SECTION III.

PHYSIOGRAPHY.

§ 1. General Description of Australia.

1. **Geographical Position.**—The Australian Commonwealth includes Australia proper lying in the Southern Hemisphere, an island continent, and Tasmania, in all an area of about 2,974,581 square miles, the mainland alone containing about 2,948,366 square miles. Bounded on the west and east by the Indian and Pacific Oceans respectively, it lies between longitudes 113° 9′ E. and 153° 39′ E., while its northern and southern limits are the parallels of latitude 10° 41′ S. and 39° 8′ S., or including Tasmania, 43° 39′ S. On its north are the Timor and Arafura Seas and Torres Strait, on its south the Southern Ocean and Bass Strait.[1]

(i.) *Tropical and Temperate Regions.* Of the total area of Australia the lesser portion lies within the tropics. Assuming, as is usual, that the latitude of the Tropic of Capricorn is 23° 30′ S.[2], the areas within the tropical and temperate zones are approximately as follows :—

AREAS OF TROPICAL AND TEMPERATE REGIONS

OF STATES WITHIN TROPICS.

Areas.	Queensland.	Northern Territory.	Western Australia.	Total.
	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.
Within Tropical Zone	359,000	426,320	364,000	1,149,320
Within Temperate Zone	311,500	97,300	611,920	1,020,720
Ratio of Tropical part to whole State ...	0.535	0.814	0.373	0.530
Ratio of Temperate part to whole State ...	0.465	0.186	0.627	0.470

Thus the tropical part is roughly about one-half (0.530) of the three territories mentioned above, or about five-thirteenths of the whole Commonwealth (0.386). See hereafter Meteorology 9.

2. **Area of Australia compared with that of other Countries.**—That the area of Australia is greater than that of the United States of America, that it is four-fifths of that of Canada, that it is more than one-fourth of the area of the whole of the British Empire, that it is nearly three-fourths of the whole area of Europe, that it is about 25 times as large as any one of the following, viz., the United Kingdom, Hungary, Norway, Italy, the Transvaal, and Ecuador, are facts which are not always adequately realised. It is this great size, taken together with the fact of the limited population, that gives to the problems of Australian development their unique character, and its clear comprehension is essential in any attempt to understand those problems.

1. The extreme points are "Steep Point" on the west, "Cape Byron" on the east, "Cape York" on the north, "Wilson's Promontory" on the south, or, if Tasmania be included, "South East Cape." The limits, according to the 1903-4 edition of "A Statistical Account of Australia and New Zealand," p. 2; and, according to Volume XXV. of the "Encyclopædia Britannica," p. 787, are respectively 113° 5′ E., 153° 16′ E., 10° 39′ S., and 39° 11½′ S., but these figures are obviously defective.

2. Its correct value for 1908.0 is 23° 27′ 4″.5.

The relative magnitudes may be appreciated by a reference to the following table, which shews how large Australia is compared with the countries referred to, or *vice versa*. Thus, to take line 1, we see that Europe is about $1\frac{3}{10}$ times (1.29776) as large as Australi, or that Australia is about three-quarters (more accurately 0.77) of the area of Europe.

SIZE OF AUSTRALIA

IN COMPARISON WITH THAT OF OTHER COUNTRIES.

Commonwealth of Australia ... 2,974,581 square miles.

Country.	Area.	Australian Commonw'lth in comparison with—	In comparison with Australian C'wealth.
	Sq. miles.		
Continents—			
Europe	3,860,303	0.77	1.29776
Asia	16,967,778	0.18	5.70426
Africa	10,788,934	0.28	3.62704
North and Central America and West Indies ...	8,550,561	0.35	2.87454
South America	7,328,731	0.41	2.46378
Australasia and Polynesia	3,455,080	0.86	1.16153
Total, exclusive of Arctic and Antarctic Conts.	50,951,387	0.06	17.12891
Europe—			
Russia (inclusive of Poland, Ciscaucasia & Finland)	2,122,527	1.40	0.71355
Austria-Hungary (incl. of Bosnia & Herzegovina)	261,035	11.39	0.08776
Germany	208,780	14.25	0.07011
France	207,054	14.37	0.06969
Spain	194,770	15.27	0.06548
Sweden	172,876	17.21	0.05812
Norway	124,130	23.96	0.04173
United Kingdom	121,390	24.50	0.04081
Italy	110,659	26.88	0.03720
Turkey (inclusive of Crete)	68,750	43.27	0.02311
Denmark (inclusive of Iceland)	55,348	53.73	0.01861
Rumania	50,720	58.65	0.01705
Bulgaria	38,080	78.11	0.01280
Portugal	35,490	83.82	0.01193
Greece	25,014	118.91	0.00841
Servia	18,650	159.49	0.00627
Switzerland	15,976	186.22	0.00537
Netherlands	12,648	235.29	0.00425
Belgium	11,373	261.78	0.00382
Montenegro	3,630	819.67	0.00122
Luxemburg	998	2941.18	0.00034
Andorra	175	16997.61	0.00006
Malta	117	25423.76	0.00004
Liechtenstein	65	45793.55	0.00002
San Marino	38	78278.45	0.00001
Monaco	8	371822.63	...
Gibraltar	2	1487290.50	...
Total, Europe	3,860,303	0.77	1.29776
Asia—			
Russia (inclusive of Transcausia, Siberia, Steppes, Transcaspia, Turkestan and inland waters) ...	6,525,130	0.45	2.19364
China and Dependencies	4,277,170	0.70	1.43791
British India	1,087,124	2.74	0.36547
Independent Arabia	966,700	3.08	0.32499
Turkey (including Samos)	693,790	4.29	0.23324
Feudatory Indian States	679,393	4.38	0.22840
Persia	628,000	4.74	0.21112

Country.	Area.	Australian Commonwe'lth in comparison with—	In comparison with Australian C'wealth.
ASIA (continued)—			
Dutch East Indies	584,611	5.09	0.19654
Afghanistan	250,000	11.90	0.08405
Siam	195,000	15.25	0.06555
Japan (inclusive of Formosa, Pescadores, and Southern Sakhalin)	190,534	15.61	0.06405
Philippine Islands (inclusive of Sulu Archipelago)	127,853	23.27	0.04298
Laos	98,400	30.23	0.03308
British Borneo and Sarawak	83,106	35.79	0.02794
Bokhara	83,000	35.83	0.02790
Omán	82,000	36.27	0.02757
Korea	71,000	41.89	0.02387
Nepál	54,000	55.10	0.01815
Annam	52,100	57.08	0.01752
Tonking	46,000	64.68	0.01546
Cambodia	45,000	66.10	0.01513
Federated Malay States	26,380	112.74	0.00887
Ceylon	25,332	117.37	0.00852
Khiva	24,000	123.94	0.00807
Cochin China...	20,000	148.73	0.00672
Bhután	20,000	148.73	0.00672
Aden and Dependencies	9,080	327.87	0.00305
French Siam	7,800	381.68	0.00262
Timor, etc.	7,330	406.50	0.00246
Cyprus	3,584	833.33	0.00120
Goa, Damaõ, and Diu	1,638	1818.18	0.00055
Straits Settlements	1,600	1851.85	0.00054
Hong Kong and Dependencies	390	7692.31	0.00013
Wei-hai-wai	285	10623.50	0.00009
Kiauchau	200	14872.91	0.00007
French India (Pondicherry, etc.)	196	15176.43	0.00007
Labuan	30	99152.70	0.00001
Italian Concession, Tientsin	18	165254.50	0.00001
Macao, etc.	4	743643.25	...
Total, Asia	16,967,778	0.18	5.70426
Africa—			
Turkey (inclusive of Egypt and Soudan) ...	1,748,900	1.70	0.58795
French Sahara	1,500,000	1.98	0.50427
Congo Independent State	909,654	3.27	0.30581
French Congo	669,000	4.46	0.22491
Angola	484,800	6.14	0.16298
Rhodesia	435,000	6.83	0.14633
Tripoli	400,000	7.44	0.13447
German East Africa	384,000	7.74	0.12909
Algeria	343,500	8.66	0.11548
German South-west Africa	322,450	9.23	0.10840
Portuguese East Africa	293,400	10.14	0.09864
Cape Colony	276,995	10.74	0.09312
Bechuanaland Protectorate	275,000	10.82	0.09245
Northern Nigeria Protectorate	256,400	11.60	0.08620
Madagascar and adjacent Islands	228,000	13.05	0.07665
Morocco	219,000	13.58	0.07362
Abyssinia	200,000	14.87	0.06724
British East Africa Protectorate	200,000	14.87	0.06724
Kamerun	191,130	15.56	0.06425
Ivory Coast	130,000	22.87	0.04370
Gold Coast Protectorate	119,260	24.94	0.04009

Country.	Area.	Australian Commonw'lth in comparison with—	In comparison with Australian C'wealth.
AFRICA (continued)—			
Transvaal	117,732	25.27	0.03958
Uganda Protectorate	117,681	25.27	0.03956
Italian Somaliland	100,000	29.74	0.03362
French Guinea	95,000	31.31	0.03194
Eritrea	88,500	33.61	0.02975
Southern Nigeria and Protectorate	77,260	38.51	0.02597
Senegambia and Niger	70,000	42.49	0.02353
Rio de Oro, etc.	70,000	42.49	0.02353
British Somaliland	68,000	43.74	0.02286
Dahomey	65,000	45.77	0.02185
Orange River Colony	50,392	59.03	0.01694
Tunis	50,000	59.49	0.01681
Nyasaland Protectorate	43,608	68.21	0.01466
Liberia	40,000	74.36	0.01345
Natal	35,371	84.10	0.01189
Togoland	33,700	88.26	0.01133
Sierra Leone and Protectorate	30,000	99.11	0.01009
Portuguese Guinea	13,940	213.22	0.00469
Basutoland	10,293	289.02	0.00346
Rio Muni, etc.	9,800	303.95	0.00329
French Somali Coast, etc.	5,790	513.74	0.00194
Gambia Protectorate	3,615	819.67	0.00121
Cape Verde Islands	1,480	2000.00	0.00050
Zanzibar	1,020	2941.18	0.00034
Réunion	965	3082.46	0.00032
Fernando Po, etc.	780	3846.15	0.00026
Mauritius and Dependencies	705	4219.26	0.00024
Comoro Islands	620	4761.91	0.00021
French Senegal	438	6791.28	0.00147
St. Thomas and Prince Islands	360	8262.73	0.00012
Seychelles	160	19830.54	0.00005
Mayotte, etc....	140	21247.01	0.00005
St. Helena	47	63288.95	0.00002
Ascension	35	84988.03	0.00001
Spanish North and West Africa	13	228813.92	...
Total, Africa	10,788,934	0.28	3.62704
North and Central America and West Indies—			
Canada	3,745,574	0.79	1.25919
United States	2,970,230	1.00	0.99854
Mexico	767,005	3.88	0.25785
Alaska	590,884	5.03	0.19864
Newfoundland and Labrador	162,734	18.28	0.05471
Nicaragua	49,200	60.46	0.01654
Guatemala	48,290	61.61	0.01623
Greenland	46,740	63.65	0.01571
Honduras	46,250	64.31	0.01555
Cuba	44,000	67.61	0.01479
Costa Rica	18,400	161.55	0.00619
San Domingo	18,045	164.74	0.00607
Haiti	10,204	291.55	0.00343
British Honduras	7,562	393.70	0.00254
Salvador	7,225	411.52	0.00243
Bahamas	5,450	545.79	0.00183
Jamaica	4,200	708.23	0.00141
Porto Rico	3,435	869.57	0.00115
Trinidad and Tobago	1,868	1592.39	0.00063
Leeward Islands	701	4243.33	0.00024
Guadeloupe	688	4323.52	0.00023
Windward Islands	672	4426.46	0.00023

Country.	Area.	Australian Commonwe'lth in comparison with—	In comparison with Australian C'wealth.
N. & C. AMERICA & W. INDIES (continued)—			
Curaçao and Dependencies	403	7381.09	0.00014
Martinique	381	7807.30	0.00013
Turks and Caicos Islands	169	17601.07	0.00006
Danish West Indies	138	21554.94	0.00005
St. Pierre and Miquelon	93	31984.74	0.00003
Bermudas	20	148729.05	0.00001
Total, N. and C. America and W. Indies ...	8,550,561	0.35	2.87454
South America—			
Brazil (inclusive of Acré)...	3,292,991	0.90	1.10704
Argentine Republic	1,135,840	2.62	0.38185
Peru	695,733	4.28	0.23389
Bolivia	605,400	4.91	0.20352
Colombia	435,100	6.84	0.14627
Venezuela	364,000	8.17	0.12237
Chile	307,620	9.67	0.10342
Ecuador	116,000	25.64	0.03900
Paraguay	98,000	30.35	0.03295
British Guiana	90,277	32.95	0.03035
Uruguay	72,210	41.19	0.02428
Dutch Guiana	46,060	64.60	0.01548
Panamá	31,500	94.43	0.01059
French Guiana	30,500	97.56	0.01025
Falkland Islands	6,500	456.62	0.00219
South Georgia	1,000	2974.58	0.00034
Total, South America	7,328,731	0.41	2.46378
Australasia and Polynesia—			
Commonwealth of Australia	2,974,581	1.00	1.00000
Dutch New Guinea	151,789	19.60	0.05103
New Zealand and Dependencies	104,751	28.39	0.03522
Papua	90,540	32.85	0.03044
German New Guinea	70,000	42.50	0.02353
Bismarck Archipelago	20,000	148.73	0.00672
British Solomon Islands	8,360	355.87	0.00281
New Caledonia and Dependencies	7,650	389.11	0.00257
Fiji	7,435	400.08	0.00250
Hawaii	6,449	460.83	0.00217
New Hebrides	5,000	594.92	0.00168
German Solomon Islands	4,200	709.22	0.00141
French Establishments in Oceania	1,520	1960.78	0.00051
German Samoa	1,000	2974.58	0.00034
Caroline and Pelew Islands	560	5311.75	0.00019
Tonga	390	7627.13	0.00013
Marianne Islands	250	11898.32	0.00008
Guam	200	14872.91	0.00007
Gilbert Islands	166	17919.16	0.00006
Marshall Islands	150	19830.54	0.00005
Samoa (U.S.A. part)	79	37652.92	0.00003
Norfolk Island	10	297458.10	...
Total, Australasia and Polynesia ...	3,455,080	0.86	1.16153
British Empire...	11,365,763	0.26	3.82096

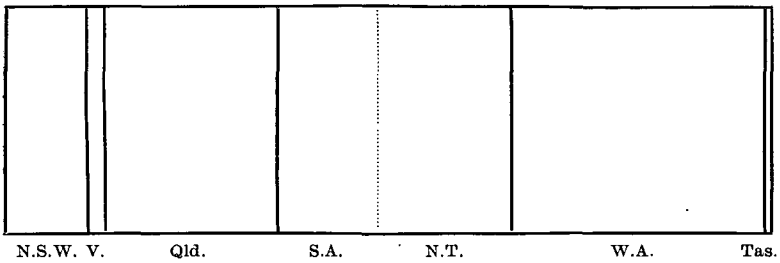
3. **Relative Size of Political Subdivisions.**—As already stated, Australia is divided into six States, the areas of which, in relation to one another and to the total of Australia, are shewn in the following table :—

RELATIVE SIZES OF STATES AND COMMONWEALTH.

State.	Area.	Ratio which the Area of each State bears to that of other States and Commonwealth.						
		N.S.W.	Victoria.	Q'land.	S.A. (Total.)	W. Aust.	Tas.	C'wlth.
	Sq. miles.							
N.S.W. ...	310,372	1.000	3.532	0.463	0.344	0.318	11.840	0.104
Victoria ...	87,884	0.283	1.000	0.131	0.097	0.090	3.352	0.030
Queensland	670,500	2.160	7.629	1.000	0.742	0.687	25.577	0.225
S.A. (total)	903,690	2.912	10.283	1.348	1.000	0.926	34.472	0.304
S.A. (proper)	(380,070)	(1.225)	(4.325)	(0.567)	(0.421)	(0.389)	(14.498)	(0.128)
N. Terr. ...	(523,620)	(1.687)	(5.958)	(0.781)	(0.579)	(0.537)	(19.974)	(0.176)
W. Aust. ...	975,920	3.144	11.105	1.455	1.080	1.000	37.228	0.328
Tasmania ...	26,215	0.085	0.298	0.039	0.029	0.027	1.000	0.009
Total ...	2,974,581	9.584	33.847	4.436	3.292	3.048	113.469	1.000

Thus, looking at the top line, New South Wales is seen to be over three-and-a-half times as large as Victoria (3.532) and less than one-half the size of Queensland (0.463); or again, looking at the bottom line, the Commonwealth is shewn to be more than nine-and-a-half times as large as New South Wales (9.584), and nearly thirty-four times as large as Victoria (33.847).

These relative magnitudes are shewn in the small diagram below. It may be added that Papua (or British New Guinea), with its area of 90,540 square miles, is 0.030 of the area of the Commonwealth.



4. **Coastal Configuration.**—There are no striking features in the configuration of the coast: the most remarkable indentations are the Gulf of Carpentaria on the north and the Great Australian Bight on the south. The York Peninsula on the extreme north is the only other remarkable feature in the outline. In Year Book No. 1 an enumeration of the features of the coast-line of Australia was given (see pp. 60 to 68).

(i.) *Coast-line.* The lengths of coast-line, exclusive of minor indentations, both of each State and of the whole continent, are shewn in the following table:—

SQUARE MILES OF TERRITORY PER MILE OF COAST-LINE.

State.	Coast-line.	Area ÷ Coast-line.	State.	Coast-line.	Area ÷ Coast-line.
	Miles.	Sq. miles.		Miles.	Sq. miles.
New South Wales...	700	443	South Australia ...	1,540	247
Victoria	680	129	Western Australia	4,350	224
Queensland ...	3,000	223	Continent[1] ...	11,310	261
Northern Territory	1,040	503	Tasmania ...	900	29

1. Area 2,948,36 square miles.

For the entire Commonwealth this gives a coast-line of 12,210 miles, and an average of 244 square miles for one mile of coast-line. According to Strelbitski, Europe has only 75 square miles of area to each mile of coast-line, and, according to recent figures, England and Wales have only one-third of this, viz., 25 square miles.

(ii.) *Historical Significance of Coastal Names.* It is interesting to trace the voyages of some of the early navigators by the names bestowed by them on various coastal features—thus Dutch names are found on various points of the Western Australian coast, in Nuyts' Archipelago, in the Northern Territory, and in the Gulf of Carpentaria; Captain Cook can be followed along the coasts of New South Wales and Queensland; Flinders' track is easily recognisable from Sydney southwards, as far as Cape Catastrophe, by the numerous Lincolnshire names bestowed by him; and the French navigators of the end of the eighteenth and the beginning of the nineteenth century have left their names all along the Western Australian, South Australian, and Tasmanian coasts.

5. **Orography of Australia.**—As indicated in the two preceding issues of this Year Book, it is intended each year to give fairly complete information concerning some special geographical element. In this issue an enumeration of the mountains of Australia is selected. Triangular measurements of heights are not available to any great degree, and the heights of mountains given in the following paragraphs must, therefore, in many cases be taken as approximate only. Thus, the height of Mount Kosciusko is given as "about 7300 feet." Various measurements of the peak originally called by that name shewed it to be slightly lower than its neighbour, Mount Townsend, and the names were thereupon transposed by the New South Wales Lands Department, so that Mount Kosciusko still remains the highest peak of Australia, and Mount Townsend, given by the Geodetical Survey of Victoria as 7266 feet, ranks as second. Officially the height of Mount Kosciusko is now stated as 7328 feet.

(i.) *General.* The chief mountain system of Australia runs more or less parallel with the eastern and southern coasts of the continent. The main Dividing Range, which forms its central chain, can be traced from New Guinea across Torres Straits to Cape York, and thence southward through the States of Queensland, New South Wales, and Victoria to Wilson's Promontory. From that point it is continued by the islands of the Flinders group to Tasmania, while a second spur traverses Victoria in a westerly direction. The mountains of South Australia run chiefly in a north-easterly direction, from Cape Jervis, along what was probably in pre-historic times the eastern shore of the sea, joining the head of Spencer's Gulf to the Gulf of Carpentaria. The chief mountain ranges of Western Australia lie also mainly along the coast.

It will be found more convenient to consider the mountain systems in their geographical order, commencing with Queensland, and then taking New South Wales, Victoria, Tasmania, South Australia, and Western Australia in the order named.

(ii.) *Queensland.* The northernmost parts of the main Dividing Range are known respectively as the Richard Range, the Sir William Thompson Range, and the McIlwraith Range. In the McIlwraith Range are Mount Carter, Mount White, Mount Newberry, and Mount Walsh. Farther to the west lies the Wilkinson Range. In a range forming the watershed between the Normanby and Mitchell Rivers are Mount Emma and Mount Lukin. Westerly offshoots are the Kirchner Range, the Granite Hills with Barney's Nob, the Gregory Range towards Normanton, and north of it the Newcastle Range. Near Hughenden a range branches off to the west, which forms the watershed between the rivers flowing to the Gulf of Carpentaria and those flowing westward. Various parts of this range are known as the McKinlay Range and the Selwyn Range (Mount Guide). Southerly offshoots from the range just mentioned are the Forsyth Range, with Mount Landsborough, Mount Alice, and Arthur's Mountain, and farther west Allan's Range, Cory's Range, Tully Range, the Kangaroo Mountains (Mount Edward), the Sword Range (Mount Rourke), the Charters Range, Lawson's Hills, Hill's Range, the Müller

Range, the Finucane Range, the Standish Range (Mount Collis and Mount Aplin), and the De Little Range (Longsight Peak). Easterly offshoots of the main range are the Granite Range (Mount Stewart) running towards Charters Towers, and its continuation, the Seventy-Mile Range. Farther south is the Terraic Range, from which the Llanarth Range and the Rottenstone Range branch off in a northerly direction. Near the Rottenstone Range is Mount McConnell.

From Trinity Bay to the Tropic of Capricorn the main range takes a southward direction. In this part of the range is the Table Mountain.

From the Herberton district southward there are a number of ranges between the main range and the coast, and following the line of the latter more or less closely. Among these may be mentioned the Coast Range, the McAllister Range, the Bellenden Ker Range, and the Seaview Range. Not far from Herberton is Mount Bartle Frere, 5438 feet, the highest mountain in Queensland. To the south of the Seaview Range are the Leichhardt Range, the Denham Range, the Peak Range with Wolfang Peak, and the Drummond Range, which approaches the main range near Mount Howard. Between the Denham and Drummond Ranges on the west and the coast on the east are the Boomer Mountains, the Broadsound Ranges, and Connor's Range.

Near Mount Howard the main range takes a south-easterly direction. Its highest peaks in this neighbourhood are Mount Pluto, Mount Faraday, and Table Top. The southern part of the main range is here known as the Grafton Range (Mount Combabula and Mount Horrible). From the place where the range turns to the south again it is called Craig's Range, and is continued as the Boonya Mountains (Mount Haly, 3130 feet, Mount Mowbillah, 3605 feet).

On reaching the New South Wales border the range takes a westerly direction so far as Mount Leslie, and then turns to the south again until it enters New South Wales, north of Tenterfield.

The principal offshoots from the main range in Southern Queensland are the Warrego Range, which branches off in a westerly direction from Mount Howard. Its principal peak is Mount Blunt. North of the Warrego Range are the Gowan Range (Mount Harden, Mount Grey) and the Blackall Range. From Mount Grey the Grey Range turns off to the south-west, until it reaches the New South Wales border near its western termination. In the Grey Range are Mount Calvin, Mount Pinkilla, Mount Heays, and Mount Shillinglaw. To the east of the southern part of the Grey Range lie Willie's Range, the Moriarty Range, and Helen Range.

East of Table Top and north of the main range are the Carnarvon Range and the Bigge Range. In a northerly offshoot of the last, called the Expedition Range, is Mount Nicholson.

Between the Bunya Mountains and the coast lie the Little Liverpool Range, the D'Aguilar Range, the Yabba Range, and the Cooyer Range.

From the spot where the main range reaches the New South Wales border, a spur known as the McPherson Range runs eastward and reaches the coast near Point Danger. In this range are Mount Barney, 4300 feet, Mount Merino, Mount Lindsay, 4064 feet, Mount Clunie, and Wilson Peak. From Mount Leslie a spur of the main range runs north-west. This spur contains Mount Domville.

A number of isolated western ranges may be mentioned here, such as the Constance Range, south of the Gulf of Carpentaria. West of the Grey Range are the Cheviot Range, the Negri Mountains, the Ruyera Mountains (Mount Stewart), the Catt Mountains (Mount Hamilton), the Beal Range (Mount Hetherton), the Canaway Range, the Coleman Range, the McGregor Range, and the Stokes Range.

Isolated peaks near the boundary of the Northern Territory, and in the latitude of the Tropic of Capricorn, are the Sisters, the Wrekin, and Barrington Peak. Near the point where Queensland, New South Wales, and South Australia meet, is McDonald Peak.

(iii.) *New South Wales.* From Maryland to a point north of Tenterfield the main Dividing Range forms the boundary between Queensland and New South Wales. From Tenterfield the range runs in a southerly direction to Ben Hall's Gap, east of Murru-

rundi, and is known as the New England Range; from this place the range runs west, as the Liverpool Range, to Beacon Hill, north of Cassilis. From Cassilis to Goulburn the range runs in various directions, forming the connecting link between the northern and southern tablelands. It is here known variously as the Main Range or the Blue Mountain Range. From Goulburn to Queanbeyan the range is called the Cullarin Range, and thence to Nimitybelle, the Gourock Range. Near Nimitybelle the range takes a sudden turn to the north-west so far as Kiandra. This part of the range is known as the Monaro Range (often found on maps as the "Maneroo" Range, from an obsolete spelling of "Monaro"). From Kiandra the range, now called the Muniong Range, runs south again until it enters Victoria near Forest Hill.

The chief peaks of the main range, going from north to south, are:—Sugarloaf Mountains, Bald Rock, Red Hill, Bluff Rock, Jondol, Coolamangeera, Baninba, Little and Big Spiraba, Capoompeta, Bald Nob, The Lighthouse (near Glen Innes), Blair Hill, Ben Lomond, 5000 feet, The Brothers, Mount Mitchell, Mount Butler, Mount Harris, Mount Brisbane, Mount Marion, Harnham Hill, Mount Andy, Mount Sugarloaf, White's Sugarloaf, Royinn Muc, Hanging Rock, Wambramurra, Lagoon Mountain, Mount Temi, Mount Tinagroo (near Murrurundi), Mount Towarri, Oxley's Peak, 4500 feet, Mount Moan, Mount Palmer, Halfmoon Peak, Lavarock, Omaleah Cliff, Mount Dexter (near Gulgong), Red Hill, Mount Graham, Nullo Mountain, Mount Coricudgy, Mount Boonboourwah, Mount Coorongooba, Mount Durambang, Mount Marsden, Corcalgong Hill, Monkey Hill, Mount Parwar and the Round Hill (near Tambaroora), Mount Horrible, Mount Blaxland (near Rydal), Mount Bindo, 4460 feet, Shooter's Hill, Sugarloaf Hill, Mount Armstrong, Mount McAlister, 3390 feet (near Taralga), Rocky Hill, Bald Hill, Mount Cullarin (near Gunning), Govan (between Lakes George and Bathurst), Mount Twynam, Tallerang Peak, 3134 feet, Mount Tumatbulla, The Bald Peak, The Bald Mountains, Big Badja, Kybeyan, 4010 feet, Hudson's Peak, The Brothers, The Twins, Bald Hill, Coolrington Hill, Peter's Hill, Murlingbul Hill, The Sugarloaf, Mars Hill, Tantangara Hill, New Chum Hill, Bullock Hill, Tabletop Mountain, Cobrabald Mountain, Bull's Peaks, Mount Townsend, Mount Kosciusko, about 7300 feet, The Ram's Head, The Pilot, 6020 feet, Forest Hill.

