

## CLIMATE.

THE Tropic of Capricorn divides Australia into two parts ; of these the northern or inter-tropical portion contains 1,176,000 square miles, comprising half of Queensland, the Northern Territory of South Australia, and the north-western divisions of Western Australia. The whole of New South Wales, Victoria, New Zealand, and Tasmania, South Australia proper, half of Queensland, and more than half of Western Australia, comprising 1,985,500 square miles, are without the tropics. In a region so extensive very great varieties of climate are naturally to be expected, but it may be stated as a general law that the climate of Australasia is milder than that of corresponding lands in the Northern Hemisphere. During July, which is the coldest month in these latitudes, one half of Australasia has a mean temperature ranging from 40° to 64°, and the other half from 64° to 80°. The following are the areas subject to the various average temperatures during the month referred to:—

Temperature, Fahrenheit.	Area in square miles.
35° — 40° .....	300
40° — 45° .....	39,700
45° — 50° .....	88,000
50° — 55° .....	635,300
55° — 60° .....	701,300
60° — 65° .....	858,200
65° — 70° .....	529,700
70° — 75° .....	234,500
75° — 80° .....	24,500

The temperature during December ranges from 50° to above 95° Fah., half Australia having a mean temperature below 83°. Dividing the land into zones of average summer temperature, the following are the areas which would fall to each:—

Temperature, Fahrenheit.	Area in square miles.
50° — 55° .....	300
55° — 60° .....	66,300
60° — 65° .....	111,300
65° — 70° .....	74,300
70° — 75° .....	373,600
75° — 80° .....	453,000
80° — 85° .....	756,500
85° — 90° .....	588,400
90° — 95° .....	602,400
95° and over. ....	135,400

Judging from the figures just given, it must be conceded that a considerable area of the continent is not adapted for colonisation by European

paces. The region with a mean summer temperature in excess of 95° Fahr. is the interior of the Northern Territory of South Australia north of 20th parallel; and the whole of the country, excepting the seaboard, lying between the meridians of 120° and 140° and north of the 25th parallel has a mean temperature in excess of 90° Fahr.

Climatically, as well as geographically, New South Wales is divided into three marked divisions. The coastal region, which is between the parallels of 28° and 37° south latitude, has an average summer temperature ranging from 78° in the north to 67° in the south, with a winter temperature of from 59° to 52°. Taking the district generally the difference between the mean summer and mean winter temperature may be set down as averaging not more than 20°, a range smaller than is found in most other parts of the world. The famed resorts on the Mediterranean seaboard bear no comparison with the Pacific slopes of New South Wales, either for natural salubrity or for the comparative mildness of the summer and winter.

Sydney, situated as it is midway between the extreme points of the Colony, in latitude 33° 52' S., has a mean temperature of 62·9°, corresponding with that of Barcelona, the great maritime city of Spain, and of Toulon, in France; the former being in latitude 41° 22' N., and the latter in 43° 7' N. At Sydney the mean summer temperature is 71°, and that of winter 54°. The range is thus 17° Fahr. At Naples, where the mean temperature for the year is about the same as at Sydney, the summer temperature reaches a mean of 74·4°, and the mean of winter is 47·6°, with a range of 27°. Thus the summer is warmer, and the winter much colder, than at Sydney. The highest temperature in the shade ever experienced in Sydney was 106·9°, and the lowest winter temperature was 35·9°, giving a range of 71°. At Naples the range has been as great as 81°, the winter minimum falling sometimes below the freezing-point. The mean temperature of Sydney for a long series of years was, spring 62°, summer 71°, autumn 64°, and winter 54°.

Passing from the coast to the tableland, a distinct climatic region is entered. Cooma, with a mean summer temperature of 65·4° and winter 41·4°, may be taken as illustrative of the climate of the southern tableland, and Armidale of the northern. The first-named town stands in the centre of the Monaro plains, at an elevation of 2,637 feet above sea-level, and enjoys a summer as mild as either London or Paris, while its winters are far less severe. On the New England tableland, the climate of Armidale and other towns may be considered as nearly perfect as can be found. The yearly average temperature is scarcely 56·1°, while the summer only reaches 67°, and the winter falls to 43·77°, a range of temperature approximating closely to that of the famous health-resorts in the south of France.

The climatic conditions of the western districts of the Colony are entirely different from those of the other two regions, and have often been cited as disagreeable. Compared with the equable temperature

of the coastal district, or of the tableland, there may appear some justification for such a reputation, but only by comparison. The climate of the great plains, in spite of the heat of part of the summer, is very healthy. The town of Bourke may be taken as an example. Seated in the midst of the great plain of the interior, it illustrates peculiarly well the defects, as well as excellencies, of the climate of the whole region. Bourke has exactly the same latitude as Cairo, yet its mean summer temperature is  $1\cdot3^{\circ}$  less, and its mean annual temperature  $4^{\circ}$  less than that of the Egyptian city. New Orleans also lies on the same parallel, but the American city is  $4^{\circ}$  hotter in summer. As regards winter temperature, Bourke leaves little to be desired. The mean winter reading of the thermometer is  $54\cdot7^{\circ}$ , and accompanied as this is by clear skies and an absence of snow, the season is both refreshing and enjoyable.

