820	16,252,103	16,006,743	18,646,097	29,896,275*	..	..
Imports, Oversea—Value £	..	10,991,377	9,201,942	11,481,567	13,802,598	12,686,880	21,850,963	57,608,777	49,592,677
Exports ,, ,, £	..	12,209,794	12,843,451	12,318,128	11,403,922	13,075,259	18,915,716	34,871,961	29,611,985
Shipping .. .. tonnage	195,117	1,090,002	1,355,025	2,411,902	4,715,109	6,715,491	9,907,046	9,314,944	13,532,568
Railways open .. miles	..	214	276	1,247	2,764	3,238	3,496	4,274	4,442
Telegraph wire .. ,,	..	2,586	3,472	6,626	13,989	15,356	16,405	31,243	35,043
Postal business—Letters No.	381,651	6,109,929	11,716,166	26,308,347	62,526,448	83,973,499	159,092,051	180,797,030	195,166,640
,, Newspapers ,,	381,158	4,277,179	5,172,970	11,440,732	22,729,005	27,104,344	36,125,728	31,660,611	40,241,184
Savings Bank Deposits £	52,697	582,796	1,117,761	2,569,438	5,715,687	9,662,006	18,213,040	48,262,058†	57,326,305†
Factories—									
Number of	..	531	1,740	2,488	3,141	3,249	4,873	6,532	7,289
Hands employed ..	..	4,395	19,468	43,209	52,225	66,529	102,176	140,743	156,162
Value of machinery, plant, land, and buildings £	..	..	4,725,125	8,044,296	16,472,859	12,298,500	16,613,348	35,492,735	53,196,475
Value of articles produced £	..	..	..	13,370,836	22,390,251	19,478,780	36,660,854	106,098,294	113,921,927
State Education—									
Number of Primary schools	61	671	988	1,757	2,233	1,967	2,059	2,334	2,460
Expenditure on Education £	..	162,547	274,384	546,285	726,711	701,034	1,052,418	2,117,151	2,763,213
Total value of rateable property in municipalities .. £	..	29,638,091	50,166,078	87,642,459	203,351,360	185,101,993	265,083,727	399,502,745	499,967,961
Friendly Societies—									
Number of members ..	..	7,166	35,706	47,908	89,269	101,045	145,439	143,421	150,264
Total funds .. £	..	..	213,004	475,954	961,933	1,370,604	2,246,296	3,375,050	3,838,252

NOTE.—In a few instances in the earlier years, where it is not possible to give figures for the exact date or period shown, those for the nearest dates or periods are given. Gold was discovered in 1851, in which year the return was 145,137 oz. Butter figures were not collected prior to 1891.

* These figures relate to the calendar year 1909. Owing to the Commonwealth authorities having discontinued the keeping of records of Inter-State trade the value of the total imports and exports of the State are not available for a later year.

† Including deposits in the Commonwealth Savings Bank.

The population of the State at the end of 1850 was 76,162; at the end of 1924 it had increased to 1,657,095. During the period 1850–1924 the revenue steadily increased from £259,433 to £23,075,968. There was no public debt until after the separation of the State from New South Wales. In 1861 the State indebtedness was £6,345,060; in 1924 the funded debt had reached £124,108,326, which has been spent on revenue-yielding and other works of a permanent character. The land in cultivation in 1850 was 52,300 acres; it now amounts to 6,976,441 acres. The value of oversea imports in 1861 was £10,991,377; in 1923–24 it was £49,592,677. Oversea exports amounted to £12,209,794 in 1861, and to £29,611,985 in 1923–24. No railways or telegraphs were in existence up to the end of 1855; in 1861 there were 214 miles of railway open, and in 1924 there were 4,442 miles; 2,586 miles of telegraph wires had been erected up to 1861, and 35,043 miles up to the 30th June, 1924. Postal business in letters and newspapers has expanded rapidly during the period covered by the table, and there has also been a large increase in Savings Bank deposits, which rose from £52,697 in 1850 to £57,326,305 in 1924.

The expenditure on education amounted to £162,547 in 1861, and had increased to £2,763,213 in 1923–24. Members of friendly societies numbered 7,166 in 1861 and 150,264 in 1923–24—the funds amounting to £213,000 in 1871 and £3,838,052 in 1923–24. Hands employed in factories rose from 19,468 in 1871 to 156,162 in 1923–24. The total value of rateable property in municipalities, which was £29,600,000 in 1861, was £499,967,961 in 1923–24.

CONSTITUTION AND GOVERNMENT.

The Present Constitution.

Reform Act 1903.

After the establishment of the Federal Government it became evident that the representation of the States in the States Houses was excessive, and steps were taken to reform the States Constitutions. Accordingly an Act "to provide for the Reform of the Constitution" was passed in Victoria and reserved for the Royal assent on 7th April, 1903. After an interval of some months the Royal assent was proclaimed on 26th November, 1903. This Act, entitled *The Constitution Act* 1903, provided for a reduction in the number of responsible Ministers from ten to eight, and in their salaries from £10,400 to £8,400 (since increased to £10,000); and decreased the number of members of the Legislative Council from 48 to 35, including one special representative for the State railways and public servants; but increased the number of electoral provinces from fourteen to seventeen, each being now represented by two members elected for six years—one retiring every three years by rotation, except at a general election, when one-half of the members are to be elected for only three years. The property qualification of members of the Council was reduced from