The Main Range throws off numerous spurs both on the eastern and on the western side. On the eastern side are the McPherson Range, forming the boundary between New South Wales and Queensland. In it are One Tree Hill, Koreelah Peak, Mount Wilson, Mount Clunie, Mount Lindsay, 4064 feet, Mount Glonnie, Mount Gipps, Mount Nungulba, Mount Worendo, Mount Merino, Mount Cougall, Mount Boololagang, Woodgee. The Richmond Range, which runs southward from near Mount Lindsay and forms the watershed between the Richmond and the Clarence Rivers, is a coastal range in its southern part. It contains The Edinburgh Castle, Bald Nob, Dome Mountain, Theresa Mountain, Mount Belmore, Mount Pickaooba, Mount Powarpar, Mount Mokima, Mount Marsh, Mount Lardner, Chapman's Peak.

The Macleay Ranges lie west and south of the Clarence River. In the northernmost of the ranges are Darke's Point, Mount Pleasant, Bold Top Millera, Mount Hunter, Camel Back, Hanging Rock, Bluff Rock, Mount Walker, Mount Tindal. In the range south of the Nymboida River are Hewitt's Peak, Mount Hyland, 4760 feet, Chandler's Rock, 5130 feet, Mount Williams, The Aberfoyle Sugarloaf, The Round Mountain, The Lookout, 4090 feet, McGrath's Hump, Boambee. A spur running south from the last-mentioned range to the mouth of the Macleay River contains Mount Yarrahapinny.

The Hastings Ranges form the watershed between the Macleay and the Hastings on the north, and between the Manning and the Hastings on the south.

In the northern range are Kemp's Pinnacle, Spoke's Hill, Mount Bunda Bunda, Mount Kippara, and in the southern range—Mount Carrington, Nesbitt's Peak, Hanging Rock Hill, Mount Comboyne, Mount Seaview.

The watershed between the Manning and Hunter Rivers is formed by the Mount Royal Range, which contains Gulph Mountain, Gog and Magog, The Pinnacle, Paddy's Ridge, Mount William, Mount Paterson, Mount Allyn, Mount Royal, 3000 feet, Mount Toonumbue, the Belgrave Pinnacle, Mirannie Mountain, Mount George, Hudson's Peak, Mount Johnstone.

South of the Hunter River lies the Hunter Range, beginning at Mount Coricudgy, about 3000 feet, and having in it Mount Baker, Mount Munnundilla, Mount Winstone, Mount Wirraba, Mount Poppong, Mount Howe, Mount Wareng, Mount Yengo, Mount Calore, Mount Bulgalaben, Mount Moruben, Mount Kuttenbun, Mount Simpson, Mount Manning, Mount Lockyer, Mount Warrawalong, 2084 feet.

The Blue Mountains in that part lying north of the Grose River contain Mount Wilson, Mount Tootie, Mount Tomah, 3276 feet, Mount King George. East of Rydal are Mount Clarence, 4000 feet, and Mount Victoria, 3525 feet. Farther south, towards the Mittagong Range, are Mount Mouin, Mount Thurat, Mount Shivering, Mount Colong, and the Burragorang Mountains.

The Mittagong Range forms the connecting link between the Great Dividing Range and the Illawarra Range, a coastal range extending from Clifton in the north to the Shoalhaven River in the south. In the Illawarra Range are Mount Keira, Mount Cordeaux, Mount Kembla, 1752 feet, Mount Macquarie, the Cambewarra Mountains, Mount Meryla.

The Great Dividing Range has no further offshoots to the east until the great bend is reached, but a few coastal ranges may be mentioned here. The Currockbilly Range lies between the Shoalhaven River and Moruya. It contains The Pigeon House, 2400 feet, Mount Kingimar, Mount Currockbilly, and Mount Budawang, 3630 feet. South of the Tuross River is Mount Dromedary, 2706 feet, and in a range running north-west from Tathra is the Mumballa Mountain. South-west of Twofold Bay lies Mount Imlay, 2910 feet, and Timbillica Hill.

Where the main range turns to the north-west, a spur is thrown off in a southerly direction, which contains The Coal Hole, Big Jack Mountain, Mount Marshall, Burimbucoo, and Mount Tennyson on the border of Victoria.

Between this range and the Snowy River is Sherwin's Range, and in it Timbury Mountain (near Nimitybelle). Farther west (near Berrydale) is Gygederick Hill, and south of this Shaw's Hill, Talbinga Hill, and Mount Tingi Ringi on the Victorian border.

Not far from Mount Kosciusko the Ram's Head Range branches off from the main range in a north-easterly direction; it contains Pretty Point and Waste Point, and in its neighbourhood lies Crackenback Peak.

Turning now to the western offshoots of the main range, there is first a spur extending westward from Wallangarra along the Queensland border to the River Severn. In this spur is Sailor's Jack Mountain.

A spur branching off in a north-westerly direction from Ben Lomond, and dividing again into various ranges, contains Mount Rumbee, White Rock, The Lighthouse, and Table Top Mountain (near Inverell).

The Nandewar Range follows a north-westerly direction from the neighbourhood of Kentucky. In it are Fox's Nob, Mount Lowry, Mount Drummond, Mount Tareela, Old Man Mountain, Brushy Mountain, Mount Kapunda, Mount Lindsay, 3000 feet, Lowe's Mountain, Bobby Waa, Mount Couradda, Mount Waa, Mount Eulowrie, Mount Rodd, the Terrybong Mountain, and Gravesend Mountain, half way between Moree and Warialda.

The Currabubula Range, which lies south of the Nandewar Range, and also has a north-westerly direction, contains Junction Peak, Mount Minarooba, Mount Turi, 3000 feet, Mount Uriari, Mount Erangaroo, the Pine Mountain, and Mount Moorowaba.

The Warrumbungle Range branches off to the north-west from Beacon Hill. In it are the Bluff Mountain, Dean's Mountain, Round Mountain, Mount Tomilbildoon, Appletree Mountain, Ulamambri Mountain, Timor Rock, Ulleamble Mountain, Cainby Point, and Uringery Mountain. Isolated peaks north of the Warrumbungle Range are—Carthian Hill, The Skipper, Mount Bingle, Mount Talbareya, Mount Digby, Tower Hill, and Picnic Hill. To the south of the range lie Belougery Mountain, Wambelong Mountain, Foley Mountain, Naman Mountain, Gowang Hill, Wangabutta Mountain, Mount Abundance, Boogadah Pinnacle, Mount Toogarlan, and The Parramattas.

Another north-easterly spur between Capertee and Cudgegong contains Mount Bongo, Eagle Hawk Hill, Emiguyley Mountain, Mount Bodangora. This spur is con-

tinued in a westerly direction from Molong, and has in it Mount Tuckelbri. It ends north of Condobolin in the Gobondry Mountains. A northern spur of this continuation is known as Hervey's Range, with Burrabadine Peak, and farther north as the Sappa Bulga Range, with The Sappa Bulgas, and Gibraltar Peak, south of Dubbo.

The Macquarie Range branches off from the main range near Shooter's Hill. It contains Mount Bathurst, Mimosa Hill, Bushranger's Hill, Mount Lawson, Toole's Mountain, Mount Macquarie, 3843 feet, and ends in The Canoblas, 4610 feet, south of Orange.

The Mundoonan Range branches off near Lake George. In it are Mount Mundoonan, 2674 feet, Mount Martin, Mount Midgee, Congera Hill, Mount Hunter, Mount Darling, Mount Baker, Cook's Hill, Mount Collins, the Illumie Mountains, Mount Dribendrew, Birrangan Mountain, Lucy Hill, Mount Wheoga, Mount Carawandool, and Mount Tallabung, south of Forbes. A southern spur leaves the Mundoonan Range near the Illumie Mountains, and contains Memagong Hill, near Young, and Mount Lightning, Kangaroo Mountain, and The Parson, near Gundagai.

The Muniong Range sends out three principal spurs, the Murrumbidgee Range, between the Murrumbidgee and Goodradigbee Rivers, the Tumut Range, between the Goodradigbee and Tumut Rivers, and the Murray Range, between the Tumut and Murray Rivers.

The principal peaks of the Murrumbidgee Range are:—Blue Bull Peak, Mount Yarrowlumla, Mount Tennent, Castle Hill, Tidbinbilla Peak, and Mount Urayarra.

In the Tumut Range are Mount Peppercorn, The Peak, Bogong Mountain, Blowering Mountain, Mount Jallula, Mount Bimberi, Mount Murray, Howell's Peak, The Half-moon, and The Sentry Box.

The Murray Range contains Smith's Lookout, Jagungal, Grey Mary's Bogong, The Inkbottle, Mount Dargal, 5490 feet, Manjar, Mount Garland, the Pilot Hill, Mount Hugel, Oberne Hill, and Mount Yaven, near Tarcutta. An offshoot from the Murray Range follows a westerly direction to Jerra Jerra, near Henty, and then turns south and ends in Mullanjandra Hill and the Pulpit Rock, near Albury.

In the extreme north-west of the State lies a range which may be considered as a continuation of the ranges of Western Queensland. In this range are:—Pic Du Faur, Mount Sturt, and Mount Poole. Near Milparinka the range becomes known as the Mount Brown Range, with Mount Brown as its principal elevation.

Farther south along the western boundary of the State lies the Grey Range, which stretches from The Pinnacle in the north to Broken Hill in the south. In it are Lewis' Peak, Mount Roby, Lake's Nob, Umberumberka, and, south of Broken Hill, The Pinnacles (North, Middle, and South).

(iv.) *Victoria.* The Great Dividing Range enters Victoria at Forest Hill, and takes a south-westerly direction under the name of the Cobboras Range and the Bowen Mountains. It then turns north-west until it reaches Mount Hotham. Hence it continues, as the Barry Mountains, in a westerly direction to Mount Howitt. From the latter peak to Mount Singleton it runs south, and then, under the name of the Hume Range, west again. After taking a northerly sweep round the head-waters of the Saltwater River, it returns to its westerly direction from Mount Macedon, and is for some distance known as the Bald Hills, and farther west as the Pyrenees. The Pyrenees may be considered as the end of the Great Dividing Range on the continent.

The chief peaks of the main range are:—Forest Hill, 5000 feet, on the boundary of New South Wales; Cobboras, 6050 feet, in the Cobboras Range; Leinster, Tambo, 4707 feet, The Sisters, and The Gap, in the Bowen Mountains; Mount Phipps, Mount Parslow, and Mount Hotham, 6100 feet, in the part of the range running north-west; Mount St. Bernard, 5060 feet, The Twins, 5582 feet, and Mount Howitt, 5718 feet, in the Barry Mountains; Mount Magdala, Mount Clear, Mount Skene, Mount Shillinglaw, and Mount Singleton, in the part of the range running south; Mount Selma, Mount Matlock, 4544 feet; Mount St. Clair, Mount Arnold, Mount Grant, Mount Strickland, Mount St. Leonard, and Mount Disappointment, 2631 feet, in the Hume Range; Mount William, 3827 feet, The Den, Dryden's Rock or Mount Diogenes, and Mount Macedon,

3324 feet, in the curve north of Lancefield; Mount Cavern, The Cardinal, Ravenscroft Hill, Mount Misery, Watershed Hill, St. Mary's Hill, Ben Major, Mount Buangor, 3247 feet, Mount Ararat, 2020 feet, and Kirk's Hill, in the Bald Hills and in the Pyrenees.

Offshoots from the main range are exceedingly numerous, especially in the eastern part of the State. Of those lying to the north of the range the following may be mentioned:—From Forest Hill to St. Bernard's Mount the main range forms the southern boundary of the counties of Benambra and Bogong. In County Benambra, a range forming the western watershed of the Indi River, and containing Mount Misery, leads to Mount Gibbo, 5764 feet. This mountain forms a central point from which at least six distinct chains branch out in various directions. Most of these ranges have offshoots of their own. The principal peaks are Pine Mountain, Mount Pininbar, 4100 feet, Black Mountain, Burrowa Mountain, 4181 feet, Baringamah, Cooyatong, 3270 feet, Mount Bernard, Walra, 2638 feet, Granyah, 3620 feet, Hore's Hill, Mount Talgarna, 2101 feet, Wheeler's Gibbo, The Brothers, McFarlane's Lookout, and Mount Leinster.

County Bogong, which lies between the Mitta Mitta River on the east and the Ovens River on the west, is, with the exception of its north-western part, practically a solid mass of mountains. In its easternmost range are Mount Wills, 5758 feet, Mount Cooper, Mount Martin, and Granite Peak. The Bundarrah Range, with Mount Cope, 6015 feet, and Mount Fainter is a westerly offshoot from the southern part of this range. From Mount Wills another range branches off, which contains Mount Bogong, 6508 feet, and Towanga, 4151 feet. From Mount Hotham a spur is sent out to the north which contains Mount Loch, 5900 feet, Mount Feathertop, 6306 feet, and Mount Stanley, 3444 feet.

West of the Ovens River the country becomes more level, and the ranges to the north of the main range are shorter. In a range, generally known as the Buffalo Mountains, which goes northward from St. Bernard's Mount, are Mount Cobbler, 5349 feet, Mount Typo, and Mount Buffalo, 5645 feet. A range going due west from Mount Howitt contains The Bluff, while in another range going north from Mount Matlock is Flour Bag Hill. The Cerberean Range forms the boundary between Counties Wonnangatta and Anglesey, and has in it Mount Torbreck, 5001 feet, and Mount Enterprise. It is continued northward by a range containing Mount Battery, Wombat Hill, Table Top, Hat Hill, 2544 feet, and Mount Samaria, 3138 feet.

Farther west are the Puzzle Range and the Strathbogie Ranges, in which are Mount Barran, Mount Wombat, 2659 feet, Sugarloaf Hill, Bailey's Hill, Upton Hill and Mount Barnard. Between the Strathbogie Ranges and the main range are some peaks, in County Anglesey, among which may be mentioned Mount Caroline, Junction Hill, Mount Millar, Boundary Hill, Ewing Hill, The Sisters, Mount Mackenzie, and Breach Peak.

A range which stretches north towards Bendigo contains Mount Alexander, 2435 feet, Mount Gaspard, and Mount Prospect.

Farther west only a few isolated ranges and peaks are found north of the Great Dividing Range, among which the following may be mentioned:—Mount Hooghly, near Dunolly, and farther north—Mount Moliagul, Mount Kooyoora, Mount Korong, 1408 feet, Mount Gowar, Mount Kerang, and Mount Egbert. West of the Avoca River are Avoca Hill, 2461 feet, Landsborough Hill, 1903 feet, Navarre Hill, 1355 feet, and Bolangum, 1225 feet.

On the southern side of the main range a branch follows the New South Wales boundary from Forest Hill to Cape Howe, and throws off various spurs to the south into County Croajingolong. In this range are Mount Tingaringy, 4771 feet, Mount Delegete, 4307 feet, Mount Tennyson, 3422 feet, Mount Merragunegin, Mount Buckle, 1465 feet, and Mount Carlyle, 1189 feet, near Cape Howe. Peaks of the southern spurs are Mount Ellery, 4251 feet, Mount Raymond, Mount Whittaker, Mount Bowen, Mount Watt, Mount Buck, Mount Bulla Bulla, Mount Deddick, and Sugarloaf Peak. Among the more or less isolated peaks of County Croajingolong may be mentioned Genoa Peak, 1611 feet, Mount Kay, 3284 feet, Mount Everard, and Mount Cann.

In a range running south from Cobboras through County Tambo are Black Mountain, Mount Statham, Mount Stewart, Campbell's Nob, Mount Murindal, Mount Dawson, Mount McLeod, Mount Tara, 2009 feet, and Nowa Nowa Hill. In a range farther to the west and on the eastern bank of the Tambo River are Mount Bindi, Mount Hopeless, Mount Tongio, and Mount Elizabeth.

In County Dargo, several ranges are stretching southward towards Bairnsdale. The most important of these ranges is known as the Mountain Ash Range. In it and the adjoining ranges are Notch Hill, 4507 feet, Mount Bald Head, Mount Little Dick, Mount Alfred, and Mount Taylor, 1571 feet. In a range farther to the west are Mount Birregun, Quagmunjie Hill, and Mount Thomson.

A group of mountains in the south-eastern corner of County Wonnangatta includes Snowy Bluff, Mount Kent, 5129 feet, Castle Hill, 4860 feet, and Mount Pretty Boy.

The Strzelecki Range extends southward from Mount Selma, and contains Mount Useful, 4270 feet, and farther to the west Mount Lookout, 3590 feet.

In County Buln Buln, south of the Latrobe River, are a number of ranges gradually leading down towards Wilson's Promontory, and known under the generic name of the Buln Buln Mountains. On the peninsula are Mount Singapore, Mount Hunter, Round-backed Hill, Mount Vereker, 2092 feet, Mount Leonard, Mount Latrobe, 2366 feet, Mount Ramsay, Mount Oberon, Mount Wilson, 2350 feet, Mount Norgate, and nearest to the Promontory, Mount Boulder, 1725 feet. From here the range can be traced over the islands of the Flinders group to Tasmania.

From the Buln Buln Mountains the range extends westward along the coast, and contains Mount Liptrap, near the Cape of the same name, Mount Wellington, on French Island, and Arthur's Seat, 1031 feet, Bald Hill, and Mount Martha, on the eastern shores of Port Phillip.

County Evelyn is traversed by the River Yarra, whose northern watershed is formed by the main Dividing Range, and the southern watershed by the Baw Baw Mountains and the Dandenong Range. Peaks in this district that have not already been mentioned are Mount Monda, 2974 feet, The Black Spur, Mount Juliet, 3631 feet, and Mount Riddell.

West of Port Phillip are the Otway Ranges, leading from the main range towards Cape Otway, and containing Peter's Hill, 1280 feet, and Lawry's Hill, and west of the Cape, Wattle Hill, and Mount Mackenzie.

West of the Yarrowee River are Mount Mercer and Mount Lawaluk, and, in the neighbourhood of Scarsdale, Mount Erip, 1539 feet.

A more important range turns southward from the extremity of the main range. In its northern part it is known as the Grampians, and farther south as the Serra Range. It contains Briggs' Bluff, Mount Difficult, 2657 feet, and Mount Abrupt, 2721 feet. Farther west lies the Victoria Range with The Ass's Ears, Mount Thackeray, and The Chimney Gap; and farthest west, the Black Range, with Mount Talbot, Mount Byron, West Glen Isla, Conical Hill, and East Glen Isla.

The extreme western district of Victoria contains a number of isolated peaks, many of which are of volcanic origin. Among these may be mentioned Mount Hamilton, 1050 feet, Mount Fyans, Mount Shadwell, Mount Noorat, 1024 feet. Richmond Hill and Mount Kincaid lie near the western boundary of the State. A further group of these volcanic hills lies across the border in the south-eastern district of South Australia.

(v.) *Tasmania.*—After reaching Tasmania, the Great Dividing Range spreads out towards the south and west. Two main systems may be distinguished, one lying between the eastern coast and the more or less level tract of land traversed by the Mersey and Tamar Rivers and their tributaries flowing northward, and the Derwent and its tributaries flowing southward, while the other system, both higher and larger in extent, lies to the west of the tract of land just described. The eastern system is again divided into a northern and a southern part by the South Esk River. A peculiarity of the Tasmanian mountain systems is that the country everywhere rises in terraces, which are locally known as "Tiers."

In the north-eastern mountain system the following peaks may be mentioned:—Mount Cameron, 1808 feet, The Batger, Little Mount Horror, Mount Horror, Mount Stronach, Mount Arthur, 3895 feet, The Blue Tier, Mount Pearson, 1203 feet, Mount Maurice, Mount Victoria, 3964 feet, Mount Barrow, 4644 feet, Ben Nevis, 3910 feet, Mount Saddleback, Ben Lomond, 5010 feet, the Mount Nicholas Range, 2812 feet, and St. Patrick's Head, 2227 feet.

In the south-eastern system, which may be said to stretch as far south as Frederick Henry Bay, although its offshoots are to be found on Tasman's Peninsula, are the Campbelltown Mountain, 2356 feet, St. Paul's Dome, 3368 feet, Mount St. John, 2550 feet, Snow Hill, 3175 feet, Lyne's Sugarloaf, 1777 feet, Mount Connection, 2630 feet, Mount Peter, Mount Freycinet, 2014 feet, Fadden's Tier, 2144 feet, Tooms, 2222 feet, Little Swanport, 1757 feet, Mount Murray, Brown Mountain, 2598 feet, Mount Morrison, and Prosser's Sugarloaf, 2195 feet. In the southern offshoots of the system are Mount Lord and Mount Connection, 1131 feet.

The level land west of the eastern mountains systems contains a number of isolated ranges and peaks, especially in its southern part, where it rises considerably higher than in the north, and forms, under the name of the Great Central Table Land, the watershed between the rivers flowing north and east, and those flowing south. Some of these peaks, taking here only those which lie east of the Mersey River, are:—The Asbestos Range, Mount Direction, Black Sugarloaf, Mount Arnon, Hummocky Hills, 1575 feet, Jacob's Sugarloaf, Vincent's Hill, 2000 feet, Mount Anstey, Jones' Point, Green Hill, Spring Hill, Pyke's Hill, 2289 feet, Mount Seymour, 2429 feet, Mount Reid, the Black Tier, 2544 feet, Quoin Mountain, Constitution Hill, Butler's Hill, 2197 feet, Staples' Sugarloaf, Mount Bethune, Mount Field East, 4165 feet, Platform Peak, Mount Dromedary, 3245 feet, Mount Wellington, 4166 feet, and Mount Rumney, 1236 feet. Farther south, to the west of D'Entrecasteaux Channel, is the Grey Mountain, 2713 feet.

In the western mountain system, going from north to south, a large number of peaks and ranges of a comparatively great height are found. Among these are the following:—Mount Tor, Mount Claude, Gad's Hill, Mount Cripps, Mount Charter, Mount Block, Mount Ramsay, 3810 feet, Mount Romulus, Mount Remus, the Cradle Mountain, 5069 feet (the highest mountain in Tasmania), Barn Bluff, Granite Tor, Mount Murchison, Mount Read, 3890 feet, Mount Tyndall, Mount Sedgwick, the Eldon Range, 4789 feet, with Eldon Peak and Eldon Bluff, the Rugged Mountain, the DuCane Range, Mount Ida, Mount Olympus, Mount Hugel, 4700 feet, Ironstone Mountain, 4736 feet, Quamby's Bluff, Dry's Bluff, 4257 feet, Brady's Lookout, 4497 feet, Mount Penny, 3782 feet, Mount Franklin, 3587 feet, the Table Mountain, 3596 feet, Wood's Quoin, 3033 feet, Nicholas' Sugarloaf, Blue Hill, Brady's Sugarloaf, 3361 feet, King William I. Mountain, 4360 feet, Mount Hobhouse, 4031 feet, King William II. Mountain, King William III. Mountain, the Loddon Hills, Mount Lyell, about 2750 feet, Mount Owen, about 3600 feet, Mount Huxley, the Raglan Ranges, Mount Jukes, Mount Sorell, Mount Darwin, Frenchman's Cap, 4756 feet, the Deception Range, the Prince of Wales' Range, Goodwin's Peak, the Denison Range, Wyld's Craig, 4399 feet, Mount Field West (or Mount Humboldt), 4721 feet, Mount Styx, Coan's Bonnet, Mount Wedge, the Wilmot Range, 3483 feet, Moore's Lookout, Tabletop, the Junction Range, 1210 feet, with View Hill, the Frankland Range, with Mount Giblin, the Arthur Range, 3668 feet, Mount Weld, and Mount Picton, 4340 feet.

Various ranges lie to north, west, and south of the western system. Ranges and peaks to the north (west of the Mersey River) are—Mount Roland, the Dial Range, and St. Valentine's Peak, 3637 feet.

In the north-west (north of the Pieman River) are—the Meredith Range with Mount Livingstone and The Parson's Hood, 2849 feet, the Campbell Range, the Dip Range, the Magnet Range, Mount Bischoff, 2598 feet, Mount Cleveland, Pyramid Hill, the Norfolk Range with Mount Donaldson, Longback, Mount Sunday, Mount Norfolk, Mount Balfour, Mount Cameron West.

Ranges to the west of the western system (south of the Pieman River) are—Mount Heemskirk, Mount Agnew, Mount Dundas, 3922 feet, Mount Zeehan, about 2500 feet, The Professors, the Croycroft Range, the Elliott Range, the D'Aguilar Range.

To the south-west lie the DeWitt Range, 2445 feet, Mount Berry, 2132 feet, Harry's Bluff, the Bathurst Range, 2626 feet.

In the south, running down to the South-east Cape, are the Hartz Mountains, The Calf, The Cow, Mount La Pérouse, 3800 feet, South Cape Hill, and Bare Hill.

(vi.) *South Australia and the Northern Territory.* Apart from some isolated peaks of volcanic origin, similar to those found in the western district of Victoria, lying in the extreme south-east of South Australia, such as Mount Gambier, Mount Schank, Mount Hope, and Mount Graham, the mountains of South Australia proper form a system of ranges extending about 400 miles northward from Cape Jervis, with another system in the extreme north of the State, and a third system to the west of Spencer's Gulf.

The first system probably formed at one time a coastal range along the eastern shore of the sea which connected the head of Spencer's Gulf with the Gulf of Carpentaria. The southernmost portion of this system begins at Cape Jervis, and is known as the Adelaide Range or the Mount Lofty Chain. Its northern continuation can be traced to the neighbourhood of Lake Frome. The Mount Lofty Range has a number of subsidiary ranges, chiefly on its eastern side, and nearly all running north and south. Among these are the Bull's Creek Range, the Bremer Range, the Mount Torrens Range, the Murray Range, Tothill's Range, the Bald Hill Range, the Camel's Hump Range, the Brown's Hill Range, and the Porcupine Range. Also on the eastern side of the main range, but running east and west, is the Mount Gould Range. On the south is the Bluff Range, running east and west, and on the west the Sellick's Hill Range, running north-east and south-west. The chief elevations in these ranges are:—Mount Lofty, 2334 feet, Mount Barker, 1681 feet, Mount Kaiserstuhl, 1973 feet, Lagoon Hill, Mount Bryan, 3065 feet, Mount Cone, 2601 feet, and Mount Razorback, 2834 feet. In the north-eastern offshoots of this range, towards Lake Frome, are Faraway Hill, Mount Victor, Billeroo Hill, and Nancatee Hill.

The Hummocks Range, known in its northern part as the Barunga Range, is intermediary between the Mount Lofty Range and the Flinders Range, of which latter range it has, however, often been taken to be the southern part. It begins near the head of St. Vincent's Gulf and stretches northward for about fifty miles.