The rainfall of New South Wales varies from an annual average of 64 inches at the Tweed Heads, on the northern coast, to less than 12·5 inches in the Trans-Darling country. The coastal districts average about 45 inches of rain per annum; on the tableland the mean rainfall is 30·84 inches, but in the western interior it is as low as 17 inches. The average rainfall of Sydney for the last thirty-four years was 49 inches.

The climate of Victoria does not differ greatly from that of New South Wales; the heat, however, is generally less intense in summer and the cold greater in winter. Melbourne, which stands in latitude  $37^{\circ} 50' S.$ , has a mean temperature of  $57\cdot3^{\circ}$ , and therefore corresponds with Bathurst in New South Wales, Washington in the United States, Madrid, Lisbon, and Messina. The difference between summer and winter is, however, less at Melbourne than at any of the places mentioned. The mean temperature is  $6^{\circ}$  less than that of Sydney and  $7^{\circ}$  less than that of Adelaide,—the result of a long series of observations being:—spring,  $57^{\circ}$ ; summer,  $65\cdot3^{\circ}$ ; autumn,  $58\cdot7^{\circ}$ ; winter,  $49\cdot2^{\circ}$ . The highest recorded temperature in the shade at Melbourne was  $110\cdot7^{\circ}$ , and the lowest was  $27^{\circ}$ .

Ballarat, the second city of Victoria, about 100 miles westerly from Melbourne, and situated at a height of about 1,400 feet above sea-level, has a minimum temperature of  $29^{\circ}$ , and a maximum of  $104\cdot5^{\circ}$  the average yearly mean being  $54\cdot1^{\circ}$ . Bendigo, which is about 100 miles north of Melbourne, and 700 feet above the level of the sea, has a rather higher average temperature, ranging from  $31\cdot2^{\circ}$  to a maximum of  $106\cdot4^{\circ}$ , the average yearly mean being  $59\cdot4^{\circ}$ . At Wilson's Promontory, the most southerly point of Australia, the minimum heat is  $38\cdot6^{\circ}$ , and the maximum  $96\cdot4^{\circ}$ , the average yearly mean being  $56\cdot7^{\circ}$ .

During the year 1892 the rainfall at Melbourne amounted to 24·96 inches, and for the last twenty-eight years it averaged 25·51 inches, with an average of 131 days during the year in which rain fell. At Bendigo, during 1892, 26·85 inches fell, and 33·73 at Portland. Among the mountain ranges in Gippsland the rainfall averaged 36 inches.

As about one-half of the Colony of Queensland lies within the tropics, it is but natural to expect that the climate would be very warm. The temperature, however, has a less daily range than that of other countries under the same isothermal lines. This circumstance is due to the sea-breezes which blow with great regularity, and temper what would otherwise be an excessive heat. The hot winds which prevail during the summer in some of the other Colonies are unknown in Queensland. Of course in a territory of such large extent as that of Queensland there are many varieties of climate, and the heat is greater along the coast than on the elevated lands of the interior. In the northern parts of the Colony the high temperature is very trying to persons of European descent.

The mean temperature at Brisbane, during December, January, and February, is about  $76^{\circ}$ , while during the months of June, July, and August it averages about  $60^{\circ}$ . Brisbane, however, is situated near the extreme southern end of the Colony, and its average temperature is considerably less than that of many of the towns further north. Thus, the winter in Rockhampton averages nearly  $65^{\circ}$ , while the summer heat rises almost to  $85^{\circ}$ , and at Townsville and Normanton the average temperature is still higher.

The average rainfall of Queensland is high, especially along the northern coast, where it ranges from 60 to 70 inches per annum. At Brisbane 50.38 inches is the average of thirty-three years, and even on the plains of the interior from 20 to 30 inches usually fall every year. During 1892 as much as 64.98 inches of rain fell in Brisbane, the number of wet days being 146.

South Australia, extending as it does over about 26 degrees of latitude, naturally presents considerable variations of climate. The southern portions have a climate greatly resembling that of the coast of Italy. The coldest months are June, July, and August, during which the temperature is very agreeable, averaging for a series of years  $53.6^{\circ}$ ,  $51.7^{\circ}$ , and  $54^{\circ}$  for those months respectively. On the plains slight frosts occasionally occur, and ice is sometimes seen on the highlands. The summer is the only really disagreeable portion of the year. The sun at that season has great power, and the temperature frequently reaches  $100^{\circ}$  in the shade, with hot winds blowing from the interior. The weather on the whole is remarkably dry. At Adelaide there are on an average 120 rainy days per annum; during the last fifty-four years the mean rainfall has been 21.08 inches per annum, while further north the quantity recorded was considerably less. The country is naturally very healthful, and in evidence of this it may be mentioned that no great epidemic has ever visited the Colony.