The Flinders Range extends northward to the northern end of Lake Torrens. It has also a number of subsidiary ranges running more or less parallel with the main range. On the eastern side are the Brown's Hill Range, the Never Never Range, the Yappala Range, and Bunker's Range, all running north and south, and the Druid Range and Chace's Range, running north-east and south-west. On the western side, and running north and south, are Campbell's Range, Ragless Range, and Elder Range. The chief peaks in the Flinders Range are Mount Remarkable, 3178 feet, Mount Brown, 3200 feet, Mount Arden, 2750 feet, Mount Serle, 3060 feet, Mount Benbonyatha, 3470 feet, Freeling Heights, 3120 feet, Mount Aleck, 3700 feet, and St. Mary's Peak, 3900 feet.

The Gawler Ranges form the northern base of the triangle of Eyre's Peninsula. A low range, in which are Mount Laura, and Mount Whyalla, and which in its western part is known as the Baxter Range, forms a kind of connecting link between the Gawler Ranges and the Flinders Range. The only elevation in the Gawler Ranges worth mention is Mount Miccolo, 1058 feet. South of the ranges are a number of isolated peaks and ranges, among which are Darke's Peak, Tooligie Hill, Parla Peak, Mount Greenly, the Marble Range, and Mount Drummond.

North of Lake Gairdner are the Warburton Range, with Wilgena, and farther west the Ooldea Range, with Pounuthy Peak. West of Lake Eyre is the Stuart Range, and farther north the Denison Range, with The Peak, and the Hanson Range, with Mount Arthur. To the north of Mount Arthur lies Mount Alexander, and west of the latter are Mount Alberga, Mount Weir, and Chambers' Bluff. Farther west is the Everard Range, and in its north the Musgrave Range, with Mount Morris, 3732 feet, Mount Woodroffe, 3786 feet, and Mount Windham. West of the Musgrave Range are the Deering Hills, with Mount Hardy and Mount James, and south of the Deering Hills, the Blyth Hills and the Birksgate Range, with Mount Sir Thomas and Mount Watson. North of the

Deering Hills is Petermann's Range, with Stevenson's Peak, and farther north again are McNichol's Range, Rowley's Range, and Blood's Range.

North of Lake Amadeus lies Long's Range, with Mount Unapproachable. Farther north is the James Range, and connected with the latter on the east, Chandler's Range, with Mount Peachy, and on the west, Watson's Range, Cleland Hills, Magarey Range, with Mount Lyell Brown, and the Henty Hills, with Mount Russell. North of the James Range is Gardiner's Range, and then the Macdonnell Ranges, continued on the west by the Bahama Range, with Mount Liebig, Mount Peculiar, and Mount Udor. In the Macdonnell Ranges the principal peaks are Mount Heughlin, Mount Lloyd, and Mount Sir Charles. To the east, the Macdonnell Ranges are continued by the Strangways Range, Hart's Range, with Mount Brassey, and the Jervois Range, with the Pulpit Rock, Mount Michael, Ledan's Peak, Mount Baldwin, and Mount Leighton, and farther east, Mount Hogarth. A subsidiary range branches off from Mount Michael, which contains Arno's Peak, Mount Skinner, and Mount Winnecke. This range leads to Forster's Range, with Mount Mann. West of Forster's Range is John's Range, with Mount Stuart and Mount Browne, and farther on the Giles Range with Mount Denison, Mount Barkly, and Mount Rennie; then the Treuer Range, with Mount Hardy, Mount Singleton, and Mount Farewell, and the Campbell Range, with Mount Cockburne.

The Crawford Range, with Mount Morphett and Mount Strzelecki, lies to the north of Forster's Range. Farther north are the Davenport Range, the Murchison Range, with Mount Fisher and Mount Blyth; the McDouall Range, with Mount Samuel; the Short Range; the Whittington Range, with Cox's Nob, Mount Primrose, and Mount Shilling; and the Ashburton Range. From the Ashburton Range, a range containing Mount Bedford leads to the White Stone Ridge, with Mount Thomas, in the vicinity of the Gulf of Carpentaria.

The chief elevations in the ranges near the Roper River are :—Mount Colton, Mount Müller, Mount Elsie, Benda's Bluff, Snowden's Peak, Mount Bray, and Mount Catt.

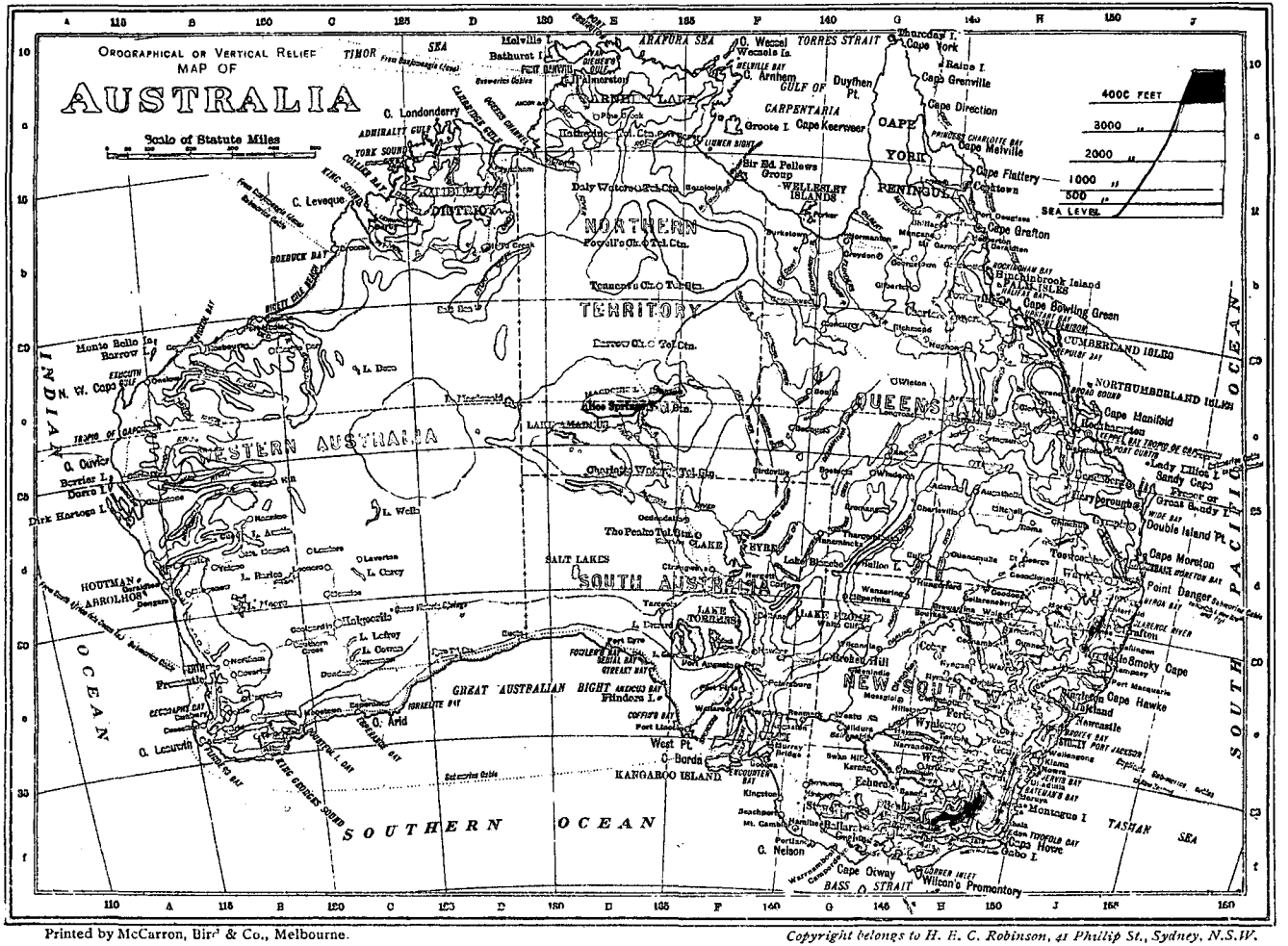
In the neighbourhood of Blue Mud Bay are—Mount Parsons, Mount Ramsay, and Mount Fleming. Mount Solitary, Mount Rigg, and Mount Gwydir lie between the Roper and the Catherine Rivers, while north of the latter river are Mount Harvey and Coronet Hill.

In the neighbourhood of the Victoria River are the following ranges :—North of the river—the Ellesmere Range, with Croker's Hill and Round Hill, and the Delamere Downs, with Mount Needham; south of the river are the Murchison Range; the Newcastle Range, which is continued towards the boundary of Western Australia by the Connaught Range, with the Remarkable Peaked Hill; the Stokes Range; the Jasper Range, with Mount Sandiman and Mount Warburton; and Roe's Downs, with Mount Sanford, Mount Baines, Mount Fagan, and Mount Wollaston.

(vii.) *Western Australia.* The chief ranges of Western Australia follow the coast, although a large number of isolated ranges and peaks are found in the interior towards the boundary of South Australia and the Northern Territory. Near the south coast the following may be mentioned :—The Bussell Range, at the western end of the Great Australian Bight; the Wittenoom Range, with Mount Ridley, north of Esperance; the Ravensthorpe Range, with Mount Desmond and Mount Madden farther west; and the Stirling Range, with Bluff Knoll, 3640 feet, and Mount Barker, north of Albany.

The Darling Range skirts the west coast as far north as Gantheaume Bay. In its southern part is Mount William, 1700 feet; north of the Swan River the range is also known as the Gairdner Range, and farther north as the Moresby Range and Victoria Range. Mount Lesueur is the most important elevation. From the Moresby Range a range branches off towards the north-east along the Greenough River. In this range are Tinderlong and Beedeinna. Farther to the north-east the range is known as the Nicholson Range, with Illimbirrie and Mount Luke, and finally as the Weld Range, with Mount Lulworth.

North of these ranges is the Robinson Range, with Mount Seabrook and Mount Gould; and west of the Robinson Range, the Lockyer Range, with Mount Observation, Fossil Hill, Mount Dalgety, Mount Puckford, Mount Steere, Mount Gascoyne, and



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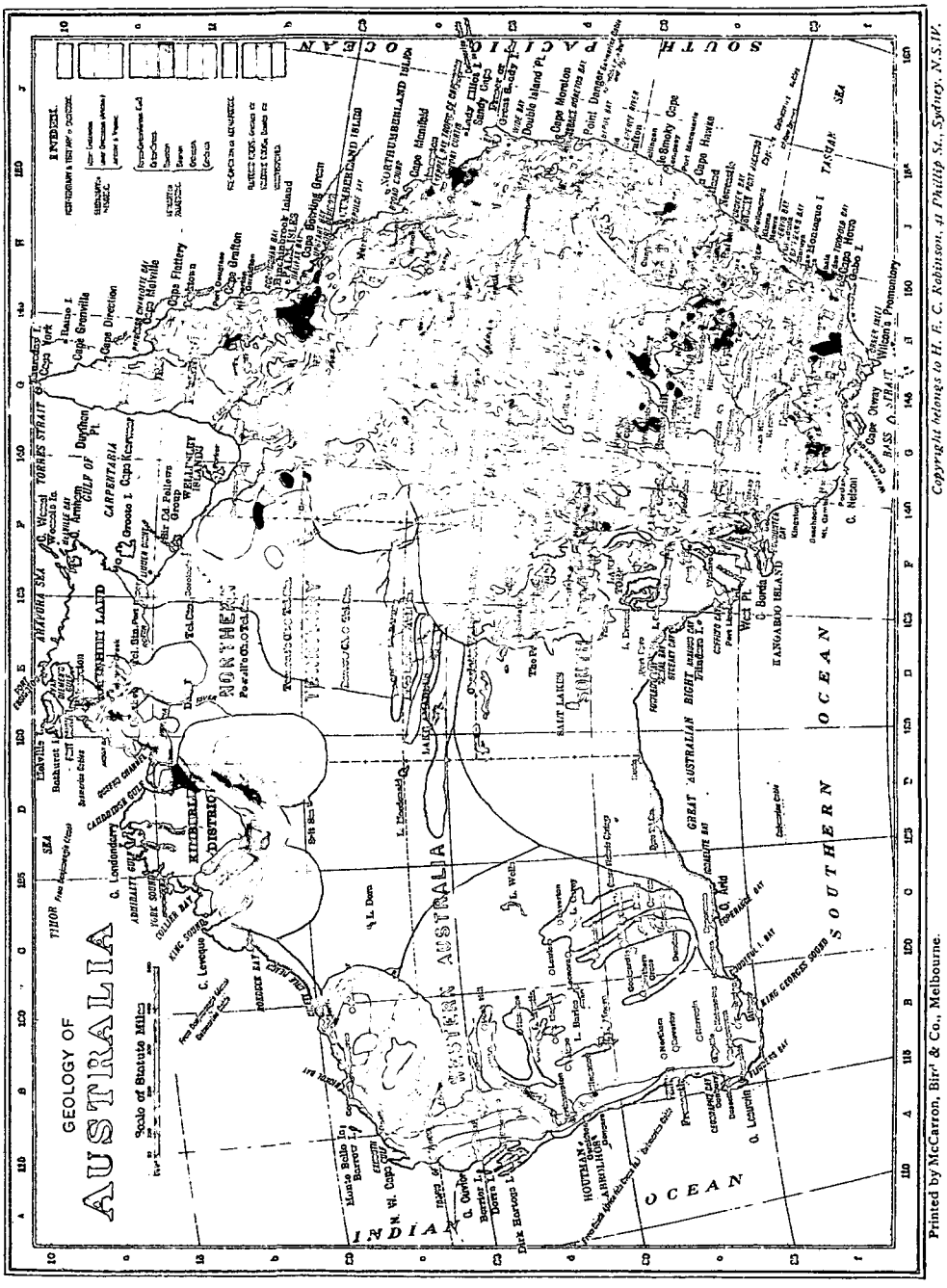

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Mount James; and the Kennedy Range, with Mount Sandiman and Mount Agamemnon. Stretching towards Exmouth Gulf are the Black Range, with Mount Thomson, The Pleiades and Mount Forrest; and the Barlee Range, with Mount Palgrave and Mount Florry. Nearer to the coast are the Bald Hills, with Mount Alexander, Mount Murray, Mount Stuart, Mount Amy, and Mount Minnie. East of the Lockyer Range are the Waldburg Range, with Mount Samuel, Mount Augustus, Double Peak, Mount Egerton, and Mount Beverill; and stretching eastward from Mount Augustus, the Teano Range.

South of the Fortescue River is the Hamersley Range, with Mount Darnell, Mount Enid, Mount Elvire, Mount Riga, Mount Flora, Mount Farquhar, Mount Pyrton, Mount Margaret, Mount Sylvia, Mount Stevenson, Mount Bruce, and Mount George. Mount Bruce, 3800 feet, is considered to be the highest mountain in Western Australia.

The Mungaroona Range lies north of the Fortescue River; a subsidiary range stretching northward from it towards the DeGrey River contains Mount Berghaus, Mount Grant, and Mount Woodhouse. South-east of this range are the Gregory Range, the Throssell Range, and the Paterson Range, with Mount Isdell.

Lying to the east of these ranges are a number of others extending towards the South Australian border, among which the following may be mentioned, going from south to north:—The Bremer Range, with Mount Gordon, west of, and the Fraser Range, east of the Dundas goldfield. Farther north, near the Southern Cross goldfield, are Mount Geraning, Hope's Hill, and Mount Jackson. Mount Gibson, Mount Maclean, and Mount Churchman are in the neighbourhood of Lake Moore; and the Brooking Range, with Ranford Peak and the Maynard Hills, with Mount Forrest, Mount Richardson, Mount Bevan, Mount Mason, and Mount Ida, are east of Lake Barlee. Mount Magnet lies to the south of Lake Austin. From Lake Austin eastward, and in the neighbourhood of the East Murchison goldfield, are the Montagu Range, the Barr Smith Range, the Kimberley Range, the Finlayson Range, Bates' Range, with Mount Cleaver, the Sholl Range, and the Grant Duff Range.

Near the Mount Margaret goldfield are the Princess Range, the Carglew Range, with Mount Courtenay; the De La Poer Range, with Mount Alexandra; the Neckersgat Range, with Mount Pater, Mount Strawbridge and Cowderoy Hill; the Virginia Range, the Newland Range; and the Ernest Giles Range, with Peterswald Hill. Father to the east lie the Sutherland Range; the Spinifex Range, with Remarkable Peak; the Todd Range, with Mount Charles; the Warburton Range, with Mount Whitby; the Barrow Range, with Mount Burt; the Cavenagh Range, with Mount Scott, Mount Aloysius and Mount West; and the Tomkinson Range. The last-named range joins the Deering Hills, the westernmost offshoot of the South Australian Warburton Range. North-east of the Princess Range is the Timperley Range, with Mount Moore; and west of the latter range, the Lee Steere Range, with Mount Sir James; the Parker Range, the Brassey Range, with Mount Normanhurst and Mount Sir Gerard; and the Carnarvon Range, with Mount Essendon.

Between these ranges and the Throssell Range mentioned above are:—Sugarloaf Hill; the Ophthalmia Range, with Mount Newman; the Robertson Range; and the Wadara Hills, with Mount Hann. In the same latitude as the Wadara Hills, but nearer to the South Australian boundary, are the Runton Range; the Rawlinson Range, with Mount Forrest, Mount Buttfield, Mount Barlee, Mount Russell, and Gill's Pinnacle; the Robert Range; and the Carnarvon Range, with Mount Destruction. North of the Carnarvon Range are the Turner Hills, the Bonython Range, the Angas Range, the Gordon Range, and the Winnecke Hills. The lastnamed range is near the South Australian boundary, as are the following ranges lying farther north:—The Stansmore Ranges, the Erica Range, the Phillipson Ranges, the Gordon Hills, with Mount Elphinstone; and the Musgrave Ranges, with Mount Wilson. More or less isolated peaks west of the Musgrave Ranges are Mount Erskine, Mount Ernest, Mount Cornish, Mount Elgin, Mount Romilly, Mount Stewart, and Mount Fotheringham.

The ranges of the Kimberley district lie along the courses of the Fitzroy River and of its tributaries, and between these rivers and the coast-line extending from King Sound to Queen's Channel on the boundary of the Northern Territory. In the south-western part of this district is the Edgar Range, with Goorda Tower and Mount Collins. East of its northern part is the Grant Range, with Mount Wynne; and farther east the St. George Range, with Mount Tuckfield and Mount Campbell; the Geikie Range; the Hull Range, with Mount Ball; the Müller Range, with Mount Amherst; the Lubbock Range, the Ramsay Range, the McClintock Range, the Cummins Range, the Albert Edward Range, with Eliotra Mountain; the Osmond Range, with Mount Elder; the Mica Range, with Mount Parker and Mount Pitt; the Carr Boyd Range, with Pompey's Pillar; the Burt Range, the Pincombe Range, and the Bastian Range, south of Cambridge Gulf.

From the Geikie Range, the Oscar Range, with Mount North; the Napier Range, with Mount Joseph; the Wyndham Range, with Mount Nellie; the Kimbolton Range, and the Saddle Range stretch towards the north-west, the three last-named ranges reaching the coast between King Sound and Collier Bay. The ranges above-mentioned form in a general way the southern boundary of the Kimberley Goldfields, while the following ranges, going in a south-westerly direction from Cambridge Gulf, form its northern limit:—The Cockburn Range, with Mount Cockburn; the Saw Range, the O'Donnell Range, the Howitt Range, with Mount Lush and Mount King; the Sir John Range, with Mount Wells and Mount Luke; the Forrest Range, with Mount Leake; and the King Leopold Range. The King Leopold Range takes a sweep north-westward towards Collier Bay, and contains Mount Ord, Bold Bluff, Mount Smith, Mount Humbert, and Mount Hopeless. North of the King Leopold Range is the Edkins Range, with Mount Shadforth, Mount Egnes, and Mount William. The Macdonald Range, with Mount Lyell and the Whately Range, lie to the south of Brunswick Bay. East of the Edkins Range are the Caroline Range, with Mount Elizabeth and Mount Harris; the Phillips Range, and the Carlton Range. Mount Bertie and Mount Horace are to the north of Mount Elizabeth. Near York Sound is the Princess May Range, with Mount York, about 3000 feet, and Mount Hann, 2800 feet. In the extreme north of the State, near Vansittart Bay, are the Sir Frederick Range and Mount Casuarina.

§ 2. The Geology of Australia.

1. **General.**—Independent and authoritative sketches of the geology of each State were given in Year Books No. 1 (see pp. 73 to 103) and No. 2 (see pp. 78 to 111). Want of space has precluded the insertion of these sketches in the present issue of the Year Book, and it has not been considered possible to give anything like a sufficient account of the geology of Australia by presenting here a mere condensation of these sketches. Reference must, therefore, be made to either Year Book No. 1 or No. 2, *ut supra*.

2. **Geological Map of Australia.**—The map of the Geology of Australia on page 70, shews the geographical distribution of the more important geological systems and formations.

§ 3. The Fauna of Australia.[1]

1. **Introduction.**—An authoritative article describing in some detail the principal features of the Fauna of Australia was given in Year Books No. 1 (see pp. 103 to 109) and No. 2 (see pp. 111 to 117). The information given herein is merely a synopsis of that article.

2. **Zoological Isolation of Australia.**—The most striking character of the Australian Fauna is its distinctness from that of the rest of the world, and is evinced as much by the peculiarity of the animals found in Australia as by the absence of others which are widely spread over the remainder of the earth's surface. The land-fauna of the globe is, as a rule, limited in its migrations by the sea. The older a group of animals is the farther could it spread, for it has been able to make use of many land connections that have now vanished. Thus, the *Felidæ* and *Suidæ* (cats and pigs) are old enough to have found their way over almost the whole habitable globe, excepting Australia and a few islands to the north. Alone of the great islands of the world, our island-continent has remained separated from the other great land masses since the first appearance of the *Felidæ* and *Suidæ*. The barrier that prevented the incursion of the adaptable and enterprising cats and pigs was equally efficient in the case of a host of other forms, from elephants to earthworms.

3. **Effect of Isolation.**—Before this isolation of Australia, however, some animals had reached our shores, and among them were the marsupials. Once here, they varied among themselves, and gave rise to the diversified forms that now inhabit the country.

There are other groups besides the marsupials whose history runs on similar lines. Of some of them we know the history, but not of all, and the deciphering of the tale of the early origin of the fauna of Australia is one of the many interesting pieces of work that lie before the naturalist.

4. **The Non-Marine Fauna.**—The peculiar features of the fauna of Australia are more noticeable in the land and fresh-water types than in the marine forms, since barriers to the migration of the latter are more easily broken.

(i.) *Mammalia.* The great group of mammals has been divided into two sections, the *Prototheria* or egg-laying mammals, and the *Theria*, which includes all the rest. The *Theria* are again subdivided into numerous sections, one of which is that of the marsupials. The egg-laying mammals are confined to Australia, Papua and Tasmania, and there is no absolutely conclusive evidence of their ever having lived elsewhere. As regards marsupials, they are found nowadays only in Australia and some adjacent islands, and in America as far north as the Southern United States. In former times, as we know from fossils, they ranged still further north and lived even in Europe. (*a*) *The Higher Theria.* The chief types of *Theria* above the marsupials are the Dingo *(Canis Dingo)*, several kinds of true rats *(Mus)*, a widely spread water-rat *(Hydromys Chrysogaster)*, and bats (the largest of which are generally known as flying foxes). Among marine forms there are seals, whales, and the dugong. (*b*) *Marsupials.* The group of Marsupials has, in Australia, reached its highest stage of development, and, as the other *Theria* are almost absent, its members have become differentiated in almost every direction to occupy their places. Thus we have the grass-eating kangaroos, the flesh-eating Tasmanian wolf and Tasmanian devil, and the "tiger cat," the insect-eating native cats and "weasels," the ant-eating marsupial mole and banded ant-eater, the root-eating wombats, the omnivorous bandicoots and leaf-eating koalas. One great group of land *Theria* has no counterpart. There is no marsupial bat.

1. Contributed by T. S. Hall, Esquire, M.A., D.Sc., Lecturer in Biology, Melbourne University.

Marsupials have been divided into two main groups roughly corresponding to carnivorous and vegetarian, and known respectively as *Diprotodontia*, that is, "having two front teeth," and *Polyprodontia*, that is, "having many front teeth." A more modern classification, and apparently a better one, is based on the structure of the foot. In the kangaroo, what appears to be a single toe on the inner side of the hind foot bears two claws. In reality there are two toes present which are bound together by skin. This feature is known as "syndactyly," and gives its name to the group, *Syndactyla*. The other group comprises the remaining marsupials, and is known as *Diadactyla* (c) *Prototheria or Monotremes*. The egg-laying mammals, in their strange method of reproduction, and in certain points in their structure, shew a decided approach to the reptiles, and they are widely separated in many ways from the higher mammals. They include only the platypus *(Ornithorhynchus anatinus)* and the spiny-ant-eaters. The platypus is found only in Eastern Australia and Tasmania, and does not range up very far into Queensland. The spiny-ant-eaters are represented on the mainland and in Tasmania by the well-known *Tachyglossus aculeata* or *Echidna aculeata*, and in Papua by an allied form with a somewhat longer beak.

(ii.) *Diadactylous Marsupials.* Confining our attention to the Australian marsupials, we find the *Diadactyla*, which have the second and third toes separate, are represented only by a single family, the *Dasyuridæ*, or native cat family. This family is apparently less changed from the original marsupial stock than is any other Australian one. The "native cats" *(Dasyurus)*, the several kinds of which range in size from that of pug-dog to that of a ferret, are found all over Australia, from Tasmania to New Guinea. A number of small species exist, belonging to two other genera *(Phascologale* and *Sminthopsis)*. Popularly they are called weasels and mice. Some of them are terrestrial, others arboreal. Among the special types may be mentioned a jerboa-like species *(Antechinomys laniger)*; the banded ant-eater *(Myrmecobius)*; the Tasmanian Devil *(Diabolus ursinus*, or *Sarcophilus ursinus)*; and the Tasmanian wolf or tiger *(Thylacynus cynocephalus)*.

(iii.) *Syndactylous Marsupials.* Taking now the remaining Australian marsupials, we find that they all have the second and third toes bound together; they are *Syndactyla*. Two families are polyprotodont, namely the *Peramelidæ* and the *Notoryctidæ*; the others are diprotodont.

The *Peramelidæ*, or bandicoot family, comprises several animals mostly about the size of a large rat. They are ground-dwellers, and range over all Australia. The marsupial-mole *(Notoryctes)* forms a family by itself.

The remaining families are diprotodont. The *Phalangeridæ* include the Australian "possums" *(Trichosurus)*, which have wrongly appropriated the name of the true or American opossums. Some allied forms *(Petaurus, Dromicia* and *Acrobates)* have a fold of skin stretching from the hind to the fore-limb, which enables them to glide from a greater to a lesser height. Collectively, they are spoken of as flying-squirrels, though they cannot fly and are not squirrels. The Koala, Kola, or native bear or monkey-bear *(Phascolarctos)*, a lethargic leaf-eater, belongs to this family. The *Phascolomyidæ*, or wombat family, contains only one living genus *(Phascolomys)*, confined to the south-east and Tasmania.

The kangaroo family *(Macropodidæ)* is a large one, and its members vary in size from the giant, standing higher than a man, to the Musk kangaroo of the Herbert River, which is about ten inches long. The larger forms dwell on the open plains, while the smaller ones frequent the scrubs and rocky fastnesses of the hills. The tree kangaroos of Queensland and New Guinea *(Dendrolagus)* browse on the leaves of the lofty eucalypts, which they climb to their topmost branchlets.

Among extinct marsupials we have *Diprotodon*, as large as a rhinoceros, and *Thylacoleo*, a huge carnivorous monster, greater than a polar bear, allied to the phalangers. There were also giant kangaroos, standing a dozen feet high, and wombats as large as an ox. On the other hand there was a dwarf wombat, about a quarter of the size of our recent species. The oldest known Australian marsupial, *Wynyardia*, is of Oligocene or perhaps Eocene age.

(iv.) *Aves.* Birds show the same characteristics that the mammals do. Deficiencies, as well as the presence of peculiarly Australian forms, serve to distinguish Australia from the rest of the world. Among the groups which are eminently characteristic are the birds of paradise, which have their home in New Guinea and just pass into Northern Queensland. Of pigeons, we have more species than the rest of the world, and we have the largest and the smallest kinds. The cassowary and the emu, forming a single family, are unknown beyond our regions. The brush-tongued lories *(Trichoglossidæ)* follow the flowering of the honey-yielding eucalypts throughout Australia. The honey-eaters *(Meliphagidæ)* are among our most characteristic birds, though they pass far beyond Australia itself, and out across the Pacific, even to the Sandwich Islands. The peculiar mound-nests of the *Megapodidæ*, where the eggs are hatched after the manner of those of reptiles, are very characteristic of Australia, though not confined to it. Among other strange forms are the bower birds *(Ptilonorhynchidæ)*, the lyre birds *(Menuridæ)* and the scrub birds *(Atrichidæ)*. The striking absentees, whose abundance in Eastern Asia makes their absence here so remarkable, are the pheasants and vultures, while there are other abundant East Asiatic forms which are poorly represented amongst us.

(v.) *Reptilia.* Among reptiles we have the estuary crocodile *(Crocodilus porosus)* occurring commonly in the northern rivers, and ranging from India to the Solomons, and even it is said, as a stray, to Fiji. A small, harmless species *(Crocodilus johnstoni)* is found in the fresh waters of the north. Of freshwater tortoises there are three genera represented *(Chelodina, Emydura* and *Elseya)*. None occur in Tasmania. Among lizards the most peculiar are the so-called legless lizards *(Pygopodidæ)*, which are confined to Australia. The family contains seven genera, *Pygopus, Delma* and *Lialis* being the most widely spread. The skinks *(Scincidæ)* are the most numerous Australian family, and the *Varanidæ*, commonly called "goannas," contain the largest of our lizards. Altogether we have about 390 species of lizards.

There are slightly more than 100 species of Australian snakes, about three-quarters of them being venomous. The number of non-poisonous forms decreases as the latitude rises, so that in Tasmania none are found, all the snakes being venomous. The harmless kinds include the blind snakes *(Typhlopidæ)*, the pythons and the rock snakes. *Python spilotes*, the diamond and carpet snake of the mainland, and *Dendrophis punctulatus*, the long, slender, green tree-snake are found throughout almost the whole of Australia. Though so many of our snakes are poisonous, only five common forms are really deadly. These are the brown snake *(Diemenia textilis* or *Demansia textilis)*, the black snake *(Pseudechys porphyriacus)*, the copperhead—unfortunately called diamond snake in Tasmania—*(Denisonia superba)*, the tiger snake *(Notechis scutatus)*, known in Tasmania as the carpet snake, and lastly the death adder *(Acanthophis antarctica)*. The first four all occur in Tasmania, and are the only snakes found there. None of our snakes have long enough teeth to make their bite, when made through clothing—even a single thickness of tweed—a cause of dread.

(vi.) *Amphibia.* In amphibia the most striking fact is the absence of tailed forms *(Urodela)*. The characteristic old world genus *Rana* just invades North Queensland. We are especially rich in tree frogs *(Hylidæ)*, some of which as *Hyla aurea*, the common southern green frog, have lost their tree-climbing habits and the adhesive suckers on fingers and toes. The *Cystignathidæ*, which include the common sand frog of the south-east, occur also in South America. The water-holding frog, with its body enormously distended by water, can live for a year or more in thoroughly dried mud. It is found in Central Australia.

(vii.) *Pisces.* Owing to our poor river development, Australia is not rich in fresh-water fish. The great river basin of the Murray has several species peculiar to itself, as the Murray cod *(Oligorus macquariensis)*, the golden perch *(Plectroplites ambiguus)*, the silver perch *(Therapon ellipticus)* and the catfish *(Copidoglanis tandanus)*. Another curious instance of distribution is that of the blackfish of the south-east *(Gadopsis marmoratus)*. This is almost confined to rivers entering Bass Straits, it being found in

Northern Tasmania and Southern Victoria. Eels, which are common in all streams from Cape York to Beachport, are absent from the entire Murray basin and Central and Western Australia, and apparently from Northern Australia as well. The southern trouts *(Galaxias)* are found in the streams of south-eastern Australia and Tasmania. As some of the species, but not all, breed in the sea, the distribution of the genus is not as remarkable as once was thought. The gudgeons or bullheads *(Gobiidæ)* have representatives in fresh water all over Australia. None of these grow to any size. The most remarkable of all our fresh-water fish, however, is the lung fish *(Neoceratodus forsteri)* which, as its name implies, has a lung, a modified swim-bladder, in addition to the usual gills.

(viii.) *Invertebrate Fauna.* In land and fresh-water shellfish we are not well off. The eastern coastal strip from Cape York well into New South Wales is closely related to Papua in its shellfish, as it is also in so many other ways. There are many genera of the Helices. Of the rest of Australia the western State seems the poorest in molluscs, though many of its inhabitants range right across to the eastern highlands.

Among insects, the butterflies of the warm damp Queensland costal districts vie in beauty with those of any part of the world. We are especially rich in beetles of the families *Buprestidæ*, *Curculionidæ*, and *Cerambycidæ*, the members of the first family containing some very handsome insects. White ants are plentiful, especially in the tropics.

Among crustacea a species of *Apus* is found in the interior, and the allied *Lepidurus* in the southern coastal districts. The peculiar isopod, *Phreatoicus*, and some allied genera, are found in our mountain streams or burrowing in the damp southern gullies. *Koonunga*, a recently described Anaspid, is an annectant form between the stalk and sessile-eyed groups. Among the higher crustacea belonging to the *Parastacidæ* are the genera *Astacopsis (Chærops)*, which is spread all over the continent, and *Engaeus*, found only in Tasmania and Southern Victoria. The larger species of *Astacopsis* are used as food.

Among the flat-worms, *Linstowia* is peculiar, as it is confined to the monotremes and the marsupials of Australia and South America. *Temnocephala* infests the fresh-water crayfish, and is curious on account of its distribution, as it ranges up into America, and, strange to say, an allied form has recently been recorded from Southern Europe.

Australia is rich in earthworms, but the native species are being ousted by European forms. *Megascolides* is remarkable for the size of one of its species, the giant earthworm of Gippsland (*M. australis*), which reaches a length of over seven feet, and is as thick as a man's finger. The *Acanthodrilidæ* are distinctly a southern family, being especially plentiful in Australia, New Zealand, and South America, and gradually becoming fewer in species as we pass north from these lands.

To attempt to deal with the fresh-water protozoa would make too great demands on space, and for the same reason the whole of the marine fauna must here be passed over in silence.

§ 4. The Flora of Australia.

1. **Introduction.**—In Year Books No. 1 (see pp. 109 to 114) and No. 2 (see pp. 117 to 122) a fairly complete though brief account was given of the Flora of Australia. It has not been thought desirable to repeat that account at length in the present issue of the Year Book; the information presented below is, therefore, given in an extremely condensed form.

2. **Character of the Australian Flora.**—(i.) *Effect of Climate and Altitude.* Owing to the large extent of Australia and the consequent diversity in climate in different parts of the continent, its vegetation is largely varied. Though there is a certain similiarity in various types of vegetation between Australia and New Guinea and the Malay

Archipelago, and again between Australia and Africa, the great bulk of the vegetation of the temperate zone, where the flora is profuse and various, is distinctly Australian. Hence Australia has been isolated for a long time, but probably not so long as New Zealand. The fact that the Australian flora is of a primitive type is of particular interest from a scientific point of view. Forms belonging to early stages in plant evolution exist upon this continent, which otherwise can only be studied as fossils in rocks of long-passed geological ages. This is seen particularly in *Byblis*, *Casuarina*, *Cephalotus*, *Nuytsia*, *Polypompholyx*, and *Phylloglossum*.

(ii.) *General Features of the Australian Landscape.* The coastal regions furnish the most luxuriant vegetation. Upon the heights near the coast, and on the uplands and foot-hills which stretch from them to the coast, is to be found the heaviest forest. There is, however, in Western Australia, also a great forest belt, some 350 miles in length, and from 50 to 100 miles in breadth, not on the coastal side, but extending eastward from the Darling Ranges. Inland from what may be called the coastal forest region, the vegetation becomes thinner as the more arid regions replace those of heavier rainfall, and rapidly dwindles, till bushes, scrubs, and dwarf eucalypts, with belts of pine at intervals, give place to a scant and inferior vegetation. Except in its south-west portion Western Australia has little forest. South Australia has still less. Under the copious rainfall of the coastal regions the wild flowers that belong to Australia, variegated, bright, often scentless, grow luxuriously.

(iii.) *Special Plant Adaptations.* The general dryness of the climate of Australia has led to marked adaptations in form and structure, especially in the interior parts of the continent. Spiny plants, with foliage of hard, woody ribs and reduced surface area, are characteristic. Short, scale-like leaves, for example, mark considerable reduction in the foliage area. In some desert plants, as *Verbenaceæ* and *Solanaceæ*, a dense coat of hairs covers the leaves or whole plant; in others, as in some acacias, the surface of leaves and twigs is substantially a layer of resin, both modifications greatly reducing the transpiration, and serving also as a protection against the extremes of heat and cold to which they are subjected.

(iv.) *Forestry, Agriculture, and Horticulture.* Both hardwoods and softwoods abound in the forests, their commercial uses being set out in the chapter on Forestry (see Section X.) Cereals are grown in large quantities, but none are indigenous. Native plants fit for human consumption are insignificant. Useful fruits are found, but most of them require to be cooked, being very acid in their native state. In tropical Queensland there are pleasant fruits of the lime family. Edible species of fungi are also common, but none are marketed or much used, except the common mushroom.

3. **Botanic Distribution.**—(i.) *Tropical and Extra-tropical Regions.* The indigenous vegetation of Australia may be roughly classed as tropical and extra-tropical.

(*a*) *The North-east Tropical Vegetation.* While something under a tenth of Queensland bears timber of general commercial value, at least a third of that State may be said to be covered with trees which have a local use for building and other purposes. There are a large number of fibrous plants of the orders *Malvaceæ*, *Sterculiaceæ*, *Leguminosæ*, *Urticaceæ*, *Scitamineæ*, *Amaryllideæ*, and *Aroideæ*. Of indigenous fruits the principal are the lime and Davidson's plum, with others of the order *Euphorbiaceæ*, *Ampelideæ*, *Rutaceæ*, and *Urticaceæ*. There are numerous fungi—many of them edible. Among trees, acacias, araucarias, xanthorrhœas, eucalypts, canariums and callitris are the most abundant. Besides these there are medicinal, oil, perfumery, rubber, and spice plants, as well as some which give tanning and dyeing material. Trees of many varieties, of unique beauty in the landscape, and yielding handsome timber for carpentry, cover the forests.

(*b*) *The North-west Tropical Vegetation.* In the northern district of Western Australia, there are extensive tracts of pasture lands on the slopes drained by the rivers flowing into the Indian Ocean. Inland from these are stunted bush and scrub lands, which in some cases impinge even upon the sea border. The Kimberley district has forest country about the Fitzroy River, and the King Leopold Ranges are tree-clad. Farther eastward, and continuing across the border into the Northern Territory, grasses and stunted growths form the main vegetation. The flatness of the country accounts for the absence of mountain flora, the vertical elevation rarely reaching 1500 feet.

(*c*) *The Australian Extra-tropical Vegetation.* Australia is believed to have been free from geological upheavals and cataclysms for a longer period than most other lands. The persistence of type which has resulted has enabled its flora to become very well adapted to prevailing climatic conditions. The chief feature of the Australian forest landscape, as presented by the eastern, south-eastern, and south-western portions of the continent, is the presence of giant hardwoods, mostly eucalypts—very often rapidly reproductive, and attaining to a great age. Along the shores of the Great Australian Bight, and in the north and north-west, there are no extensive forests. In the desert interior the vegetation is generally dwarfed and stunted. In the south-west, where the ranges approach closely to the ocean, the forest bed extends beyond the watershed some distance inland. The great belt of jarrah (*E. marginata*) which stretches eastward from the Darling Hills, has two distinct but narrow belts of tuart (*E. gomphocephala*) and red gum (*E. calophylla*) between it and the coast. Within this extensive tract of jarrah, in the extreme south-western part of the State, is the main karri (*E. diversicolor*) belt, stretching from Cape Hamelin to Torbay. In this region the jarrah, karri, tuart and red gum are the dominant trees. In the somewhat drier districts stretching eastward of the jarrah belt, there is a fairly wide strip of white gum (*E. redunca*) enclosing a narrow belt of York gum (*E. loxophleba*) which, as regards its northern and southern limits, is almost coterminous with the jarrah. East of this again the arid region is entered, and the forest rapidly dwindles. The Tasmanian flora represents that of South-east Australia, but there are also some valuable conifers, chiefly in the western and southern parts, such as the Huon (*Dacrydium Franklini*), King William, and celery-top (*Phyllocladus rhomboidalis*) pines. The forest area of the island is extensive, covering two-thirds of its surface.

(*d*) *Alpine Vegetation.* Owing to its generally low elevation, but little characteristic alpine flora is found in Australia. The transition from the forest to the alpine region is gradual, and it is only the highest points of the mountains of Eastern and South-eastern Australia that bear alpine flora.

(*ii.*) *Exotics.* While Australia has made large and flourishing additions to the forest flora of many countries, a large number of exotics have been successfully introduced here, furnishing a welcome variation to the sombre landscape presented by the prevailing eucalypts. With practically no cereals of value as food for man, and with few fodder plants, and these generally of an inferior kind, the fruits of the earth which Australia offered were indeed small. Now, however, her fields are sown with introduced grains and grasses, and yield abundantly. But alien weeds have come in too. Native pests are few in number, but some of the most aggressive weeds have intruded themselves, to the detriment of the native flora.

4. **Natural Orders of Plants Represented in Australia.**—A classified list of the natural orders of plants represented in Australia may be found in Year Books No. 1 (see p. 114) and No. 2 (see p. 122).

§ 5. Climate and Meteorology of Australia.[1]

1. **History of Meteorology of Australia.**—Systematic rainfall observations appear to have been commenced first in Adelaide by the late Sir G. Kingston in 1839, and continued till 1878, the last eighteen years being concurrent with more complete observations taken at the Astronomical Observatory in that city. At Sydney, Port Macquarie, Melbourne, and Brisbane observations appear to have been taken from 1840. Those at Sydney, from April, 1840, to the end of 1855 were taken at South Head, five miles east of Sydney; at Petersham in 1856, at Double Bay in 1857-8, and at the Sydney Observatory, Flagstaff Hill, from 1859 onwards.

At Brisbane a record of rainfall was kept from 1840 to 1846 by Captain T. C. Wickham. About 1860 Dr. Barton, Resident Surgeon of the Brisbane Hospital, continued the observations on the site occupied by the Supreme Court Buildings, but upon his death the duties were transferred to the staff of the telegraph office, and the instruments removed to William-street. On the appointment of the first Government Meteorologist (Mr. E. MacDonnell) the instruments were again removed to Wickham Terrace, and some years later to the present site. Mr. C. L. Wragge succeeded Mr. MacDonnell in 1887.

At Hobart observations were started by Sir John Franklin, when Governor of Tasmania, in the year 1840. The Observatory was founded in the following year by Captain Kay, R.N., who took hourly observations for eight years. Mr. Francis Abbott, who had a private observatory in Murray-street, carried on tri-daily observations of pressure, temperature, humidity, cloud and rain from 1841 to 1880. Observations of rainfall were also started by the Marine Board at the lighthouses under their care, and by others privately. Mr. Abbott was obliged to relinquish his work in 1880. Captain Short was appointed Government Meteorologist in 1882.

Under the late Mr. R. L. J. Ellery, an Observatory was founded near Williamstown, Melbourne, in the middle of 1853, and a record also kept at Melbourne by Mr. Brough Smyth from 1856 till 1858, viz., to the date of the creation of the new Observatory on Flagstaff Hill under Professor Neumayer.

The observations at the present Melbourne Observatory were commenced in June, 1863, under Mr. R. L. J. Ellery himself, the Observatories at Williamstown and Flagstaff Hill being abandoned. At Port Phillip records were taken for the years 1840 till 1851, and are given in the New South Wales *Government Gazette*. Some doubt attaches to these records and to the site upon which they were taken; for this reason they have not been used in the discussion of rainfall for Melbourne itself, the results of which have been tabulated and given herein.

At Perth no official records of rainfall were taken till 1875, when the observations were commenced at the Botanical Gardens by the Surveyor-General (Sir Malcolm Fraser), and where they have been continued up to the present time.

During the first half of last century meteorological observations were confined largely to rainfall only. Systematic observations of pressure, temperature, rainfall, wind, and other meteorological elements began with the foundation of the astronomical Observatories in the capitals of the different States, viz.:—At Adelaide in 1856; Hobart, 1841; Melbourne, 1854; and Sydney, 1858. The directors of these Observatories established meteorological stations, under competent observers, in different parts of the country from time to time, as opportunity allowed.

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1. Prepared from data supplied by the Commonwealth Meteorologist, H. A. Hunt, Esquire, F.R.M.S.

2. **Magnetic Observations.**—On the 1st January, 1841, an Imperial Observatory, forming part of an international scheme, was founded at "Hobart Town" (Tasmania), and magnetic observations were taken there systematically up to the end of 1854.

Early in 1858 Prof. Neumayer opened an Observatory on Flagstaff Hill, Melbourne, where hourly observations in terrestrial magnetism were taken regularly up to the 28th February, 1863. That gentleman also made extended trips into the country, where he determined the magnetic elements at 230 stations from sea-level to 7200 feet above, and distributed in such a manner that the greatest distance between them was not more than 30 miles, and frequently only 18 or 20 miles. By the commencement of February, 1864, Neumayer had completed his magnetic survey of Victoria. Since June, 1863, magnetic observations have been systematically continued at the Melbourne Observatory.

Observations in the other States, more or less fragmentary, have been carried on from time to time under the auspices of the Surveyor-General's Department.

3. **Equipment.**—The determination of the climatological data has been made by records from the following instruments :—

(i.) *Rainfall.* Rainfalls have been generally measured by the cylindrical gauge, 8 inches in diameter.

(ii.) *Temperature.* Temperatures have been recorded by self-registering maximum and minimum thermometers, which are read and set daily.

(iii.) *Atmospheric pressure.* Pressures have been measured by mercurial barometers of the Fortin or Kew pattern.

(iv.) *Evaporation.* The following description of tanks has been used in the observations of evaporation, viz.:—

Perth.—Slate tank :—3 ft. by 3 ft. by 3 ft., inside a cement tank (sunk into the ground 2 ft. 6 in., leaving 5 in. clear all round) which is kept full of water.

Adelaide.—Slate tank :—3 ft. by 3 ft. by 3 ft., inside a cement tank (sunk into the ground, leaving 7 in. clear all round) which is kept full of water.

Brisbane.—Piché's tube evaporimeter, from 1902 to 1908, that is, for seven years only.

Sydney.—Galvanised iron tank, 4 ft. diameter and 3 ft. deep, sunk in the ground 2 ft. 11 in.

Melbourne.—Slate tank :—3 ft. by 3 ft. by 10 in., sunk in ground and covered with wire cage 2 ft. above tank, $\frac{3}{4}$-in. wire netting.

4. **Wind Velocities and Pressures.**—The velocities have been measured by means of anemometers, of Robinson's pattern, at Perth, Adelaide, Sydney, and Melbourne, the sizes being as follows :—

Perth—Diameter of cups, 9 in. ; distance from centre to centre of cups, 4 ft.
Adelaide—Diameter of cups, $8\frac{1}{4}$ in. ; distance from centre to centre of cups, 4 ft.
Sydney—Diameter of cups, 4 in. ; distance from centre to centre of cups, 4 ft.
Melbourne—Diameter of cups, $8\frac{3}{4}$ in. ; distance from centre to centre of cups, 4 ft. $0\frac{1}{2}$ in.
At Hobart, Hagemann's suction tube was used.

The wind-pressures corresponding to the observed velocities have been calculated by the formula $P=0.003\ V^2$, in which P denotes pressure in lbs. per square foot, and V velocity in miles per hour.

5. **Creation of the Commonwealth Bureau of Meteorology.**—By Chapter 1, Part 5, Section 51, sub-section viii. of the Commonwealth Constitution it is enacted that "Parliament shall, subject to this constitution, have powers to make laws for the peace, order, and good government of the Commonwealth with respect to *inter alia* meteorological observations." The Meteorological Act of 1906 was assented to on the 28th August, 1906, and enacts that—The Commonwealth Meteorologist may, subject to the

regulations and to the directions of the Minister, be charged with any of the following duties:—

(*a*) The taking and recording of meteorological observations.
(*b*) The forecasting of weather.
(*c*) The issue of storm warnings.
(*d*) The display of weather and flood signals.
(*e*) The display of frost and cold wave signals.
(*f*) The distribution of meteorological information.
(*g*) Such other duties as are prescribed to give effect to the provisions of this Act.

The Governor-General may enter into an arrangement with the Governor of any State in respect of all or any of the following matters:—

(*a*) The transfer to the Commonwealth, on such terms as are agreed upon, of any observatory and the instruments, books, registers, records, and documents used or kept in connection therewith.
(*b*) The taking and recording of meteorological observations by State officers.
(*c*) The interchange of meteorological information between the Commonwealth and State authorities.
(*d*) Any matters incidental to any of the matters above specified or desirable or convenient to be arranged or provided for for the purpose of efficiently and economically carrying out this Act.

The Governor-General may enter into any arrangement with the Governments of other countries or any of them for the interchange of meteorological information and any matter incidental thereto between such Governments and the Commonwealth.

The Governor-General may make regulations prescribing all matters necessary or desirable to be prescribed for carrying out or giving effect to this Act.

H. A. Hunt, Esquire, F.R.M.S., was appointed Commonwealth Meteorologist, and entered upon his duties on the 1st January, 1907.

6. **Meteorological Conference.**— Under the presidency of the Commonwealth Meteorologist, a conference of meteorologists was held in the Conference-room of the Bureau of Census and Statistics during the period from the 20th to the 23rd May, 1907, when the following questions were discussed, viz.:—

(i.) The range of practical meteorological observation to be at once undertaken.
(ii.) The expansion of meteorological work to be undertaken in the future.
(iii.) The extent of purely scientific investigations, the undertaking of which is desirable in the interests of meteorology.
(iv.) Meteorological records, reports, and publications.
(v.) Maritime meteorology.
(vi.) The relation of river observation to flood forecasting.
(vii.) The co-operation of the Commonwealth and States Departments.

7. **Organisation of Meteorological Bureau.**—The Central Bureau premises are situated at the corner of Victoria and Drummond streets, Carlton, Melbourne. Observations are carried on at this site, and also within the Royal Society's grounds, which afford a better exposure for the instruments. Divisional offices are also maintained in the capitals of each of the other States. The central Bureau is divided into five sub-departments, each being under the immediate supervision of assistants, whose duties are distributed as follows:—

Weather predictions, storm warnings, summaries of current weather, and management of the Central Bureau.
Divisional Bureaux and observing stations.
Climatological work and records of the Commonwealth.

Daily observations, entry of same into ledgers, reduction tables for various elements, distribution and collection of information with respect to the maritime branch of the service.

Instrumental stock, standardising and satisfactory working of all instruments before distribution to the observing stations throughout the Commonwealth.

The five assistants have been drawn from the different States, where they held leading positions in the meteorological services prior to the advent of federal control. They now constitute a daily forecast board, presided over by the Commonwealth Meteorologist. The observations made at the chief meteorological stations are telegraphed to the Central Bureau, where they are plotted on charts and discussed by the Board. The results of its deliberations are then wired to the divisional Bureaux, where they are amplified or modified in the light of the latest local indications, and then distributed to the settled districts of the respective States.

8. **Publications, etc.**—The following have been issued daily, viz.:—(i.) Weather charts. (ii.) Rainfall maps. (iii.) Bulletins, Victorian and Interstate, shewing pressure, temperature, wind, rain, cloud extent, and weather.

The Bulletins of Climatology are as follow:—(*a*) Bulletin No. 1.—A general discussion of the climate and meteorology of Australia, illustrated by one map and diagrams.

(*b*) Bulletin No. 2.—A discussion of the rainfall over Australia during the past ten years compared with the normal, illustrated by one map.

The daily observations made at all stations throughout the Commonwealth are being reduced to tabular form monthly with a view to publication at the end of the present year.

9. **General Description of Australia.**—In the general description of Australia, page 53, it is pointed out that a considerable portion (0.530) of three States of the Australian Commonwealth is north of the tropic of Capricorn, that is to say, within the States of Queensland, the Northern Territory and Western Australia, no less than 1,149,320[1] square miles belong to the tropical zone, and 1,020,720 to the temperate zone. The whole area of the Commonwealth within the temperate zone, however, is 1,825,261[2] square miles, thus the tropical part is about 0.386, or about five-thirteenths of the whole, or the "temperate" region is half as large again as the "tropical" (more accurately 1.509). By reason of its insular geographical position, and the absence of striking physical features, Australia is, on the whole, less subject to extremes of weather than are regions of similar area in other parts of the globe; and latitude for latitude Australia is, on the whole, more temperate.

The altitudes of the surface of Australia range up to a little over 7300 feet, hence its climate embraces a great many features, from the characteristically tropical to what is essentially alpine, a fact indicated in some measure by the name Australian Alps given to the southern portion of the great Dividing Range.

While on the coast the rainfall is often abundant and the atmosphere moist, in some portions of the interior the rainfall is very limited, and the atmosphere dry. The distribution of forest, as might be expected, and its climatic influence, is consequently very variable. In the interior there are on the one hand fine belts of trees, on the other there are large areas which are treeless, and where the air is hot and parched in summer. Again, on the coast, even as far south as latitude 35°, the vegetation is tropical in its luxuriousness and also somewhat so in character. Climatologically, therefore, Australia may be said to present a great variety of features. The various climatological characteristics will be referred to in detail.

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1. In the article "Australia" in the Encyclopædia Britannica, Vol. XXX., p. 796, this area is given as 1,145,000 square miles.

2. Given as 1,801,700 square miles in the work above quoted, where, however, the statistics are said "to refer only to the continental States of the Federation, not to Tasmania."

10. **Meteorological Divisions.**— The Commonwealth Meteorologist has divided Australia, for climatological and meteorological purposes, into five divisions. The boundaries between these may be thus defined :—(*a*) between divisions I. and II., the boundary between South and West Australia, viz., the 129th meridian of east longitude ; (*b*) between divisions II. and III., starting at the Gulf of Carpentaria, along the Norman River to Normanton, thence a straight line to Wilcannia on the Darling River, New South Wales ; (*c*) between divisions II. and IV., from Wilcannia along the Darling River to its junction with the Murray ; (*d*) between divisions II. and V., from the junction of the Darling and Murray Rivers, along the latter to Encounter Bay ; (*e*) between divisions III. and IV., starting at Wilcannia, along the Darling, Barwon, and Dumaresq Rivers to the Great Dividing Range, and along that range and along the watershed between the Clarence and Richmond Rivers to Evans Head on the east coast of Australia ; (*f*) between divisions IV. and V., from the junction of the Darling and Murray Rivers along the latter to its junction with the Murrumbidgee, along the Murrumbidgee to the Tumut River, and along the Tumut River to Tumut, thence a straight line to Cape Howe ; (*g*) division V. includes Tasmania.