The climate of the Northern Territory of South Australia is extremely hot, except on the elevated tablelands. Altogether the temperature of this part of the Colony is very similar to that of Northern Queensland, and the climate is equally unfavourable to Europeans. It is a fact

worthy of notice that the malarial fevers which are so troublesome to the pioneers of the northern parts of Australia almost, and in some cases entirely, disappear after the land has been settled and consolidated by stock. The rainfall in the extreme north, especially in January and February, is exceedingly heavy. The average yearly rainfall in the coast districts is about 63 inches.

Western Australia has practically only two seasons. The winter, or wet season, commences in April and ends in October; the summer, or dry season, comprises the remainder of the year. During the wet season frequent and heavy rains fall, and thunderstorms with sharp showers occur in the summer. The extremes of drought and flood experienced in the other Colonies are almost unknown in Western Australia, but the north-west coast is sometimes visited with hurricanes of great violence during the summer months. In the southern and old settled parts of the Colony the mean temperature is about 64°, but in the more northern portions the heat is excessive, though the dryness of the atmosphere makes it superior to most tropical climates. At Perth, in 1892, the mean temperature was 64°, the maximum being 109° and the minimum 35°; the rainfall for the same year was 31·23 inches. Although the heat is very great during three months of the year, the nights and mornings are almost always cool, and through there being so little moisture in the air no danger arises from camping out.

Tasmania, protected as it is by its geographical position, and by the tempering influence of the surrounding ocean, from extremes of heat or cold, enjoys an exceedingly genial climate. The greater part of the island in the settled regions is characterised by a mild and equable temperature, ranging between the extremes of 20° to 44° in winter to 78° to 96° in summer. Spring and autumn are the most pleasant seasons of the year, especially the latter, when the mean reading of the thermometer is about 57°. The mean temperature of Hobart for the last fifty years was 55°. The richness of its flora is an evidence of the genial nature of the climate of Tasmania, while the purity of its atmosphere is proved by the small proportion of zymotic diseases recorded in the bills of mortality. The hot winds of the continent of Australia are felt in the northern parts of Tasmania only, and, even there, are greatly reduced in temperature by their passage across Bass' Straits. Generally speaking, all through the summer months there are alternate land and sea breezes, which tend to cool the atmosphere even in the hottest days. The climate of Tasmania is fresh and invigorating, and is much recommended as a restorative for those whose constitutions have been enfeebled by residence in hotter climes. Large numbers of tourists in search of health visit the island every summer. The rainfall, except in the mountain districts, is moderate and regular. The average downfall at Hobart for a long series of years was 22·93 inches, with 143 wet days per annum.

The climate of New Zealand is in some respects similar to that of Tasmania, but the changes of weather and temperature are often very

sudden. As the Colony extends over more than 10 degrees of latitude, it possesses a considerable amount of variety in regard to climate. The North Island, in this respect, is somewhat similar to Rome, Montpellier, and Milan, while the Middle or Southern Island more resembles Jersey, in the Channel Islands. The mean annual temperature of the North Island is 57°, and of the Middle Island 52°, while the yearly average of the whole Colony for each season is as follows :—Spring 55°, summer 63°, autumn 57°, and winter 48°. The mean temperature of New Zealand is lower than that of similar latitudes in Europe, though higher than is experienced in America on corresponding parallels. The mean temperature of the South or Middle Island is less by about 5° than that of the North Island. Snow very seldom lies on the ground at the sea-level in the North Island, and only occasionally in the South Island. The summits of Ruapehu, the highest mountain in the North Island, and of the great mountain chain in the South Island, are covered with perpetual snow from an altitude of 7,500 feet above the level of the sea. Ice is occasionally seen in winter-time in all parts of New Zealand. The whole Colony is subject to strong breezes, which frequently culminate in gales. The rainfall of New Zealand during 1892 varied very much at the several observing stations. At Auckland the fall amounted to 41·33 inches, while at Wellington, it reached as high as 67·66 inches. At Lincoln, on the east coast of the Middle Island, near Christchurch, only 27·88 inches fell, although at Dunedin, on the same coast, but more to the south, there was a fall of 47·55 inches, of which quantity nearly 4½ inches fell on one day—Feb. 8. Periods of lasting drought are almost unknown in New Zealand ; indeed it is very seldom that the records of any station show the lapse of a whole month without rain. The number of days in the year on which rain fell varied from 184 in Wellington, to 124 at Lincoln.

The following table illustrates the rainfall of Australasia :—

Rainfall.	Rainfall area in square miles for each division.			
	Australia.	Tasmania.	New Zealand.	Australasia.
Under 10 inches ... ..	1,254,400	.....	.....	1,254,400
10 to 20 „ ... ..	867,200	9,440	.....	876,640
20 to 30 „ ... ..	411,300	.....	69,650	480,950
30 to 40 „ ... ..	232,100	8,380	17,410	257,890
40 to 50 „ ... ..	144,300	8,380	17,410	170,090
50 to 60 „ ... ..	49,300	.....	.....	49,300
60 to 70 „ ... ..	57,700	.....	.....	57,700
Above 70 „ ... ..	14,500	.....	.....	14,500
	3,030,800	26,200	104,470	3,161,470