The populations included within these boundaries on 30th June, 1907, may be taken approximately as follows :—

Division	I.	II.	III.	IV.	V.
Population	260,000	481,000	537,000	1,369,000	1,511,000

In these divisions the order in which the capitals occur is as follows :—(i.) Perth, (ii.) Adelaide, (iii.) Brisbane, (iv.) Sydney, (v.) Melbourne, (vi.) Hobart, and for that reason the climatological and meteorological statistics will be set forth in the indicated order in this publication.

(i.) *Special Climatological Stations.* The latitudes, longitudes, and altitudes of special stations, the climatological features of which are graphically represented hereinafter, are as follows :—

SPECIAL CLIMATOLOGICAL STATIONS.

Locality.	Height above Sea Level.	Latitude. S.		Longitude. E.		Locality.	Height above Sea Level.	Latitude. S.		Longitude. E.	
	Feet.	deg.	min.	deg.	min.		Feet.	deg.	min.	deg.	min.
Perth	197	31	57	115	51	Port Darwin ...	97	12	28	130	51
Adelaide ...	140	34	56	138	35	Daly Waters ...	700	16	16	133	23
Brisbane ...	137	27	28	153	2	Alice Springs ...	1926	23	38	133	37
Sydney	146	33	52	151	12	Dubbo ...	863	32	18	148	35
Melbourne ...	91	37	50	144	59	Laverton ...	1530	28	40	122	23
Hobart	160	42	53	147	20	Coolgardie ...	1402	30	57	121	10

11. **Temperatures.**—In respect of Australian temperatures generally it may be pointed out that the isotherm for 70° Fahrenheit extends in South America and South Africa as far south as latitude 33°, while in Australia it reaches only as far south as latitude 30°, thus shewing that, on the whole, Australia has a more temperate climate when compared latitude for latitude with places in the Southern Hemisphere.

The comparison is even more favourable when the Northern Hemisphere is included in the comparison, for in the United States the 70° isotherm extends in several of the western States as far north as latitude 41°. In Europe the same isotherm reaches almost to the southern shores of Spain, passing, however, afterwards along the northern shores of Africa till it reaches the Red Sea, when it bends northward along the eastern shore of the Mediterranean till it reaches Syria. In Asia nearly the whole of the land area south of latitude 40° N. has a higher isothermal value than 70°.

The extreme range of shade temperatures in summer and winter in a very large part of Australia amounts to probably only 81°. In Siberia, in Asia, the similar range is no less than 171°, and in North America 153°, or say nearly double of the Australian range.

Along the northern shores of the Australian continent the temperatures are very equable. At Port Darwin, for example, the difference in the means for the hottest and coldest months is only 8.7°, and the extreme readings for the year, that is, the highest maximum in the hottest month and the lowest reading in the coldest month, shew a difference of under 50°.

Coming southward the extreme range of temperature increases gradually on the coast, and in a more pronounced way inland.

The detailed temperature results for the several capitals of the States of Australia are shewn in the Climatological Tables hereinafter. It will suffice here to briefly refer to special features.

(i.) *Perth.* Meteorological observations were taken in the Perth Botanical Gardens as far back as 1876, but since the conditions surrounding the instruments and the situation of the station relative to Perth cannot be regarded as quite satisfactory, the more exact climate history of Perth did not properly commence until 1897, when the present Observatory was established. During the period 1897 to 1908, the mean annual shade temperature of Perth was 64°, about a degree higher than that for Sydney and Adelaide, over 5° higher than that for Melbourne, and 10° above that for Hobart, but, on the other hand, 4° below that for Brisbane. The average temperature for the month of January is 73.5°, and for July 55.2°.

The extreme maximum shade record of 107.9° was registered in December, 1904, and the lowest minimum shade temperature was 35.3°, viz., in August, 1908.

(ii.) *Adelaide.* In Adelaide the climate is drier and more sunny than in the other capitals, and, consequently, radiation is less hindered. The extremes of heat are consequently somewhat more marked, especially in the summer months. The mean shade temperature for January is 74.2°, and February 74.0°, and that of July 51.5°. Records of the temperature having reached 100° exist for each of the six summer months from October to March, and of having exceeded 110° exist for each of those months with the exception of March and October. The highest record of shade temperature in Adelaide is 116.3°, registered in January, 1858, and the lowest 32.0°, a range of 84.3°. The freezing point has only once been reached by the shade temperature thermometers, notwithstanding the fact that records have been kept for fifty-two years. Frosts have, however, occurred on the grass (four feet below the shade thermometers) at various times between the beginning of April and the end of November.

(iii.) *Brisbane.* In Brisbane the monthly mean shade temperature ranges from 77.4° in January to 58.0° in July, a difference of 19.4°. The extremes have varied from 108.9° in January to 36.1° in July, viz., through a range of 72.8°.

(iv.) *Sydney.* In Sydney the highest monthly mean is 71.6°, recorded in January, while the lowest, again in July, is 52.3°, giving a range of 19.3°.

The extremes of shade temperature recorded at Sydney over a period of half a century are 108.5° in January, 1896, and 35.9° in July, 1890, *i.e.*, a range of 72.6°.

(v.) *Melbourne.* In Melbourne the January mean shade temperature averages 67.5°, and that of July 48.5°, the highest reading ever recorded being 111.2° in January, 1862, and the lowest 27.0° in July, 1869.

(vi.) *Hobart.* The mean temperature for the hottest month at Hobart is 62.2° in January, and that of the coldest 45.8°, in July, the highest reading ever recorded being 105.2° in December, 1897, and the lowest 27.7°, nearly a degree higher than the lowest experienced in Melbourne.

(vii.) *Hottest and Coldest Parts.* A comparison of the temperatures recorded at coast and inland stations shews that, in Australia as in other continents, the range increases with increasing distance from the coast.

In the interior of Australia, and during exceptionally dry summers, the temperature occasionally reaches or exceeds 120° in the shade, and during the dry winters the major portion of the country to the south of the tropics is subject to ground frosts. An exact knowledge of temperature disposition cannot be determined until the interior becomes more settled, but from data procurable, it would appear that the hottest area of the continent is situated in the northern part of Western Australia about the Marble Bar and Nullagine goldfields, where the maximum shade temperature during the summer sometimes exceeds 100° for days, and even weeks continuously. The coldest part of the Commonwealth is the extreme south-east of New South Wales and extreme east of Victoria, namely, the region of the Australian Alps. Here the temperature seldom, if ever, reaches 100° even in the hottest of seasons.

In *Tasmania* also, although occasionally hot winds may cross the Straits and cause the temperature to rise to 100° in the low-lying parts, yet the island as a whole enjoys a most moderate and equable range of temperature throughout the year.

(viii.) *Monthly Maximum and Minimum Temperatures.* The mean monthly maximum and minimum temperatures can be best shewn by means of graphs, which exhibit the nature of the fluctuation for each for the entire year. In the diagram (on page 103) for nine representative places in Australia, the upper heavy curves shew the mean maximum, the lower heavy curves the mean minimum temperatures based upon daily observations. On the same diagram the thin curves shew the relative humidities (see next paragraph).

12. **Relative Humidity.**—Next after temperature the degree of humidity may be regarded as of great importance as an element of climate; and the characteristic differences of relative humidity between the various capitals of Australia call for special remark. For nine representative places the variations of humidity are shewn on the graph on page 103, which gives results based upon daily observations of the greatest and least humidity. Hitherto difficulties have been experienced in many parts of Australia in obtaining satisfactory observations for a continuous period of any length. For this reason it has been thought expedient to refer to the record of humidity at first order stations only, where the results are thoroughly reliable. Throughout, the degree of humidity given will be what is known as *relative humidity*, that is, the percentage of aqueous vapour actually existing to the total possible if the atmosphere were saturated.

(i.) *Perth.* At Perth the mean annual humidity at 9 a.m. is 63; the greatest monthly mean is 83, and is in June, and the lowest 45, in January.

(ii.) *Adelaide.* At Adelaide the mean annual humidity is only 56; the mean monthly humidity has been as low as 33 in January and December, and as high as 84 in June.

(iii.) *Brisbane.* In Brisbane the mean annual humidity is 68; the lowest monthly mean recorded is 47, and is in September, and the highest 85 in the months of March and May.

(iv.) *Sydney.* In Sydney the mean annual humidity is 73; the greatest monthly average, which occurred in May, 1889, the wettest month on record during the last forty years, was 90, while the lowest monthly mean, 55, occurred in the month of October, 1867.

(v.) *Melbourne.* The mean annual humidity derived from the 9 a.m. 3 p.m. and 9 p.m. observations in Melbourne is 71; the greatest monthly average 88, in June and July, 1888, and the lowest 54, in February, 1908.

(vi.) *Hobart.* Hobart's mean annual humidity is 71, the highest 92, in June, and the lowest 51, in February.

From the above results, it is seen that, in respect of relative humidity, Sydney has the first place, while Hobart, Melbourne, Brisbane, Perth, and Adelaide follow in the order stated, Adelaide being the driest. The graphs on page 103 shew the annual variations in humidity. It will be observed that the *relative* humidity is ordinarily but not invariably great when the temperature is low.

13. **Evaporation.**—The rate and quantity of evaporation in any territory is influenced by the prevailing temperature, and by atmospheric humidity, pressure and movement. In Australia the question is of perhaps more than ordinary importance; since in its drier regions water has often to be conserved in "tanks"[1] and dams. The magnitude of the economic loss by evaporation will be appreciated from the following records, which have been obtained from either jacketed tanks sunk into the ground, or in the case of Laverton (W.A.) from a jacketed vessel exposed on the surface.

The average total evaporation at Sydney is 37.42 inches; at Melbourne, 38.40 inches; at Adelaide, 54.83 inches; and at Perth, 65.85 inches, these results being based respectively upon 46, 37, 39, and 10 years' observations. For Brisbane the result is 85.73 inches, based upon 7 years' observations only, and determined by means of Piché's tube evaporimeter.

In the interior of New South Wales the annual evaporation is as high as 84 inches; in Central Australia at Alice Springs the average for 18 years is 97.32 inches; at Coolgardie, Western Australia, the mean for ten years is 86.87 inches, and at Laverton, in the same State, the yearly amount derived from the last 4 years is 145.32 inches, or over 12 feet.

(i.) *Monthly Evaporation Curves.* The curves shewing the mean monthly evaporation in various parts of the Commonwealth will disclose how characteristically different are the amounts for the several months in different localities. The evaporation for characteristic places is shewn on diagram shewing also rainfalls (see page 104).

(ii.) *Loss by Evaporation.* In the interior of Australia the possible evaporation is often greater than the actual rainfall. Since, therefore, the loss by evaporation depends largely on the exposed area, tanks and dams so designed that the surface shall be a minimum are advantageous. Similarly, the more protected from the direct rays of the sun and from winds, by means of suitable tree planting, the less will be the loss by evaporation: these matters are of more than ordinary concern in the drier districts of Australia.

14. **Rainfall.**—As even a casual reference to climatological maps, indicating the distribution of rainfall and prevailing direction of wind, would clearly shew, the rainfall of any region is determined mainly by the direction and route of the prevailing winds, by the varying temperatures of the earth's surface over which they blow, and by the physiographical features generally.

Australia lies within the zone of the south-east and westerly trade winds. The southern limit of the south-east trade strikes the eastern shores at about 30° south latitude. Hence we find that, with very few exceptions, the heaviest rains of the Australian continent are precipitated along the Pacific slopes to the north of that latitude, the varying quantities being more or less regulated by the differences in elevation of the shores and of the chain of mountains, upon which the rain-laden winds blow, from the New South Wales northern border to Thursday Island. The converse effect is exemplified on the north-west coast of Western Australia from the summer south-east trade winds. Here the prevailing winds, blowing from the interior of the continent instead of from the ocean, result in the lightest coastal rain in Australia.

The westerly trade winds, which skirt the southern shores, are responsible for the very reliable, although generally light, rains enjoyed by the south-western portion of Western Australia, by the south-eastern agricultural areas of South Australia, by a great part of Victoria, and by the whole of Tasmania.

1. In Australia artificial storage ponds or reservoirs are called "tanks."

(i.) *Factors determining Distribution and Intensity of Rainfall.* The distribution and intensity of rainfall in the interior of the continent, and also to some extent in the areas already mentioned, are governed by the seasonal peculiarities of three distinct atmospheric control systems, the most important of which is, undoubtedly, the anti-cyclonic stream. This stream, which girdles the earth and embraces approximately the region between 15° and 40° south latitude, breaks up into vast elliptically-shaped bodies of circulating atmosphere, measuring frequently 3000 miles in their major and 2000 miles in their minor axes. In passing over Australia from west to east, these great bodies of circulating air cause moist-laden winds to sweep across the continent from the surrounding oceans. The front-circulation brings in winds from the Southern Ocean, and the rear-circulation those from the equatorial seas.

The rain-invoking agent second in order of importance because of its reliability is the well-known "V-shaped depression." The sphere of operation of this latter disturbance is ordinarily the southern half of the continent, although occasionally it may extend its influence to tropical latitudes. The western half of this type of disturbance, with a southerly wind circulation, is the portion from which rain is most frequently to be expected, but occasionally good falls of rain, attended with electrical manifestations, are liberated from the warm eastern portion.

The third agent associated with the production of rain is the tropical depression more popularly known as the "monsoonal depression." This disturbance may be in active evidence for a succession of seasons, and then be conspicuously absent for a number of years, thus raising the question whether, after all, it can be regarded as in any way a distinctive feature of Australian meteorology.

When these disturbances are actively operative in the production of rain, the effect on the country generally, and the economic results for the succeeding season, are very pronounced. The interior of the continent becomes transformed. The plains, which ordinarily have so profound an effect on the heat winds of the summer, are deluged with rain, and respond immediately with an astonishingly luxurious growth of grass and herbage. The air is both tempered in heat, and loses its dryness for considerable periods after their visitations.

The distribution of rain by monsoonal disturbances is, however, very capricious in comparison with that precipitated by the southern "depressions." During some seasons the whole of the northern half of the continent will benefit to a fairly uniform degree, at another time some special region will be favoured. A remarkable example of this peculiarity occurred in 1902, for when monsoonal rains were copiously falling over the major portion of Western Australia, the eastern half of the continent was suffering from severe drought conditions.

During other seasons, tongue-shaped regions extending southwards from the northern shores of the continent will be particularly favoured in regard to rain. These regions may extend to the interior of Western Australia, and simultaneously others may occur in the Central Territory, in Western Queensland, and in the interior of New South Wales.

It is thus obvious that different parts of the continent are mainly dependent upon forms of atmospheric disturbances for what may be called their fundamental rains, and since there is a seasonal tendency for a particular class of storms to predominate, it rarely happens that any year passes in which the rains are universally good. Again, the condition of drought can hardly affect the whole of the continent at the same time. Nevertheless a more than ordinarily fortunate condition in one part of the continent ordinarily implies drought conditions in another, or *vice-versâ*. Thus in New South Wales, monsoonal rains, so beneficial to its north-western districts, rarely extend during the same season to coastal areas, or to Southern Riverina. For this reason it may happen occasionally that sheep may with advantage be sent 500 or 600 miles from the coast for feed and water. Should the southern or antarctic low-pressures be the predominating influence, the country to the south of the Murrumbidgee River is benefit-

ing at the expense of the remainder of the State. A good coastal season ordinarily depends upon an anticyclonic control; when such exists, the country west of the tablelands usually wants water.

A good season for Australia as a whole is dependent upon many circumstances. Not only must the main rain-giving storms be well represented, but other favourable conditions must also coexist. The general rate of translation of the atmosphere across the continent is a factor of the utmost importance. Another is the latitude the cyclones and anti-cyclones are moving in, and, further, the daily or periodic surgings of high and low pressures to and from the equator are also factors of considerable moment.

(ii.) *Time of Rainfall.* Monsoonal rains affect the northern parts of the continent in the summer months, and may continue with diminishing energy for nearly six months of the year. As they penetrate into higher latitudes the period of action is delayed, but is not shortened, though the quantities of the fall materially lessen. Antarctic rains are experienced during the winter months of the year, the resultant quantities being reliable and consistently regular. The heaviest totals from this source are precipitated on the west coast of Tasmania. Thus at Mount Lyell the total for one year exceeded 140 inches, and even the average is 116.05 inches.

Anti-cylonic rains occur at all times of the year, but more markedly from March to September. They benefit particularly the southern area of the continent, and are responsible for many of the heaviest rainfalls and floods on the coastal districts of New South Wales.

(iii.) *Wettest and Driest Regions.* The wettest known place in Australia is Geraldton, on the north-east coast of Queensland, where the average rainfall for 21 years is no less than 145 inches, the maximum yearly total being 211.24 inches and the minimum 69.87 inches. The difference of range between these extremes is 141.37 inches.

The driest known part of the continent is about the Lake Eyre district in South Australia (the only part of the continent below sea level), where the annual average is but 5 inches, and where it rarely exceeds 10 inches for the twelve months.

The inland districts of Western Australia have until recent years been regarded as the driest part of Australia, but authentic observations taken during the past decade at settled districts in the east of that State shew that the annual average is from 10 to 12 inches.

(iv.) *Quantities and Distribution of Rainfall generally.* The departure from the normal rainfall increases greatly and progressively from the southern to the northern shores of the continent, and similarly also at all parts of the continent, subject to capricious monsoonal rains, as the comparisons hereunder will shew. The general distribution is best seen from the map on page 106, shewing the areas subject to average annual rainfalls lying between certain limits. The areas so defined are shewn in the following table:—

DISTRIBUTION OF AVERAGE RAINFALL.

Average Annual Rainfall.	N.S.W.	Victoria.	Queensland.	South Aust.	Northe'n Territ'y.	Western Aust.	Tasmania.	Commonwealth.
	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.
Under 10 inches	79,629	nil	126,390	309,196	153,226	417,896	nil	1,086,337
10—20 ,,	118,685	36,241	251,150	57,025	181,298	397,416	nil	1,041,815
20—30 ,,	76,217	38,794	175,390	13,257	88,505	109,481	4,242	505,886
30—40 ,,	24,685	8.072	67,310	370	16,765	37,498	7,397	162,097
Over 40 ,,	11,156	4,777	50,260	222	83,826	13,629	14,576	178,446
Total area ...	310,372	87,884	670,500	380,070	523,620	975,920	26,215	2,974,581

Referring first to the southern capitals, it may be noted that the average at Melbourne from 65 years' records is 26.16 inches; the maximum 44.25, and minimum 15.61; the range therefore is 28.64 inches. At Adelaide the average determined from sixty-nine years' totals is 21.01, the maximum 30.87, the minimum 13.43, and the range therefore 17.44 inches. At Hobart 23.29 inches is the average annual rainfall, 40.67 is the highest total for one year, 13.43 is the lowest; thus 27.24 inches is the extreme range. The average for Perth is 33.27 inches, 46.73 being the maximum and 20.48 inches the minimum; the range is therefore 26.25 inches. These figures appear to constitute an exception to the general rule, but it should be mentioned as a possible explanation that records have there been taken only since 1876, whereas the records at the other cities date from 1840 or thereabouts.

Continuing the comparison of rainfall figures, Sydney's average annual total is 48.51 inches, its maximum 82.81 in 1860, and minimum 21.48 in 1849, thus the range is 61.33 inches. At Brisbane the disparities are greater still. There the average is 47.16 inches —a trifle lower than that of Sydney—the annual maximum was 88.26 inches in 1893, the minimum 16.17 inches in 1902, and the range therefore 62.09 inches.

In order to shew how the rainfall is distributed throughout the year in various parts of the continent, the figures of representative towns have been selected. Port Darwin, typical of the Northern Territory, shews that in that region nearly the whole of the rainfall occurs in the summer months, while little or nothing falls in the middle of the year. The figures of Perth, as representing the south-western part of the continent, are the reverse, for while the summer months are dry, the winter ones are very wet. In Melbourne and Hobart the rain is fairly well distributed throughout the twelve months, with a maximum in October in the former, and in November in the latter. The records at Alice Springs and Daly Waters indicate that in the central parts of Australia the wettest months are in the summer and autumn. In Queensland, as in the Northern Territory, the heaviest rains fall in the summer months, but good averages are also maintained during the other seasons.

On the coast of New South Wales, the first six months of the year are the wettest, with slight excesses in April and July; the averages during the last six months are fair and moderately uniform. In general it may be said that one-fourth of the area of the continent, principally in the eastern and northern parts, enjoys an annual average rainfall of from 20 to 50 inches, the remaining three-fourths receiving generally from 10 to 15 inches.

(v.) *Curves of Rainfall and Evaporation.* The relative amounts of rainfall and evaporation at different times through the year are best seen by referring to the graphs for a number of characteristic places. It will be recognised at once how large is the evaporation when water is fully exposed to the direct rays of the sun, and to wind, etc.

(vi.) *Tables of Rainfall.* The table of rainfall for a long period of years for each of the various Australian capitals affords information as to the variability of the fall in successive years, and the list of the more remarkable falls furnishes information as to what may be expected on particular occasions.

RAINFALL AT THE AUSTRALIAN CAPITALS.

Year.	Perth.			Adelaide.			Brisbane.			Sydney.			Melbourne.			Hobart.		
	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.
	in.		in.	in.		in.	in.		in.	in.		in.	in.		in.	in.		in.
1840	...	...	...	24.23	99	...	29.32	...	...	58.52	150	...	22.57	...	...	...	...	...
1	...	...	...	17.96	93	...	49.31	...	...	76.31	142	...	30.18	...	...	13.95	...	...
2	...	...	...	20.32	122	...	28.81	...	...	48.82	137	...	31.16	...	...	23.60	...	...
3	...	...	...	17.19	104	...	51.67	...	...	62.78	168	...	21.54	...	...	13.43	...	...
4	...	...	...	16.88	136	...	63.20	...	...	70.67	157	...	30.74	...	...	26.25	...	...
5	...	...	...	18.83	125	...	39.09	...	...	62.03	132	...	23.93	...	...	16.68	...	...
6	...	...	...	26.89	114	...	31.41	...	41.83	43.83	139	...	30.53	...	...	21.96	...	...
7	...	...	...	27.61	109	...	...	...	(7 yr.)	42.80	142	...	30.18	...	...	14.46	...	...
8	...	...	...	19.74	114	21.07	42.59	...	...	59.17	137	58.33	33.15	...	28.22	23.62	...	19.24
9	...	...	...	25.44	110	(9 yr.)	...	...	...	21.48	140	(9 yr.)	44.25	...	(9 yr.)	33.52	...	(8 yr.)
1850	...	...	...	19.56	84	...	...	...	...	44.88	157	...	26.98	...	...	14.51	...	...
1	...	...	...	30.86	128	...	...	...	...	35 14	142	...	...	...	...	17.98	...	...
2	...	...	...	27.44	118	...	...	...	...	43.78	145	...	...	...	...	23.62	...	...
3	...	...	...	27.08	128	...	...	...	...	46.11	130	...	...	...	...	14.52	...	...
4	...	...	...	15.35	105	...	...	...	...	29.28	136	...	...	...	...	30.54	...	...
5	...	...	...	23.15	124	...	...	...	...	52.85	138	...	28.21	...	...	18.25	...	...
6	...	...	...	24.93	118	...	...	...	...	43.31	116	...	29.76	134	...	22.73	151	...
7	...	...	...	22.15	105	...	...	...	...	50.95	135	...	28.90	138	...	17.20	113	...
8	...	...	...	21.55	107	23.75	43.00	...	...	39.60	139	40.74	26.01	158	...	33.04	129	22.59
9	...	...	...	14.85	95	...	35.00	...	...	42.06	128	...	21.82	156	...	23.31	...	...
1860	...	...	...	19.67	119	...	54.63	144	...	82.81	182	...	25.38	133	...	21.65	...	...
1	...	...	...	24.04	147	...	69.45	155	...	59.36	157	...	29.16	159	...	28.19	...	...
2	...	...	...	21.85	119	...	28.27	98	...	23.98	111	...	22.08	139	...	21.72	...	...
3	...	...	...	23.68	145	...	68.83	146	...	47.08	152	...	36.42	165	...	40.67	...	...
4	...	...	...	19.75	121	...	47.00	114	...	69.12	187	...	27.40	144	...	28.11	...	...
5	...	...	...	15.51	108	...	24.11	52	...	36.29	128	...	15.94	119	...	23.07	...	...
6	...	...	...	20.11	116	...	51.18	142	...	36.81	149	...	22 41	107	...	23.55	...	...
7	...	...	...	19.05	112	...	61.04	112	...	59.68	126	...	25.79	133	...	22.27	...	...
8	...	...	...	19.99	113	19.85	35.98	110	47.55	43.05	127	50.02	18.27	120	24.47	18.08	...	25.00
9	...	...	...	14.74	117	...	54.39	114	...	48.19	134	...	24.58	129	...	23 87	...	...
1870	...	...	...	23 84	119	...	79.06	154	...	64.22	178	...	33.77	129	...	27.53	...	...
1	...	...	...	23.25	137	...	45.45	119	...	52.27	141	...	30.17	125	...	18.25	131	...
2	...	...	...	22.66	146	...	49.22	131	...	37.12	161	...	32.52	136	...	31.76	160	...
3	...	...	...	21.00	139	...	62.02	138	...	73.40	176	...	25.61	134	...	23.43	157	...
4	...	...	...	17.23	127	...	38.71	135	...	63.60	173	...	28.10	134	...	24.09	138	...
5	...	...	...	29.21	157	...	67.03	162	...	46.25	153	...	32.87	158	...	29.25	181	...
6	28.73	100	...	13.43	110	...	53.42	130	...	45.69	156	...	24.04	134	...	23.63	...	...
7	20.48	103	...	24.95	135	...	30.28	119	...	59.66	147	...	24.10	124	...	20.82	...	...
8	39.72	143	29.64	22.08	112	21.24	56.33	134	53.59	49.77	129	54.02	25.36	116	28.11	29.76	...	25.24
9	41.34	106	(3 yr.)	20.69	130	...	67.30	157	...	63.19	167	...	19.28	127	...	21.07	...	...
1880	31.79	116	...	22.48	142	...	49.12	134	...	29.51	142	...	28.48	147	...	25.05	...	...
1	24.78	101	...	18.02	135	...	29.39	117	...	41.09	163	...	24.08	134	...	22.09	...	...
2	35.68	109	...	15.70	134	...	42.62	121	...	42.28	112	...	22.40	131	...	30.30	...	...
3	39.65	122	...	26.76	161	...	32.22	114	...	46.32	157	...	23.71	130	...	24.05	160	...
4	31.96	92	...	18.74	138	...	43.49	136	...	44.04	159	...	25.85	128	...	21.55	171	...
5	33.44	110	...	15.89	133	...	26.85	112	...	39.91	145	...	26.94	123	...	28.29	176	...
6	28.90	89	...	14.42	141	...	53.66	152	...	39.43	152	...	24.00	128	...	21.39	189	...
7	37.52	105	...	25.70	164	...	81.54	242	...	60.16	189	...	32.39	153	...	24.21	174	...
8	27.83	117	33.29	14.55	131	19.30	33.08	143	45.93	23.01	132	42.95	19.42	123	24.66	18.45	151	23.65
9	39.96	123	...	20.87	143	...	49.36	155	...	57.16	186	...	27.14	125	...	30.80	180	...
1890	46.73	126	...	25.78	139	...	73.02	162	...	81.42	184	...	24.24	140	...	27.51	173	...
1	30.33	93	...	14.01	113	...	41.68	143	...	55.30	200	...	26.73	126	...	23.25	160	...
2	31.23	122	...	21.53	137	...	64.98	146	...	69.26	189	...	24.96	124	...	...	...	...
3	40.12	145	...	21.49	129	...	88.26	147	...	49.90	208	...	26.80	140	...	27.46	146	...
4	23.72	103	...	20.78	134	...	44.02	143	...	38.22	188	...	22.60	138	...	27.39	151	...
5	33.01	123	...	21.28	130	...	59.11	105	...	31.86	170	...	17.04	131	...	19.93	119	...
6	31.50	103	...	15.17	121	...	44.97	121	...	42.40	157	...	25.16	124	...	20.88	136	...
7	27.17	106	...	15.42	119	...	42.53	115	...	42.52	136	...	25.85	117	...	20.45	153	...
8	31.76	118	33.55	20.75	116	20.71	60.06	131	56.80	43.17	149	51.12	15.61	102	23.61	20.41	164	24.23
9	32.40	107	...	18.84	119	...	28.85	141	...	55.90	172	...	28.87	116	...	20.68	170	(9 yr.)
1900	36.61	124	...	21.68	133	...	34.41	110	...	66.54	170	...	26.09	139	...	19.14	135	...
1	36.75	122	...	18.01	124	...	38.48	110	...	40.10	151	...	27.45	113	...	23.66	147	...
2	27.06	93	...	16.02	123	...	16.17	87	...	43.07	176	...	23.08	102	...	21.52	151	...
3	35.69	140	...	25.47	134	...	49.27	136	...	38.62	169	...	28.43	130	...	25.86	139	...
4	34.35	125	...	20.31	117	...	33.23	124	...	45.93	155	...	29.72	128	...	22.41	139	...
5	34.61	116	...	22.28	131	...	36.76	108	...	35.03	144	...	25.64	129	...	32.09	168	...
6	32.37	121	...	26.51	127	...	42.84	125	...	31.89	159	...	22.29	114	...	23.31	155	...
7	40.12	132	...	17.78	125	...	31.46	119	...	31.32	132	...	22.26	102	...	25.92	167	...
	30.52	106	34.05	24.56	125	21.15	44.01	125	36.55	45.65	168	43.41	17.72	130	25.36	16.50	149	23.15
Aver.			33.27			21.01			47.16			48.51			26.16			23.29
No. of Yrs.			(33)			(69)			(59)			(69)			(65)			(64)

15. **Remarkable Falls of Rain.**—The following are the more remarkable falls of rain in the States of New South Wales, Queensland, Western Australia, and South Australia, which have occurred within a period of twenty-four hours :—

HEAVY RAINFALLS, NEW SOUTH WALES, UP TO 1908, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Albion Park ...	8 Feb., 1895	10.00	Leconfield... ...	9 Mar., 1893	14.53
Albury	14 „ 1898	10.70	Liverpool	23 Feb., 1874	10.39
Alme Dorrigo ...	22 Jan., 1893	10.27	Mackeville* ...	23 Feb., 1908	10.00
Anthony	28 Mar., 1887	17.14	Madden's Creek ...	2 „ „	10.36
„	15 Jan., 1890	13.13	Maitland W. ...	9 Mar., 1893	14.79
Arnold Grove ...	28 May, 1889	11.13	Major's Creek ...	14 Feb., 1898	12.32
„ „ ...	20 Mar., 1892	10.08	Mittagong... ...	6 Mar., 1893	11.71
Araluen	14 Feb., 1898	10.51	Morpeth	9 „ „	21.52
„	15 „ „	13.36	Mount Kembla ...	14 Feb., 1898	10.25
Billambil	14 Mar., 1894	12.94	„ „ ...	2 Feb., 1908	10.27
Bowral	6 „ 1893	11.94	Myra Vale ...	14 „ 1898	10.00
Bowraville... ...	22 June, 1898	11.50	Nambucca Heads ...	3 Apr., 1905	10.62
Broger's Creek ...	14 Feb., „	20.05	Nepean Tunnel ...	14 Feb., 1898	12.30
Bulli Mountain ...	19 Mar., 1894	10.45	Newcastle... ...	19 Mar., 1871	11.17
„ „ ...	13 Feb., 1898	17.14	„	9 „ 1893	11.14
Burwood	28 May, 1889	11.75	„	24 Feb., 1908	10.02
Camden	11 July, 1904	10.90	Nowra	11 July, 1904	11.50
Camden Haven ...	22 Jan., 1895	12.23	Parramatta ...	28 May, 1889	11.94
Canley Vale ...	28 May, 1889	10.06	„	20 Mar., 1892	11.01
„ „ ...	20 Mar., 1892	10.85	Port Macquarie ...	9 Nov., 1887	10.76
Castle Hill... ...	28 May, 1889	13.49	Port Stephens ...	9 Feb., 1889	10.15
Cockle Creek ...	23 Feb., 1908	10.45	Prospect	28 May, „	12.37
Colombo Lyttleton ...	5 Mar., 1893	12.17	Raymond Terrace ...	28 Sep., 1903	10.32
Condong	27 „ 1887	18.66	Richmond ...	28 May, 1889	12.18
„	15 Jan., 1890	11.50	Robertson... ...	14 Feb., 1898	10.00
Cookville	1 Apr., 1892	11.31	„	10 July, 1904	10.50
Coramba	11 June, 1893	10.83	Rooty Hill ...	27 May, 1889	11.85
Cordeaux River ...	26 Feb., 1873	10.98	Rylstone	28 „ „	10.26
„ „ ...	3 „ 1890	11.51	Seven Oaks ...	22 June, 1898	11.06
„ „ ...	14 Feb., 1898	22.58	Springwood ...	7 Mar., 1894	10.55
„ „ ...	31 Aug., 1906	10.31	Taree	28 Feb., 1892	12.24
Cudgen	15 Mar., 1894	10.23	Terara	26 „ 1873	12.57
Dapto West ...	14 Feb., 1898	12.05	Tomago	9 Mar., 1893	13.76
Darkes' Forest ...	8 „ 1895	11.10	Tongarra	9 July, 1904	11.10
Dunheved	28 May, 1889	12.40	Tongarra Farm ...	14 Feb., 1898	15.12
Eden	4 „ 1875	10.52	Towamba	5 Mar., 1893	20.00
Fernmount ...	2 Feb., 1890	10.36	Tweed Heads ...	14 Jan., 1890	10.53
„	2 June, 1903	11.29	„ „	14 Mar., 1894	11.40
Goorangoola ...	9 Mar., 1893	10.34	Trial Bay	9 „ 1893	11.13
Guy Fawkes ...	2 June, 1903	11.30	Wollongong ...	26 Feb., 1873	11.00
Hercynia	28 May, 1889	11.85	„ ...	5 Apr., 1882	10.00
Holy Flat	12 Mar., 1887	12.00	Woolgoolga ...	11 June, 1893	10.83
„ „	28 Feb., 1892	12.24	Yellow Rock ...	14 Feb., 1898	11.69
Jamberoo	14 „ 1898	10.92	South Head		
Kareela	20 Oct., 1902	11.73	(near Sydney)...	29 Apr., 1841	20.12
Kempsey	10 Mar., 1893	10.34	„ „ ...	16 Oct., 1844	20.41

* 6.50 inches fell in 2 hours.

HEAVY RAINFALLS, QUEENSLAND, UP TO 1896, INCLUSIVE.

Ayr	20 Sep., 1890	14.58	Bowen Park ...	16 Feb., 1893	10.38
„	25 Mar., 1891	10.19	Brisbane	21 Jan., 1887	18.31
„	26 Jan., 1896	10.50	Bromby Park (Bowen)	14 Feb., 1893	13.28
Beenleigh	21 „ 1887	11.30	„ „	20 Jan., 1894	11.20
Bloomsbury ...	14 Feb., 1893	17.40	Bulimba (Brisbane)...	16 Feb., 1893	10.40
„ ...	27 Jan., 1896	10.52	Bundaberg ...	31 Jan., 1893	10.15
Bowen	13 Feb., 1893	14.65	Burketown ...	15 „ 1891	13.58
„	20 Jan., 1894	11.11	Bustard Head ...	18 Feb., 1888	10.14

HEAVY RAINFALLS, QUEENSLAND—Continued.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Bustard Head ...	30 Jan., 1893	11.85	Lytton	13 Mar., 1892	10.60
Caboolture	21 „ 1887	10.00	„	16 Feb., 1893	11.74
Cairns	11 Feb., 1889	14.74	Mackay	17 „ 1888	10.10
„	21 Apr., „	12.40	„	15 „ 1893	10.46
„	5 „ 1891	14.08	Macnade Mill (Townsville) ...	28 Mar., 1891	10.61
„	19 Jan., 1892	10.56	„	15 „ 1893	10.50
Caloundra	21 „ 1887	10.50	„	18 Jan., 1894	12.56
Cape Grafton ...	5 Mar., 1896	13.37	„	17 Apr., „	14.26
Cardwell	18 „ 1887	10.15	Marlborough ...	17 Feb., 1888	14.24
„	30 Dec., 1889	12.00	„ ...	29 Jan., 1896	10.84
„	2 Jan., 1890	10.06	Mein	4 Apr., 1895	10.50
„	23 Mar., „	12.00	Mooloolah	13 Mar., 1892	11.53
Clare	26 Jan., 1896	15.30	„	2 Feb., 1893	29.11
Collaroy	30 „ „	14.25	„	9 June, „	11.50
Cooran	1 Feb., 1893	13.62	Mount Perry ...	24 Feb., 1887	10.00
„	9 June, „	10.12	Mundoolun ...	21 Jan., „	17.95
Cooroy	9 „ „	13.60	Musgrave	6 Apr., 1894	13.71
Cressbrook	16 Feb., „	10.65	Nanango	9 June, 1893	10.00
Crohamhurst (Blackall Range)	31 Jan., „	10.78	Nerang	15 „ 1892	12.35
„ „ ...	2 Feb., „	35.71	Netley (Rockhampton)	29 Jan., 1896	11.77
Crohamhurst ...	9 June, „	13.31	North Pine ...	21 „ 1887	11.60
Cryna (Beaudesert) ...	21 Jan., 1887	14.00	„ „ ...	16 Feb., 1893	14.97
Donaldson	27 „ 1891	11.29	Palmwoods ...	4 „ „	12.30
Dungeness	16 Mar., 1893	22.17	Pittsworth ...	11 Mar., 1890	14.68
„	19 Jan., 1894	11.84	Port Douglas ...	5 „ 1887	13.00
„	17 Apr., „	14.00	„ „ ...	12 Feb., 1888	10.00
Eddington (Cloncurry)	23 Jan., 1891	10.33	„ „ ...	20 Jan., 1892	11.50
Emu Park	31 „ 1893	10.00	„ „ ...	23 Feb., 1894	10.25
Esk	21 „ 1887	10.70	„ „ ...	7 Apr., „	10.00
Fassifern	21 „ „	10.20	Ravenswood ...	24 Mar., 1890	17.00
Geraldton	11 Feb., 1889	17.13	„ ...	27 Jan., 1896	10.52
„	31 Dec., „	12.45	Redcliffe	21 „ 1887	14.00
„	25 Jan., 1892	11.10	„	16 Feb., 1893	17.35
„	6 Apr., 1894	16.02	Rockhampton ...	17 „ 1888	10.82
„	3 Mar., 1896	11.42	„	29 Jan., 1896	10.53
Gladstone	18 Feb., 1888	12.37	Sandgate	21 „ 1887	10.50
„	31 Jan., 1893	14.62	„	16 Feb., 1893	14.03
Glen Broughton ...	5 Apr., 1894	18.50	St. Helena ...	16 „ „	11.20
Gold Creek Reservoir	16 Feb., 1893	11.16	St. Helens (Mackay)	24 „ 1888	12.00
Goodna	21 Jan., 1887	11.00	St. Lawrence ...	17 „ „	12.10
Goondi Mill (Gerald'n)	20 „ 1892	11.10	„ „ ...	30 Jan., 1896	15.00
„ „ ...	6 Apr., 1894	15.69	Tabragalba ...	21 „ 1887	10.00
Haughton Valley ...	26 Jan., 1896	18.10	Tambourine Mountain	17 July, 1889	10.91
Holmwood (Woodford)	2 Feb., 1893	16.19	The Hollow (Mackay)	23 Feb., 1888	15.12
Ingham	18 Jan., 1894	12.60	„ „ ...	? Mar., 1891	10.39
„	7 Apr., „	10.10	Tooloombah ...	29 Jan., 1896	11.70
Inkerman	21 Sep., 1890	12.93	Townsville ...	24 „ 1892	19.20
Inneshowen (Johnstone River)	30 Dec., 1889	14.01	Woodford	2 Feb., 1893	14.93
Inskip Point ...	13 Mar., 1892	10.65	Woodlands (Yeppoon)	10 „ 1889	10.00
Kamerunga (Cairns) ...	20 Jan., „	13.61	„ „	26 Jan., 1890	10.22
„ „ ...	23 Feb., 1894	10.10	„ „	25 Mar., „	14.25
Kamerunga ...	6 Apr., „	14.04	„ „	31 Jan., 1893	23.07
„ ...	5 „ 1895	12.31	„ „	30 „ 1896	11.91
„ ...	5 Mar., 1896	11.81	„ „	9 Feb., „	13.97
Lake Nash	10 Jan., 1895	10.02	Yandina	1 „ 1893	20.08
Landsborough ...	2 Feb., 1893	25.15	„	9 June, „	12.70
„ ...	9 June, „	12.80	Yeppoon	31 Jan., „	20.05
Lytton	21 Jan., 1887	12.85	„	30 „ 1896	11.02

HEAVY RAINFALLS, WESTERN AUSTRALIA, UP TO 1908, INCLUSIVE.

Name of Town or Locality.	Date	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Balla Balla ...	20 Mar., 1899	6.00	Obagama	16 Feb., 1896	3.95
,, ,, ...	21 ,, 1899	14.40	,, ...	17 ,, ,,	6.30
Boodaril	3 Jan., 1894	10.03	,, ...	18 ,, ,,	7.22
,, ...	4 ,, ,,	5.22	Point Torment ...	17 Dec., 1906	11.86
,, ...	21 Mar., 1899	14.53	Port Hedland ...	7 Feb., 1901	3.56
,, ...	6 Feb., 1901	1.91	,, ...	8 ,, ,,	9.55
,, ...	7 ,, ,,	9.16	Roebourne... ...	3 Apr., 1898	11.44
Bamboo Creek ...	22 Mar., 1899	10.10	,, ...	6 Mar., 1900	10.32
Carlton	11 Jan., 1903	10.64	Tambrey	6 ,, ,,	11.00
Cossack	3 Apr., 1898	12.82	,, ...	3 ,, 1903	10.46
,, ...	15 ,, 1900	6.89	Thangoo	17-19 Feb.'96	24.18
,, ...	16 ,, ,,	13.23	,, ...	28 Dec., 1898	11.15
Croydon	3 Mar., 1903	12.00	Whim Creek ...	2 Apr., 1898	7.08
Cocos Island ...	29 Nov., ,,	14.38	,, ...	3 ,, ,,	29.41
,, ,, ...	26 Dec., 1907	8.00	,, ...	20 Mar., 1899	8.89
,, ,, ...	27 ,, ,,	2.65	,, ...	21 ,, ,,	18.17
,, ,, ...	8 July, 1908	10.21	,, ...	6 ,, 1900	10.03
,, ,, ...	9 ,, ,,	2.75	,, ...	3 ,, 1903	10.44
,, ,, ...	23 ,, ,,	2.40	Wyndham... ...	27 Jan., 1890	11.60
,, ,, ...	24 ,, ,,	7.00	,, ...	11 ,, 1903	9.98
,, ,, ...	25 ,, ,,	3.85	,, ...	12 ,, ,,	6.64
Derby	29 Dec., 1898	13.09	,, ...	13 ,, ,,	4.20
,, ...	30 ,, ,,	7.14	Yeeda	28 Dec., 1898	8.42
Kerdiadary ...	7 Feb., 1901	12.00	,, ...	29 ,, ,,	6.88
Millstream ...	5 Mar., 1900	10.00	,, ...	30 ,, ,,	6.12

HEAVY RAINFALLS, SOUTH AUSTRALIA, UP TO 1908, INCLUSIVE.

Borroloola... ...	14 Mar., 1899	14.00	Pine Creek ...	8 Jan., 1897	10.35
Lake Nash ...	21 ,, 1901	10.25	Port Darwin ...	7 ,, ,,	11.67

16. **Snowfall.**—Light snow has been known to fall even as far north, occasionally, as latitude 31° S., and from the western to the eastern shores of the continent. During exceptional seasons it has fallen simultaneously over two-thirds of the State of New South Wales, and has extended at times along the whole of the Great Dividing Range, from its southern extremity in Victoria as far north as Toowoomba in Queensland. During the winter snow covers the ground to a great extent on the Australian Alps for several months, where also the temperature falls below zero Fahrenheit during the night, and in the ravines around Kosciusko and similar localities the snow never entirely disappears.

The antarctic "V"-shaped disturbances are always associated with our most pronounced and extensive snowfalls. The depressions on such occasions are very steep in the vertical area, and the apexes are unusually sharp-pointed and protrude into very low latitudes, sometimes even to the tropics.

17. **Hail.**—*Hail falls throughout Australia most frequently along the southern shores* of the continent, and in the summer months. The size of the hailstones generally increases with distance from the coast, a fact which lends strong support to the theory that hail is brought about by ascending currents. Rarely does a summer pass without some station experiencing a fall of stones exceeding in size an ordinary hen-egg, and many riddled sheets of light-gauged galvanised iron bear evidence as to the weight and penetrating power of the stones.

Hail storms occur most frequently in Australia when the barometric readings indicate a flat and unstable condition of pressure. They are invariably associated with tornadoes or tornadic tendencies, and on the east coast the clouds from which the stones fall are generally of a remarkable sepia-coloured tint.

18. **Barometric Pressures.**—The mean annual barometric pressure in Australia varies from 29.88 inches on the north coast to 30.06 inches over the central and southern parts of the continent. In January the mean pressure ranges from 29.76 inches in the northern and central areas to 29.94 and 29.95 inches in the southern. The July mean pressure ranges from 29.97 inches at Port Darwin to 30.18 at Alice Springs. Barometer readings, corrected to mean sea-level, have, under anticyclonic conditions in the interior of the continent, ranged from 30.81 inches to as low as 28.44 inches. This lowest record was registered at Townsville during a hurricane on the 9th March, 1903. The mean annual fluctuations of barometric pressure for the capitals of Australia are shewn on page 105.

19. **Wind.**—(i.) *Trade Winds.* The two distinctive wind currents in Australia are, as previously stated, the south-east and westerly trade winds. As the belt of the earth's atmosphere in which they blow apparently follows the sun's ecliptic path north and south of the equator, so the area of the continent affected by these winds varies at different seasons of the year. During the summer months the anticyclonic belt travels in very high latitudes, thereby bringing the south-east trade winds as far south as 30° south latitude. The westerly trade winds are forced a considerable distance to the south of Australia, and are very rarely in evidence in the hot months. When the sun passes to the north of the equator, the south-east trade winds follow it, and only operate to the north of the tropics for the greater part of the winter. The westerly winds, by the same force, are brought into lower latitudes during the same period of the year. They sweep across the southern areas of the continent from the Leeuwin to Cape Howe, and during some seasons are remarkably persistent and strong. They occasionally penetrate to almost tropical latitudes, and though usually cold and dusty, are of the greatest service to the country, for being rain-bearing winds, moisture is by their agency precipitated over vast areas in the south of the continent.

(ii.) *Land and Sea Breezes.* The prevailing winds second in order of importance are the land and sea breezes. These generally blow at right angles to the coast-line in their early stages, but are deflected to the north and south in the middle and later periods of the blows.

On the east coast the sea breezes which come in from the north-east, when in full force, frequently reach the velocity of a gale during the afternoon in the summer months, the maximum hourly velocity, ordinarily attained about 3 p.m., not unfrequently attaining a rate of 35 to 40 miles per hour. This wind, although strong, is usually shallow in depth, and does not ordinarily penetrate more than 9 or 12 miles inland.

The land breezes on the east coast blow out from a south-westerly direction during the night.

On the western shores of the continent the directions are reversed. The sea breezes come in from the south-west, and the land breezes blow out from the north-east.

(iii.) *Inland Winds.* Inland, the direction of the prevailing winds is largely regulated by the seasonal changes of pressure, so disposed as to cause the winds to radiate spirally outwards from the centre of the continent during the winter months, and to circulate spirally from the seaboard to the centre of Australia during the summer months.

(iv.) *Prevailing Direction at the State Capitals.* In *Perth*, southerly is the prevailing direction for November to February inclusive, and north-north-easterly for the mid-winter months.

In *Adelaide* the summer winds are from the south-west and south, and in the winter from north-east to north.

In *Brisbane*, south-east winds are in evidence all the year round, but more especially during the months January, February, March and April.

In *Sydney* from May to September the prevailing direction is westerly, and for the remaining seven months north-easterly.

Melbourne winter winds are from north-west to north-east, and those of the summer from south-west to south-east.

At *Hobart* the prevailing direction for the year is from north-west.

Over the greater part of Australia January is the most windy month, *i.e.*, is the month when the winds are strongest on the average, though the most violent wind storms occur at other times during the year, the time varying with the latitude.

20. **Cyclones and Storms.**—(i.) *General.* The "elements" in Australia are ordinarily peaceful, and although severe cyclones have visited various parts, more especially coastal areas, such visitations are rare, and may be properly described as erratic.

During the winter months the southern shores of the continent are subject to cyclonic storms, evolved from the V-shaped depressions of the southern low-pressure belt. They are felt most severely over the south-western parts of Western Australia, to the south-east of South Australia, in Bass Straits, including the coast-line of Victoria, and on the west coast of Tasmania. Apparently the more violent wind pressures from these cyclones are experienced in their northern half, that is, in that part of them which has a north-westerly to a south-westerly circulation.

Occasionally the north-east coast of Queensland is visited by hurricanes from the north-east tropics. During the first three months of the year these hurricanes appear to have their origin in the neighbourhood of the South Pacific Islands, their path being a parabolic curve of south-westerly direction. Only a small percentage, however, reach Australia, the majority recurving in their path before reaching New Caledonia.

Anemometrical records for these storms do not exist, but the fact that towns visited by them have been greatly damaged indicates that the velocity must be very great. Fortunately the area covered by these storms is very small when compared with the southern cyclones, and the region affected during an individual visitation is very limited. The heaviest blows are experienced to the west of the vortex with south-east to south-west winds.

(ii.) *Severe Cyclones.* Very severe cyclones, popularly known as "Willy Willies," are peculiar to the north-west coast of Western Australia from the months of December to March, inclusive. They apparently originate in the ocean, in the vicinity of the Cambridge Gulf, and travel in a south-westerly direction with continually increasing force, displaying their greatest energy near Cossack and Onslow, between latitudes 20° and 22° South. The winds in these storms, like those from the north-east tropics, are very violent and destructive, causing great havoc amongst the pearl-fishers. The greatest velocities are usually to be found in the south-eastern quadrant of the cyclones, with north-east to east winds. After leaving the north-west coast, these storms either travel southwards, following the coast-line, or cross the continent to the Great Australian Bight. When they take the latter course their track is marked by torrential rains, as much as 29.41 inches, for example, being recorded at Whim Creek from one such occurrence. Falls of 10 inches and over have frequently been recorded in the interior of Western Australia from similar storms.

Cyclones occasionally develop from incipient monsoonal low-pressures in the interior of the continent. Their formation is apparently materially assisted by the advancing high-pressures to the west of them, for they seldom or never appear without this accompaniment. The velocity and duration of the resultant gales, too, have a distinct relation to the magnitude of pressure in the anti-cyclones. Evidence of excess of high pressures on such occasions indicates severe gales in the cyclones, and in the case of moderate pressures, moderate gales.

These cyclones do not attain their severest phases until they reach the seaboard. The most violent winds occur in the south-western quadrant, with south-west to south-east winds. The area affected on the coast-line is not usually very great. During the visitation of one of these storms, about 500 miles in diameter, in July, 1903, a strip of land, only 80 miles in extent, was affected. But so severe was the gale within this

region that steamers of from 8000 to 10,000 tons, leaving Port Jackson, were buffeted and tossed about like corks by the turbulent sea. Notwithstanding this, vessels 200 miles to the east lay becalmed and had no indication of the violent atmospheric upheaval relatively so near.

Though storms of this type may occur at any time of the year, they are more frequent during the months of August and September. The velocity of the wind has on one occasion reached the rate of 120 miles per hour.

(iii.) *Southerly Bursters.* The "Southerly Burster" is a characteristic feature of the eastern part of Australia. It is a cool, or cold, wind peculiar to the coastal districts of New South Wales, south of latitude 30°. In a modified form, however, it also appears in the interior of that State, in Victoria, and the western districts of Queensland.

The "Southerly Bursters" invariably follow periods of hot weather, and are a great relief to the population settled over the favoured areas. They occur in all months from August to May inclusive, but most frequently in November. The preceding winds in the early and late summer months are from a north-westerly, and in the midsummer months from a north-easterly direction. A rise in the barometer always takes place before their advent, but no relation has been established between the time this rise begins and the moment of the arrival of the wind itself, neither is there any apparent connection between the velocity of the wind and the rate of gradient of the barometric rise, notwithstanding that records of nearly fifteen hundred "Bursters," extending over a period of forty years, have been analysed with a view of ascertaining if such a connection could be established. All that can be said is that, should the rise be sharp and rapid, the life of the blow will be short, while a slow and gradual one indicates a long and steady blow from the south, after the initial "Burster" has passed. "Southerly Bursters" are usually first noted on the extreme south coast, and travel northward at a rate of 20 miles an hour. The rate of translation has ordinarily no definite relation to the velocity attained by the wind itself.

"Bursters" frequently occur simultaneously at several places along the seaboard, and occasionally they have been known to progress down the coast from north to south. While they may arrive at any time during the day or night, the interval between sundown and midnight is that in which they ordinarily occur.

This type of storm is usually associated with "V"-shaped depressions, but occasionally a condition of relatively high barometric pressures in Victoria will induce their occurrence. It is most frequent during seasons of sporadic rains, and very rare during good years in the interior. In the summer of 1890, the year of the great Darling River flood, only sixteen visitations occurred, and even these were of a very mild character. The series of good years in the interior of Australia, since 1903, has been remarkable for the small annual number of "southerly bursters."

The greatest number ever experienced in a single summer was sixty-two, the average being thirty-two.

In the months of December and January they are usually short lived, and two may occur within the twenty-four hours. In the early and late summer months the intervening periods of warm weather are longer, and the winds are longer sustained, the energy being supplied from the more pronounced high pressures prevailing at these seasons of the year. The velocity varies from a rate of a few miles an hour to over 80 miles per hour, the maximum puffs occurring about an hour after the arrival of the burster. During recent years there has been a falling-off both in their number and strength, the reason for which is not yet understood, but it is suspected that the gradual extension of the agricultural and pastoral industries to the interior of the country may be one of the causes of the change.

Winds of a like character, and possibly derived from similar atmospheric actions and conditions, are—

In Europe—"The Bora," a sharp, cold north-east wind, which blows from the Croatian and Illyrian Mountains along the coast of Dalmatia from Trieste southward;

and the "Mistral," a violent northerly wind which blows from France to the Gulf of Lyons.

In North America, the "Northers" of Texas have similar characteristics, and in South America "The Pampero," a cold and strong southerly wind which blows over the Pampas of Argentina, is almost identical with the "Southerly Bursters." The "Tehuantepec" winds that blow on the Pacific side of Central America are also very similar.

All parts of Australia are subject during the summer months to hot, desiccating winds, of two kinds. The most common and general class are associated with low-pressure isobars. The more rare and local hot winds are caused by the heating of descending air on the lee-side of mountains. In Victoria the former class are known as "Brick Fielders," a name originally applied to the "Southerly Bursters" in Sydney, because of the dust they raised from the brickfields to the south of the city. When the goldfields were discovered in Victoria the miners hailing from Sydney gave the name to the dusty winds from the opposite quarter.

The hot winds on the south-eastern littoral are analogous to the "Chinook" winds which blow at the eastern foot of the Rocky Mountains; to the "Fœhn" winds of the Alpine Valleys; and to the "North-Westers" of the Canterbury Plains in the Middle Island of New Zealand.

21. **Influences affecting Australian Climate.**—Australian history does not cover a sufficient period, nor is the country sufficiently occupied, to ascertain whether or not the advance of settlement has materially affected the climate as a whole. Local changes therein, however, have taken place, a fact which suggests that settlement and the treatment of the land have a distinct effect on local conditions. For example, the mean temperature of Sydney shews a rise of two-tenths of a degree during the last twenty years, a change probably brought about by the great growth of residential and manufacturing buildings within the city and in the surrounding suburbs during that period. Again, low-lying lands on the north coast of New South Wales, that originally were seldom subject to frosts, have with the denudation of the surrounding hills from forests experienced annual visitations, the probable explanation being that, through the absence of trees, the cold air of the high lands now flows, unchecked and untempered, down the sides of the hills to the valleys and lower lands.

It is pointed out by Abercromby,[1] as shewing the influence of irrigation on climate, that "Before the Suez Canal was made, the desert through which it is cut was said to be rainless; now since the Bitter Lakes have been filled up with water, rain falls on an average eight days in the year at Ismailia." And in the United States, General A. W. Greely[2] says, concerning "Heat Waves," "It seems possible that the frequency and intensity of such visitations have diminished on the Pacific coast, since Tennant's record of hot days (classing as such those on which the temperature rose to 80° or above, at San Francisco) indicates that their annual number has very materially diminished since 1859. For seven years prior to 1859 such days averaged thirteen yearly, and since that time, up to 1871, the average yearly number is but four. The immense quantity of land placed under irrigation and the vast increase in vegetation are obvious reasons why there should be some diminution in this respect."

(i.) *Influences of Forests on Climate.* As already indicated, forests doubtless exercise a great influence on local climate, and hence, to the extent that forestal undertakings will allow, the weather can be controlled by human agency. The direct action of forests is an equalising one; thus, especially in equatorial regions and during the warmest portion of the year, they considerably reduce the mean temperature of the air. They also reduce the diurnal extremes of their shade temperatures, by altering the extent of radiating surface, by evaporation, and by checking the movement of air. While decreasing

1. "Seas and Skies," Hon. Ralph Abercromby. 8vo, London, 1888, p. 30.
2. "American Weather." 8vo, London, 1888, p. 253.

evaporation from the ground, they increase the relative humidity. Vegetation greatly diminishes the rate of flow-off of rain, and the washing away of surface soil. Thus when a region is protected by trees, steadier water supply is ensured, and the rainfall is better conserved. In regions of snowfall the supply of water to rivers is similarly regulated, and without this and the sheltering influence of ravines and "gullies" watercourses supplied mainly by melting snow would be subject to alternate periods of flooding and dryness. This is borne out in the inland rivers. Thus the River Murray, which has never been known to run dry, derives its steadiness of flow mainly through the causes above indicated.

(ii.) *Direct Influences of Forest on Rainfall.*. Whether forests have a direct influence on rainfall is a debatable question, some authorities alleging that precipitation is undoubtedly induced by forests, while others contend the opposite. According to Dr. Hann, observations have been made in India and Germany which support the idea that the destruction of trees has had a most deteriorating effect upon the climate.[1] In the Cordilleras clouds with rain falling from them can be seen hanging over forests, while over contiguous lands covered with shrubs or used for agriculture the sky is blue and the sun is shining.

In America the influence of forests on the rainfall is still debated, but in Europe authorities contend that forests encourage frequent rainfalls. Hann states that a surface which keeps the air moist and cool, and from which there is as great an evaporation as takes place from extended forests, must have a tendency to increase the amount and frequency of precipitation, as contrasted with an open country which is dry, but over which conditions are otherwise similar.

Obviously the settlement of this very important question is difficult. Observations would have to be taken, with different treatments of the land, over very extended periods. Sufficient evidence exists, however, to establish that, even if the rainfall has not increased, the beneficial effect of forest lands in tempering the effects of the climate is more than sufficient to disclose the importance of their protection and extension. Curtis, in a paper read before the Meteorological Congress in 1893, sets forth important evidence of the ill-effects on orchard and wheat country of the felling of trees for the timber trade.

In Michigan, where half a century ago peach trees flourished and were rarely injured by cold, the crops have now nearly disappeared, owing to the removal by timbermen of the shelter afforded by the forests. In Northern Kansas, too, from the same cause, the growing of peaches has been largely abandoned. Many of the South Californian citrus fruit-growers protect their orchards from the destructive effects of wind by the judicious planting of eucalyptus and other trees.

It is the rapid rate of evaporation (says Dr. Fernow), induced by both hot and cold winds, which injures crops and makes life uncomfortable on the plains. Whether the forest aids in increasing precipitation there may be doubt, but nobody can say that it does not check the winds and the rapid evaporation due to them.

Trees as wind-breaks have been successfully planted in central parts of the United States, and there is no reason why similar experiments should not be successful in many parts of our treeless interior. The belts should be planted at right angles to the direction of the prevailing parching winds, and if not more than half a mile apart will afford shelter to the enclosed areas.[2]

22. **Comparison of Rainfalls and Temperatures.**—For the purpose of comparison the following lists of rainfalls and temperatures are given for various important cities throughout the world, for some of the places mentioned as possible sites for a federal capital, and for the capitals of the Australian States :—

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1. "Climatology," p. 194.

2. See A. Woeikof, Petermann's Mittheilungen, 1885; and W. M. Fulton and A. N. Salisbury, "Convention of U.S.A. Weather Bureau Officials, 1898."

COMPARISON OF RAINFALLS AND TEMPERATURES
OF CITIES OF THE WORLD WITH THOSE OF AUSTRALIA.

Place.	Height above M.S.L.	Annual Rainfall.			Temperature.					
		Average.	Highest.	Lowest.	Mean Summer.	Mean Winter.	Highest on Record.	Lowest on Record.	Average Hottest Month.	Average Coldest Month.
	Ft.	Ins.	Ins.	Ins.	Fahr.	Fahr.	Fahr.	Fahr.	Fahr.	Fahr.
Amsterdam ...	...	26.40	...	...	62.9	37.1	93.9	5.8	63.6	35.0
Athens	...	...	...	...	...	...	106.0	...	...	...
Berlin	161	22.80	27.18	17.97	64.6	32.4	97.5	—9.6	65.8	30.6
Berne	1,880	46.00	...	...	...	...	97.2	—22.0	63.0	27.0
Bombay	37	75.00	...	...	83.0	75.0	100.0	53.0	83.0	74.0
Brussels	177	28.60	47.00	20.00	63.2	37.2	...	.....	65.0	35.6
Budapest... ...	502	21.50	...	...	...	...	...	.....	71.7	31.0
Buenos Ayres ...	72	35.20	78.74	22.76	75.4	51.4	103.1	28.4	75.0	50.0
Calcutta	21	65.60	...	...	84.7	66.7	108.0	44.0	85.0	65.0
Capetown ...	40	25.50	36.72	17.71	68.1	54.7	102.0	34.0	68.8	53.9
Chicago	595	33.40	45.86	24.40	70.0	26.0	103.0	23.0	72.0	24.0
Christiania ...	82	21.10	...	...	...	...	91.2	.....	63.0	23.5
Colombo	40	87.36	...	...	81.0	79.5	95.8	65.2	82.5	79.0
Constantinople ...	...	28.75	42.74	14.78	74.0	43.5	103.6	13.0	75.7	42 0
Copenhagen ...	46	21.80	27.87	21.58	60.5	31.9	90.5	— 9.7	61.9	31.4
Dublin	155	29.20	35.57	20.47	58.9	42.0	87.0	13.0	63.5	32.8
Edinburgh ...	441	25.00	32.89	16.50	59.0	38.4	88.0	0.0	58.0	37.0
Genoa	177	45.00	...	...	...	...	...	...	...	...
Hong Kong ...	110	84.88	100.0	57.03	80.9	59.1	92.9	40.6	80.9	55.3
Johannesburg ...	5,925	30.64	43.39	21.66	65.0	51.5	94.0	23.3	66.8	40.6
Lisbon	312	31.00	102.0	27.50	69.6	51.3	94.1	32.5	...	...
London	154	24.36	34.08	16.93	61.2	39.3	97.1	4.0	62.7	38.6
Madras	22	49.00	...	...	87.3	76.7	112.0	57.0	89.3	76.1
Madrid	2,149	17.99	27.48	11.22	73.0	41.2	107.1	10.5	75.7	39.7
Marseilles ...	246	21.73	43.05	12.05	70.3	46.0	100.4	11.5	83.0	56.3
Moscow	469	21.30	...	...	63.5	49.0	...	...	68.0	12.0
Naples	187	32.60	...	...	76.1	49.3	104.0	23.0	77.2	48.2
New York ...	175	30.70	37.60	24.30	67.0	19.0	97.0	—28.0	69.0	16.0
Ottawa	294	33.19	38.05	25.25	66.7	15.0	98.3	—31.6	68.7	12.6
Paris	104	19.68	26.18	15.28	63.0	38.4	101.1	—14.0	66 0	36.3
Pekin	...	24.40	...	...	...	...	...	...	79.2	23.6
Quebec	293	45 to 50	...	...	63.0	14.0	...	...	66.0	9.4
Rome	164	27.84	36.29	19.84	74.0	46.6	100.4	19.6	76.5	45.7
San Francisco ...	28	22.50	38.70	9.30	59.0	51.0	100.0	29.0	61.0	50.0
Shanghai ...	...	...	...	...	79.4	41.1	102.0	12.2	82.7	37.7
Singapore ...	...	92.70	123.24	65.56	...	...	93.0	...	....	...
Stockholm ...	144	15.70	...	...	...	...	...	...	63.0	24.5
St. Petersburg ...	16	20.86	25.11	15.74	61.0	19.0	87.4	—30.3	64.0	17.1
Tokyo	69	58.00	...	...	74.1	38.6	98.0	15.0	77.4	36.6
Vienna	666	25.82	37.60	20.04	65.3	30.9	101.7	—13.9	67.5	28.6
Vladivostock ...	100	12.60	...	...	...	...	...	...	69.5	5.0
Washington ...	73	43.10	61.30	30.60	75.0	35.0	104.0	—15.0	77.0	33.0
PLACES WHICH HAVE BEEN REFERRED TO AS POSSIBLE SITES FOR THE FEDERAL CAPITAL.										
					*	†				
Armidale... ...	3,333	31.79	59.34	16.61	66.0	44.1	105.2	13.9	69.1	42.1
Bombala... ...	3,000	22.92	38.18	11.88	61.0	42.8	104.1	15.5	65.2	41.3
Canberra (District) ...	2,000 to 2,900	23.00	50.69	16.56	68.0	44.7	109.0	16.0	72.0	42.0
Dalgety	2,650	17.82	23.20	13.53	64.2	41.8	104.0	11.0	67.0	40.0
Lyndhurst ...	2.204	26.29	31.74	19.05	...	...	...	...	...	...
Tumut	900	31.96	47.87	16.83	...	...	...	...	...	...
THE STATE CAPITALS.										
					*	†				
Perth	197	33.27	46.73	20.48	70.9	55.8	107.9	35.3	73.8	55.2
Adelaide... ...	140	20.41	30.87	13.43	71.3	52.9	116.3	32.0	74.2	51.5
Brisbane... ...	137	48.36	88.26	16.17	75.5	59.4	108.9	36.1	77.4	58.0
Sydney	146	48.28	82.81	21.48	69.8	53.8	108.5	35.9	71.6	52.3
Melbourne ...	91	25.43	44.25	15.61	65.0	49.9	111.2	27.0	67.5	48.5
Hobart	160	23.29	40.67	13.43	60.2	47.0	105.2	27.7	62.2	45.8

* Mean summer temperature derived from the average for November, December, January, February and March. † Mean winter temperature derived from the average for June, July, and August.

23. **Climatological Tables.**—The means, averages, extremes, totals, etc., for a number of climatological elements have been determined from long series of observations at the Australian capitals. These are given in the following tables:—

CLIMATOLOGICAL DATA FOR PERTH, W.A.

LAT. 31° 57′ S., LONG. 115° 51′ E. HEIGHT ABOVE M.S.L. 197 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mn. Sea Level and Standard Gravity from 9 a.m. and 3 p.m. Readings	Wind. Greatest Number of Miles in one day.	Wind. Mean Hourly Pressure. (lbs.)	Wind. Total Miles.	Wind. Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds 9 a.m. & 3 p.m.	No. of Clear Days.
No. of yrs. over which observation extends.	12	11	11	11	11	10	11	12	11
January	29.921	797 27/98	0.72	11,501	S	10.34	1.0	2.6	12.5
February	29.924	650 6/08	0.68	10,136	S S E	8.72	1.2	2.7	10.6
March	29.990	601 17/99	0.56	10,168	S S E	7.58	1.0	3.2	11.4
April	30.067	955 25/00	0.45	8,790	E S E	4.77	0.8	2.4	5.9
May	30.089	698 5/05	0.36	8,215	E N E	2.62	2.3	5.3	4.1
June	30.050	836 21/00	0.41	8,400	N E	1.62	1.8	6.0	1.8
July	30.099	949 11/99	0.41	8,618	E N E	1.62	2.3	5.3	4.5
August	30.104	966 15/03	0.43	8,959	E	2.34	1.5	5.3	4.1
September ...	30.066	864 11/05	0.48	9,060	S S W	3.27	1.8	5.5	5.0
October	30.021	686 15/98	0.59	10,385	S S W	5.30	1.3	5.4	5.3
November	30.001	719 7/05	0.63	10,470	S S W	7.73	0.9	3.9	9.3
December	29.932	672 31/98	0.70	11,408	S	9.94	1.4	3.1	11.7
Year Totals ...	—	—	—	—	—	65.85	17.3	—	86.2
Year Averages ...	30.022	—	0.52	9,676	S S E	—	—	4.2	—
Year Extremes ...	—	966 15/8/03	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.	Lowest.	Greatest Range.	Extreme Temperature. Highest in Sun.	Lowest on Grass.	Sea water mn. 3 ft. below surface.
No. of yrs. over which observation extends.	12	12	12	12	12	12	11	11	—
January	84.0	62.9	73.5	107.0 16/97	50.6 25/01	56.4	171.0 4/04	42.4 25/02	—
February	84.5	63.0	73.8	106.8 6/98	47.7 1/02	59.1	169.0 4/99	41.2 1/02	—
March	81.5	60.5	71.0	104.3 6, 7/06	45.8 8/03	58.5	161.6 1/99	36.7 8/03	—
April	75.9	56.6	66.3	98.0 5/06	42.4 2/01	55.6	152.0 11/01	35.0 2/01	—
May	68.8	52.5	60.7	90.4 2/07	39.9 *	50.5	138.8 15/02	31.9 18/99	—
June	63.6	49.0	56.3	74.2 1/08	36.9 14/98	37.3	131.0 5/04	30.2 14/98	—
July	62.8	47.5	55.2	73.8 24/99	36.4 19/06	37.4	131.0 31/98	29.2 29/08	—
August	64.0	48.0	56.0	80.4 30/02	35.3 31/08	45.1	134.1 †	29.9 31/08	—
September ...	65.7	50.0	57.9	86.4 28/00	39.0 18/00	47.4	144.8 19/02	33.2 15/99	—
October	69.3	53.1	61.2	93.4 17/06	41.2 10/03	52.2	152.6 30/01	34.6 6/98	—
November	74.9	56.3	65.6	100.9 27/01	42.0 1/04	58.9	161.5 17/03	36.6 3/07	—
December	80.8	60.5	70.7	107.9 20/04	48.5 16/07	59.4	168.3 20/04	40.9 21/08	—
Year Averages ...	73.0	55.0	64.0	—	—	—	—	—	—
Year Extremes ...	—	—	—	107.9 20/12/04	35.3 31/8/08	72.6	171.1 4/1/04	29.2 29/7/08	—

* 17 and 18, 1899. † 29/1898 and 18/1902.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean 9 a.m.	Highest Mean.	Lowest Mean.	Rainfall. Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.	Least Monthly.	Greatest in One Day.	Dew. Mean Amount of Dew.	Mean No. days Dew
No. of yrs. over which observation extends.	12	12	12	33	33	33	33	33	—	12
January	51	56	45	0.33	3	2.17 1879	nil *	1.74 28/79	—	2
February	54	63	48	0.34	2	2.30 1883	nil †	0.90 10/83	—	1
March	55	61	48	0.77	4	4.50 1896	nil ‡	1.53 17/76	—	3
April	63	70	54	1.66	7	4.97 1882	0.05 ‖	2.62 30/04	—	7
May	73	81	69	4.95	14	12.13 1879	0.98 1903	2.80 20/79	—	11
June	78	83	74	6.62	16	12.11 1890	2.16 1877	2.45 24/79	—	11
July	78	81	73	6.28	16	10.90 1902	2.42 1876	3.00 4/91	—	12
August	75	79	68	5.60	17	10.33 1882	0.46 1902	2.79 7/03	—	10
September ...	69	76	64	3.28	14	7.72 1903	0.69 1877	1.65 26/90	—	8
October	63	67	56	2.07	11	7.87 1890	0.49 1892	1.26 3/99	—	4
November	56	61	52	0.79	6	2.12 1880	nil 1891	1.11 30/03	—	4
December	52	56	49	0.58	4	3.05 1888	nil 1886	1.72 1/88	—	3
Year Totals ...	—	—	—	33.27	114	—	—	—	—	76
Year Averages ...	63	—	—	—	—	—	—	—	—	—
Year Extremes ...	—	83	45	—	—	12.13 5/79	nil §	3.00 4/7/91	—	—

* 1888, 1894, and 1897. † 1885, 1891, 1896, and 1903. ‡ 1877, 1881, and 1886. ‖ 1890, and 1894.
§ January, February, March, November, and December, various years.

CLIMATOLOGICAL DATA FOR ADELAIDE, S.A.

LAT. 34° 56′ S., LONG. 138° 35′ E. HEIGHT ABOVE M.S.L. 140 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mn. Sea Level and Standard Gravity from 9 a.m. and 3 p.m. Readings.	Wind. Greatest Number of Miles in one day.	Wind. Mean Hourly Pressure. (lbs.)	Wind. Total Miles.	Wind. Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds. 9 a., 3 p., 9 p.	No. of Clear Days.
No. of yrs. over which observation extends.	52	31	31	31	31	39	37	41	27
January	29.913	758 19/99	0.37	8,262	S W x S	8.99	2.2	3.5	7.5
February	29.951	691 22/96	0.32	7,022	S W x S	7.38	2.1	3.4	7.2
March	30.040	592 12/85	0.26	6,925	S W to S E	5.85	2.2	4.0	6.6
April	30.117	773 10/96	0.23	6,361	S W & S †	3.42	1.6	5.0	3.8
May	30.126	760 9/80	0.21	6,278	N E to N	2.02	1.8	5.7	1.7
June	30.098	750 12/78	0.27	6,810	N E to N	1.24	2.1	6.2	1.3
July	30.138	674 25/82	0.26	6,900	N E to N	1.31	1.5	5.8	1.3
August	30.101	773 31/97	0.30	7,370	N E to N ‡	1.87	2.1	5.7	1.9
September	30.040	720 2/87	0.33	7,551	N E & S W ‖	2.87	2.4	5.2	2.5
October	29.994	768 28/98	0.37	8,246	S W & N E ‖	4.78	3.6	4.9	3.6
November	29.975	677 2/04	0.36	7,884	W S W to S	6.61	3.9	4.5	5.5
December	29.921	675 12/91	0.37	8,227	W S W to S	8.49	2.8	3.8	7.0
Year Totals	—	—	—	—	—	54.83	28.3	—	49.9
Year Averages	30.034	—	0.30	7,320	S W	—	—	4.8	—
Year Extremes	—	773 *	—	—	—	—	—	—	—

* 10/4/96; 31/8/97. † With tendency N E. ‡ With tendency S W. ‖ Equal.

TEMPERATURE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.	Lowest.	Greatest Range.	Extreme Temperature. Highest in Sun.	Lowest on Grass.	Sea water mn. 3 ft. below surface*
No. of yrs. over which observation extends.	52	52	52	52	52	52	31	48	35
January	86.6	61.7	74.2	116.3 26/58	45.1 21/84	71.2	180.0 18/82	36.5 14/79	70.9
February	86.1	62.0	74.0	113.6 12/99	46.4 13/05	67.2	170.5 10/00	36.7 24/78	70.9
March	80.9	58.9	69.9	108.0 12/61	44.8 —/57	63.2	174.0 17/83	33.8 27/80	68.2
April	73.4	54.7	64.1	98.0 10/66	39.6 15/59	58.4	155.0 1/83	30.3 27/08	64.0
May	65.3	50.0	57.7	88.3 5/66	36.9 †	51.4	148.2 12/79	25.9 10/91	59.0
June	60.2	46.6	53.4	76.0 23/65	32.5 27/76	43.5	138.8 18/79	24 5 20/79	54.6
July	58.7	44.4	51.5	74.0 11/06	32.0 24/08	42.0	134.5 26/90	25.0 17/90	52.2
August	61.8	45.7	53.8	82.0 25/62	32.3 17/59	49.7	140.0 31/92	23.5 7/88	53.3
September	66.3	47.7	57.0	90.7 23/82	32.7 4/58	58.0	160.5 23/82	28.0 6/78	56.4
October	72.6	51.4	62.0	100.5 30/59	36.0 —/57	64.5	158.8 19/82	28.5 7/96	60.7
November	78.9	55.3	67.1	113.5 21/65	40.9 6/67	72.6	166.9 20/78	31.8 10/77	65.3
December	83.7	59.0	71.3	114.2 14/76	43.0 ‡	71.2	175.7 7/99	32.5 4/84	68.8
Year Averages	72.9	53.1	63.0	—	—	—	—	—	62.0
Year Extremes	—	—	—	116.3 26/1/58	32.0 24/7/08	84.3	180.0 18/1/82	23.5 7/8/88	—

* Taken at Lighthouse at entrance to Port River. † 26/1895; 24/1904. ‡ 16/1861; 4/1906.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean 9 a.m.	Highest Mean.	Lowest Mean.	Rainfall. Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.	Least Monthly.	Greatest in One Day.	Dew. Mean Amount of Dew.	Mean No. days Dew
No. of yrs. over which observation extends.	41	41	41	52	52	52	52	52	—	37
January	42	59	33	0.83	5	3.28 1870	nil 1878,1906	2.30 2/89	—	3
February	44	56	37	0.59	4	3.10 1856	nil 1860,etc.	1.81 6/90	—	4
March	49	58	40	1.10	6	4.60 1878	nil 1859,etc.	3.50 5/78	—	10
April	59	72	44	1.84	9	5.65 1889	0.09 1888	3.15 5/60	—	13
May	70	76	58	2.76	14	7.75 1875	0.20 1891	2.47 5/75	—	15
June	78	84	70	3.02	17	6.02 1887	0.42 1886	1.45 25/84	—	15
July	78	83	72	2.55	17	5.38 1865	0.36 1899	1.75 10/65	—	17
August	72	77	65	2.33	16	4.48 1864	0.68 1860	1.44 31/03	—	16
September	63	72	54	1.75	15	3.67 1877	0.45 1896	1.42 25/93	—	15
October	54	67	44	1.79	11	3.83 1870	0.31 1868	2.24 16/08	—	11
November	47	57	38	1.01	8	2.57 1903	0.04 1885	1.88 28/58	—	6
December	43	50	33	0.84	6	3.98 1861	nil 1904	1.32 2/61	—	4
Year Totals	—	—	—	20.41	128	—	—	—	—	129
Year Averages	56	—	—	—	—	—	—	—	—	—
Year Extremes	—	84	33	—	—	7.75 5/1875	nil *	3.50 5/3/78	—	—

— Signifies no record kept. * January, February, March, and December, various years.

CLIMATOLOGICAL DATA FOR BRISBANE, QUEENSLAND.

LAT. 27° 28′ S., LONG. 153° 2′ E. HEIGHT ABOVE M.S.L. 137 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mn. Sea Level and Standard Gravity from 9 a.m. and 3 p.m. Readings	Wind.				Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds. 9 a.m. & 3 p.m.	No. of Clear Days.
		Greatest Number of Miles in one day.	Mean Hourly Pressure. (lbs.)	Total Miles.	Prevailing Direction.				
No. of yrs. over which observation extends.	22	—	—	—	22	7	—	22	—
January	29.870	—	—	—	E	9.23	—	6.2	—
February	29 889	—	—	—	S E	7.72	—	6.3	—
March	29.955	—	—	—	S	7.11	—	6.0	—
April	30.048	—	—	—	S	6.48	—	5.2	—
May	30.098	—	—	—	S	5.38	—	5.0	—
June	30.055	—	—	—	S & W	5.21	—	4.2	—
July	30 068	—	—	—	S & W	5.78	—	3.8	—
August	30.021	—	—	—	S & S W	6.45	—	3.8	—
September ...	30.027	—	—	—	S E & S & W	7.48	—	3.9	—
October	29.994	—	—	—	N & N E	8.07	—	4.4	—
November	29 960	—	—	—	N & N E	8.16	—	5.1	—
December	29.895	—	—	—	N & N E	8.64	—	5.7	—
Year { Totals ...	—	—	—	—	—	—	—	—	—
Year { Averages ...	29.995	—	—	—	S'ly to E'ly	85.73	—	5.0	—
Year { Extremes ...	—	—	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature.			Extreme Shade Temperature.				Greatest Range.	Extreme Temperature.				Sea water mn. 3 ft. below surface
	Mean Max.	Mean Min.	Mean	Highest.		Lowest.			Highest in Sun.		Lowest on Grass.		
No. of yrs. over which observation extends.	22	22	22	22		22		22	22		22		—
January	85.4	69.3	77.4	108.9	14/02	58.8	4/93	50.1	162.7	20/89	49.9	4/93	—
February	84.4	68.5	76.5	101 9	11/04	58.7	†	43.2	162.7	3/08	49.3	9/89	—
March	82.2	66.6	74.4	96 8	16/88	55.6	30/95	41.2	160.0	1/97	46.0	28/02	—
April	78.7	61.7	70.2	95.2	*	48.6	17/00	46.6	150.1	1/08	37.0	17/00	—
May	73.2	55.4	64.3	88.8	18/97	41.3	24/99	47.5	140.8	4/88	29.8	8/97	—
June	69.1	50.4	59.8	81.5	6/06	36.3	29/08	45.2	133.9	6/06	25.4	23/88	—
July	68.2	47.7	58.0	83.4	28/98	36.1	‡	47.3	134.4	29/89	23.9	11/90	—
August	71.1	49.7	60.4	87 5	28/07	37.4	6/87	50.1	140.7	30/88	27.1	9/99	—
September	75.5	54.7	65.1	90 2	20/04	40.7	1/96	49.5	155.5	26/03	30.4	1/89	—
October	79.8	59.7	69.8	101.4	18/93	43.3	3/99	58.1	156.5	31/89	34.9	8/89	—
November	82.6	63.8	73.2	105.4	13/98	48 5	2/05	56.9	162.3	7/89	38.8	1/05	—
December	85.1	67.3	76.2	105.9	26/93	57.0	16/90	48.9	159.5	23/89	49.1	3/94	—
Year { Averages ...	77.9	59.6	68.8	—		—		—	—		—		—
Year { Extremes ...	—	—	—	108.9	14/1/02	36.1	‖	72.8	162.7	§	23.9	11/7/90	—

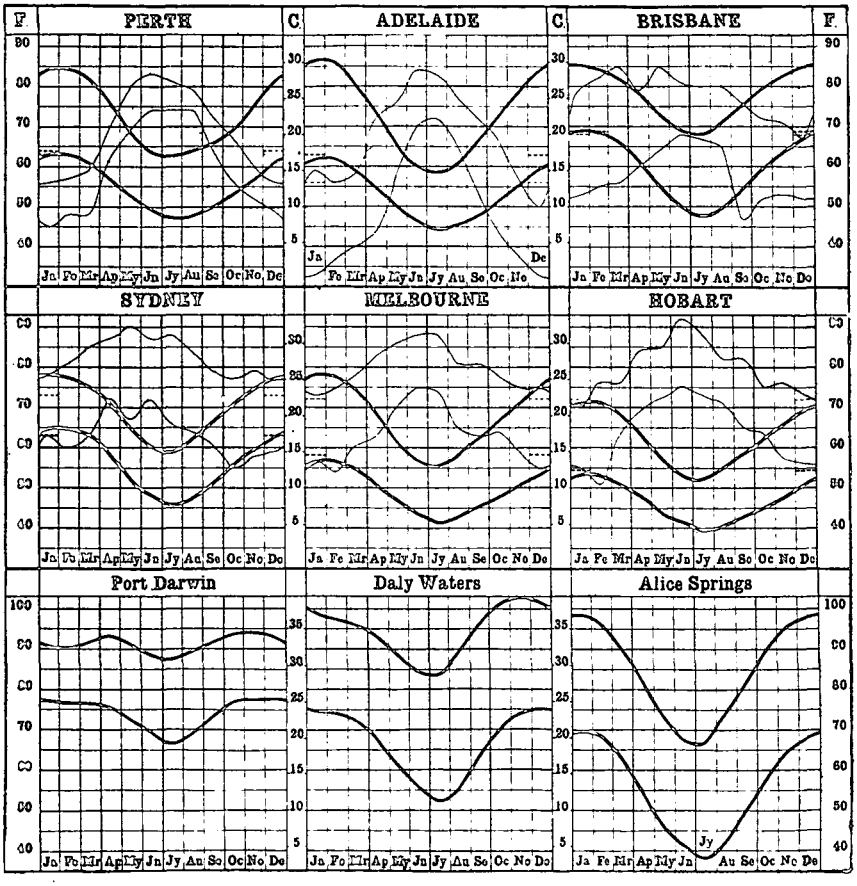
* 9/96; 5/03. † 10/04; 11/04. ‡ 12/94; 2/96. ‖ 12/7/94; 2/7/96. § 20/1/89; 3/2/08.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity.			Rainfall.						Dew.	
	Mean 9 a.m.	Highest Mean.	Lowest Mean.	Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.	Least Monthly.	Greatest in One Day.		Mean Amount of Dew.	Mean No. days Dew
No of yrs. over which observation extends	22	22	22	49	49	49	49	49		—	—
January	66	77	53	6.67	14	27.72 1895	1.23 1889	18.31	21/87	—	—
February	69	82	55	7.14	14	40.39 1893	0.77 1904	8.36	16/93	—	—
March	72	85	56	6.58	16	21.36 1890	0.63 1903	11.18	14/08	—	—
April	72	79	60	3.97	13	14.26 1892	0.05 1897	3.93	20/92	—	—
May	75	85	64	3.10	10	11.82 1903	0.47 1902	4.26	31/03	—	—
June	74	81	68	2.74	8	11.03 1893	0.02 1895	6.01	9/93	—	—
July	73	80	67	2.39	8	8.46 1889	0.04 1894	3.54	16/89	—	—
August	70	80	65	2.18	7	11.80 1887	0.24 1896	4.89	12/87	—	—
September	65	76	47	2.01	8	4.80 1890	0.10 1907	2.46	2/94	—	—
October	61	72	52	2.83	10	6.26 1892	0.14 1900	1.95	20/89	—	—
November	59	71	53	3.64	10	8.78 1889	1.07 1906	2.57	17/95	—	—
December	61	67	52	4.81	12	11.52 1895	0.55 1900	5.26	7/05	—	—
Year { Totals ...	—	—	—	—	—	—	—	—		—	—
Year { Averages ...	68	—	—	48.36	130	—	—	—		—	—
Year { Extremes ...	—	85	47	—	—	40.39 2/1893	0.02 6/1895	18.31	21/1/87	—	—

— Signifies no record kept.

GRAPHS SHEWING ANNUAL FLUCTUATIONS OF MEAN MAXIMUM AND MINIMUM TEMPERATURE AND HUMIDITY IN SEVERAL PARTS OF THE COMMONWEALTH OF AUSTRALIA.



EXPLANATION OF THE GRAPHS OF TEMPERATURE AND HUMIDITY.—In the above graphs, in which the heavy lines denote 'temperature' and the thin lines 'humidity,' the fluctuations of mean temperature and mean humidity are shewn throughout the year. These curves are plotted from the data given in the Climatological Tables hereinafter. The temperatures are shewn in degrees Fahrenheit, the inner columns giving the corresponding values in Centigrade degrees. Humidities have not been obtained for Port Darwin, Daly Waters, or Alice Springs.

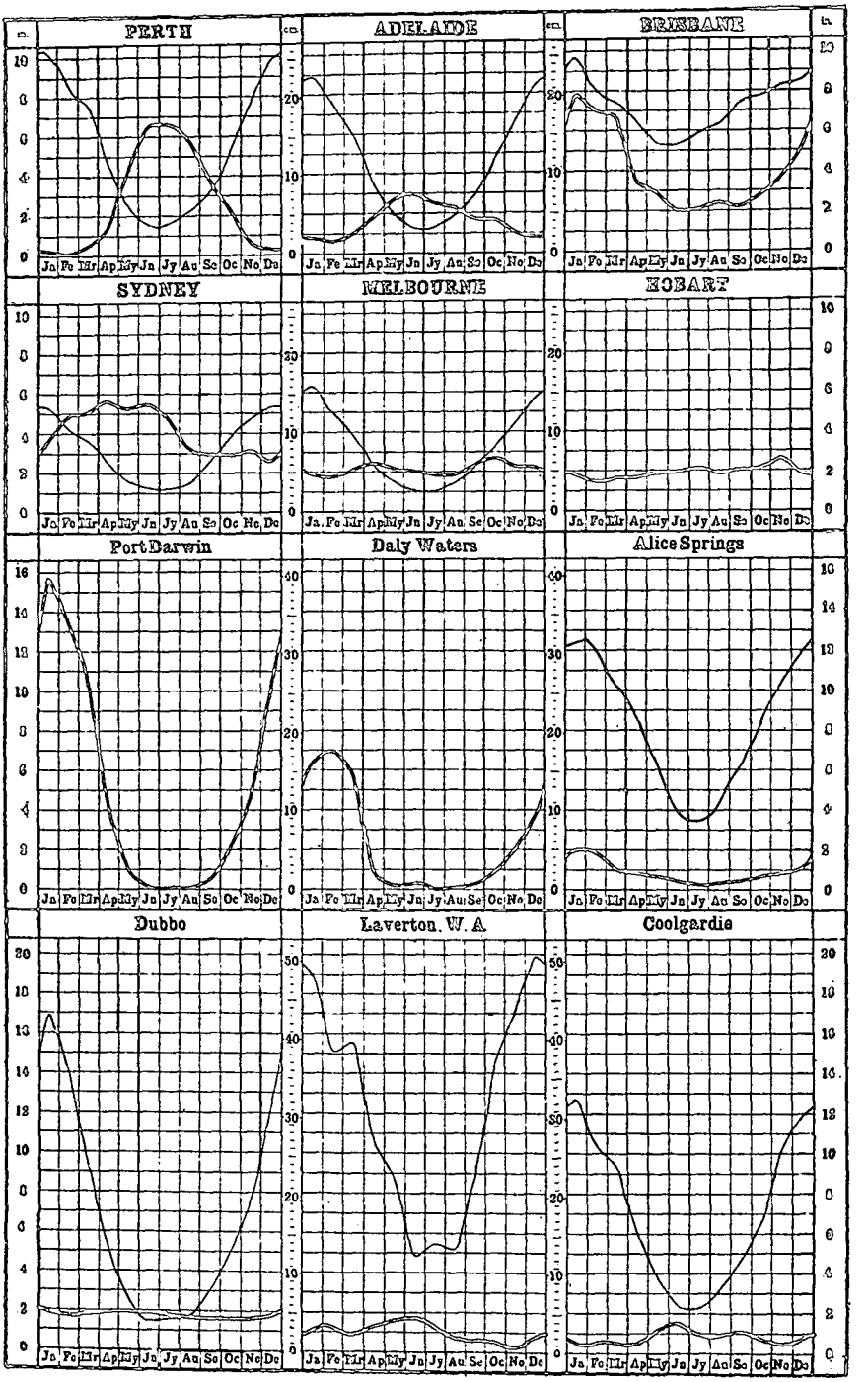
For the thin lines the degree numbers represent relative humidities, or the actual percentages of actual saturation on the total for the respective temperature.

In both cases the upper line represents the mean of the maximum, and the lower line the mean of the minimum results; thus the curves also shew the progression of the range between maximum and minimum temperatures throughout the year.

INTERPRETATION OF THE GRAPHS.—The curves denote mean monthly values. Thus, taking, for example, the temperature graphs for Perth, the mean readings of the maximum and minimum temperatures for a number of years on 1st January would give respectively about 83° Fahr. and 62° Fahr. Thus the mean range of temperature on that date is the difference, viz., 21°. Similarly, observations about 1st June would give respectively about 66° Fahr. and 51° Fahr., or a range of 15°.

In a similar manner it will be seen that the mean of the greatest humidities, say on 31st March, is about 64 and the mean of the least humidities 55; in other words, at Perth, the degree of saturation of the atmosphere by aqueous vapour ranges on 31st March between 64 % and 55 %

GRAPHS SHEWING ANNUAL FLUCTUATIONS OF MEAN RAINFALL AND MEAN EVAPORATION IN SEVERAL PARTS OF THE COMMONWEALTH OF AUSTRALIA.



(For explanation see next page.)

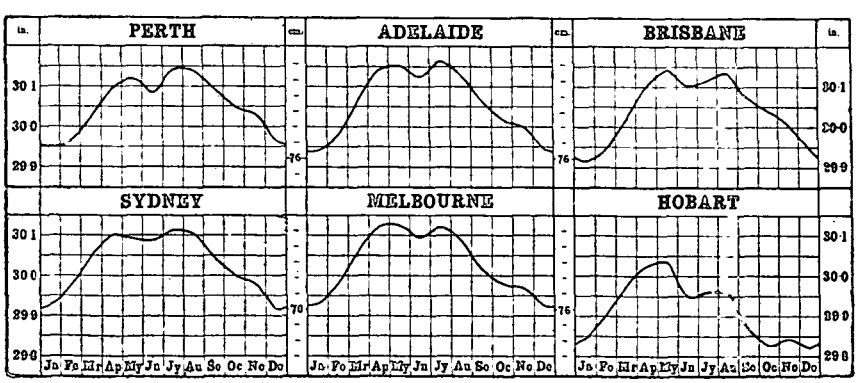
EXPLANATION OF THE GRAPHS OF RAINFALL AND EVAPORATION.—On the preceding graphs thick lines denote rainfall and thin lines evaporation, and shew the fluctuation of the mean rate of fall *per month* throughout the year. The results, plotted from the Climatological Tables hereinafter, are shewn in inches (see the outer columns), and the corresponding metric scale (centimetres) is shewn in the two inner columns. The evaporation is not given for Hobart, Port Darwin, nor Daly Waters.

INTERPRETATION OF THE GRAPHS.—The distance for any date from the zero line to the curve, represents the average number of inches, reckoned as per month, of rainfall at that date. Thus, taking the curves for Adelaide, on the 1st January the rain falls on the average at the rate of about four-fifths of an inch per month, or, say, at the rate of about 9½ inches per year. In the middle of June it falls at the rate of nearly 3 inches per month, or, say, at the rate of about 36 inches per year. At Dubbo the evaporation is at the rate of nearly 17 inches per month about the middle of January, and only about 1¼ inches at the middle of June.

TABLE SHEWING MEAN ANNUAL RAINFALL AND EVAPORATION IN INCHES OF THE PLACES SHEWN ON PRECEDING PAGE, AND REPRESENTED BY THE GRAPHS.

—	Rainfall.	Evaporation.	—	Rainfall.	Evaporation.
Perth ...	33.27	65.85	Port Darwin ...	61.55	—
Adelaide ...	20.41	54.83	Daly Waters ...	27.07	—
Brisbane ...	48.36	85.73	Alice Springs...	10.97	97.32
Sydney ...	48.28	42.25	Dubbo ...	22.38	81.03
Melbourne ...	25.43	38.40	Laverton, W.A.	10.09	—
Hobart ...	23.29	—	Coolgardie ...	9.18	86.87

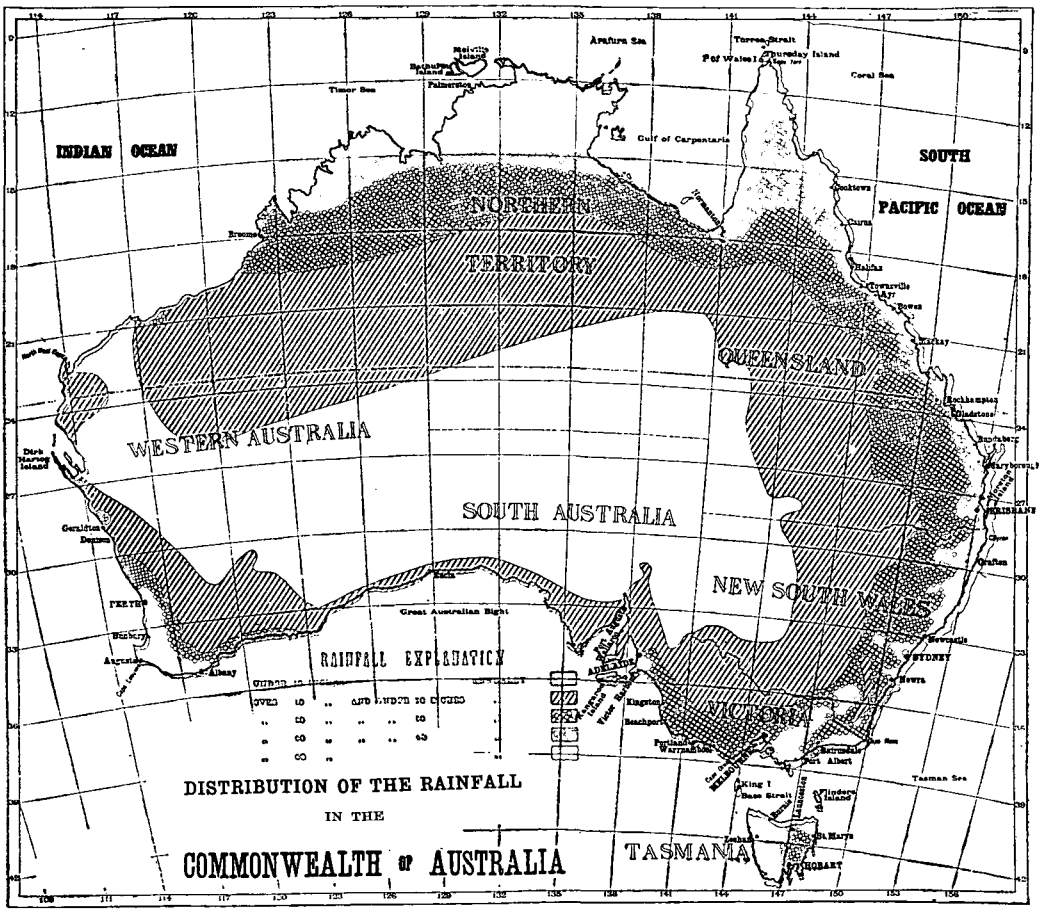
GRAPHS SHEWING ANNUAL FLUCTUATIONS OF MEAN BAROMETRIC PRESSURE FOR THE CAPITALS OF THE COMMONWEALTH OF AUSTRALIA.



EXPLANATION OF THE GRAPHS OF BAROMETRIC PRESSURE.—On the above graphs the lines representing the yearly fluctuation of barometric pressure at the capital cities are means for long periods, and are plotted from the Climatological Tables given hereinafter. The pressures are shewn in inches on about 2⅝ times the natural scale, but the corresponding pressures in centimetres are also shewn in the two inner columns, each division representing one millimetre.

INTERPRETATION OF THE BAROMETRIC GRAPHS.—Taking the Brisbane graph for purposes of illustration, it will be seen that the mean pressure on 1st January is about 29.93 inches, and there are maxima in the middle of May and August of about 30.15 and 30.14 respectively. The double maxima appear clearly on each graph.

RAINFALL OF AUSTRALIA.

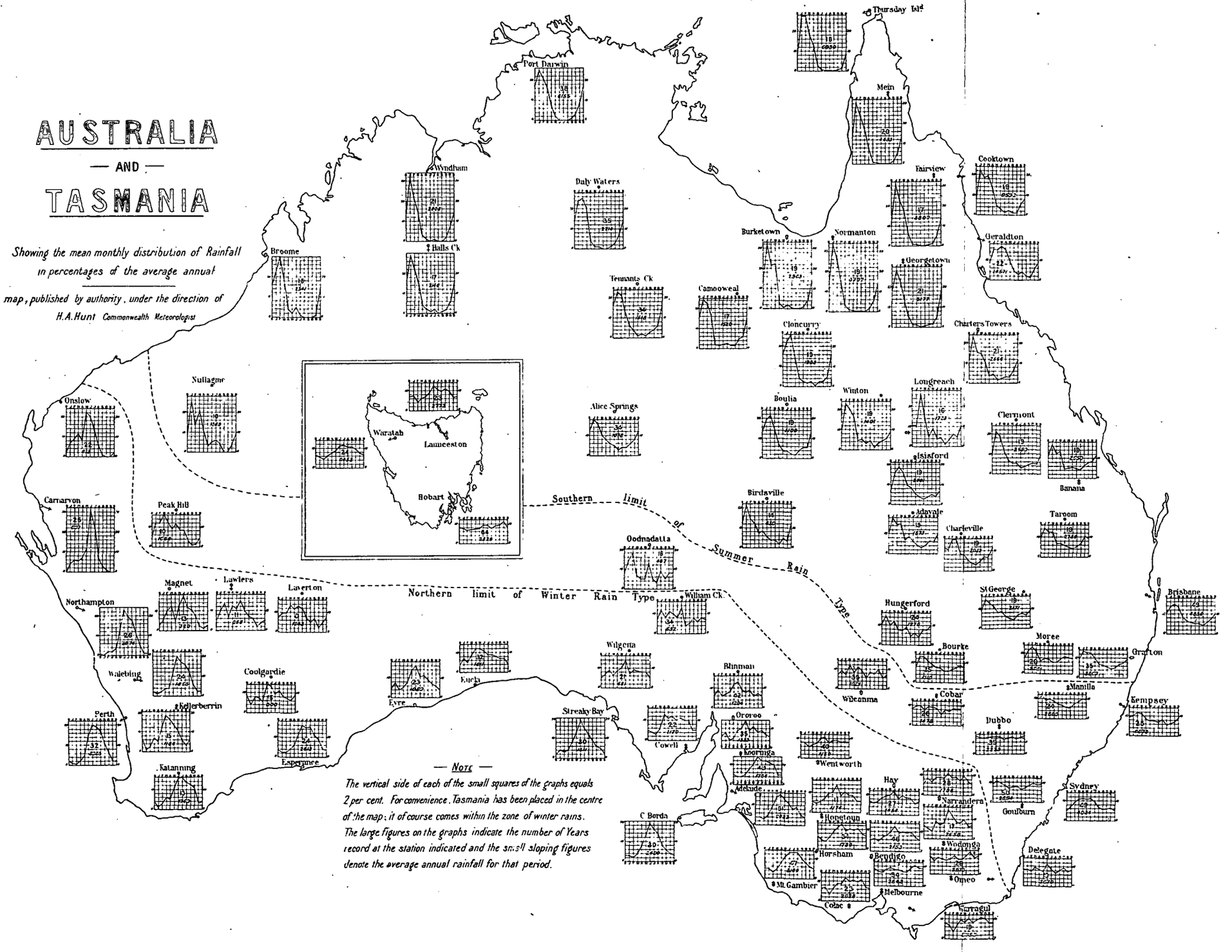


The above map has been prepared from a chart shewing the isohyets (curves of equal mean annual rainfall) for every 10 inches for Australia, and compiled from the most recent information. It was impracticable on the small scale map to distinguish between the areas with 40 to 50, 50 to 60, 60 to 70, and over 70 inches of rain annually.

AUSTRALIA
— AND —
TASMANIA

Showing the mean monthly distribution of Rainfall in percentages of the average annual

From map, published by authority, under the direction of H.A. Hunt Commonwealth Meteorologist



— NOTE —

The vertical side of each of the small squares of the graphs equals 2 per cent. For convenience, Tasmania has been placed in the centre of the map; it of course comes within the zone of winter rains. The large figures on the graphs indicate the number of Years record at the station indicated and the small sloping figures denote the average annual rainfall for that period.

CLIMATOLOGICAL DATA FOR SYDNEY, N.S.W.

LAT. 33° 52′ S., LONG. 151° 12′ E. HEIGHT ABOVE M.S.L. 146 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Barometer corrected to 32° F. Mean Sea Level and Standard Gravity from 24 hrly. Readings.	Wind. Greatest Number of Miles in one day.	Wind. Mean Hourly Pressure. (lbs.)	Wind. Total Miles.	Wind. Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds.	No. of Clear Days.
No. of yrs. over which observation extends.	49	46	46	42	46	49	45	47	45
January	29.972	721 1/71	0.35	8,324	N E	5.73	4.8	5.9	2.0
February	29.983	871 12/69	0.27	7,230	N E	4.36	4.0	6.1	1.2
March	30.063	943 20/70	0.23	6,893	N E	3.76	4.2	5.7	1.7
April	30 112	803 6/82	0.20	6,362	N E	2.62	4.2	5.1	2.5
May	30.104	758 6/98	0.20	6,487	W	1.81	3.7	4.9	3.2
June	30.097	712 7/00	0.28	7,282	W	1.44	2.4	4.8	3.4
July	30.119	930 17/79	0.26	7,387	W	1.57	2.6	4.3	4.3
August	30.113	756 22/72	0.24	7,142	W	2.10	3.5	4.1	4.6
September	30 054	964 6/74	0.27	7,382	W	3.16	4.2	4.4	3.6
October	30.007	926 4/72	0.29	8,013	N E	4.40	5.1	5.0	2.2
November	29 986	720 13/68	0.32	7,841	N E	5.22	5.6	5.6	1.4
December	29.920	938 3/84	0.32	8 177	N E	6.06	5.6	5.7	1.8
Year Totals	—	—	—	—	—	42.23	49.9	—	31.9
Year Averages	30.040	—	0.27	7,377	N E	—	—	5.1	—
Year Extremes	—	964 6/9/74	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.	Lowest.	Greatest Range.	Extreme Temperature. Highest in Sun.	Lowest on Grass.	Sea water mn. 3 ft. below surface*
No. of yrs. over which observation extends.	50	50	50	50	50	50	50	50	48
January	78.3	64.9	71.6	108.5 13/96	51.2 14/65	57.3	160 9 13/96	44.2 18/97	71.4
February	77.2	64.8	71.1	101.0 19/66	49.3 28/63	51.7	162.1 16/98	43.4 25/91	71.9
March	75.4	63.0	69.3	102.6 3/69	48.8 14/86	53.8	172.3 4/89	42.3 13/93	70.9
April	70.9	58.2	64.6	88.9 3/87	44.6 27/64	44.3	144.1 10/77	38.0 13/92	68.4
May	64.9	52 0	58.5	83.5 1/59	40.2 22/59	43.3	129.7 1/96	30.9 7/88	64.2
June	60.4	48.2	54.3	74.7 24/72	38.1 29/62	36.6	123.0 14/78	28.7 30/95	59.9
July	58.9	45.6	52.3	74.9 17/71	35.9 12/90	39.0	144.3 15/98	24.0 4/93	57.6
August	62.2	47.5	54.8	82 0 31/84	36.8 3/72	45.2	149.0 30/78	27.7 30/95	57.5
September	66.3	51.3	58.9	91 1 24/07	40.8 18/64	50.3	142.2 12/78	30.1 17/05	60.2
October	71.0	55 8	63.4	99.7 19/98	43.3 2/99	56.4	149.9 13/96	32.7 9/05	63.3
November	74.2	59 6	66.9	102.7 21/78	45.8 1/05	56.5	158.5 28/99	38.8 1/05	66.9
December	77.2	62.8	70.0	107.5 31/04	49.3 2/59	58.2	171.5 4/88	42.2 8/75	69.6
Year Averages	69.7	56.2	63.0	—	—	—	—	—	65.2
Year Extremes	—	—	—	108.5 13/1/96	35.9 12/7/90	72.6	172.3 4/3/89	24.0 4/7/93	—

* Taken at Fort Denison.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean.	Highest Mean.	Lowest Mean.	Rainfall. Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.	Least Monthly.	Greatest in One Day.	Dew. Mean Amount of Dew.	Mean No. days Dew
No of yrs. over which observation extends	50	50	50	50	50	50	50	50	50	50
January	70	78	60	3.45	14.1	10.49 1883	0.42 1888	3.75 22/63	0.002	1.1
February	73	81	60	4.72	13.9	18.56 1873	0.34 1902	8.90 25/73	0.003	1.4
March	75	85	63	5.16	14.9	18.70 1870	0.42 1876	5.66 25/90	0.007	2.9
April	78	87	64	5.40	13.3	24.49 1861	0.06 1868	7.52 29/60	0.022	6.3
May	77	90	66	5.13	15.7	20.87 1889	0.21 1885	8.36 28/89	0.030	7.3
June	79	89	72	5.33	12.8	16.30 1885	0.19 1904	5.17 16/84	0.022	5.3
July	77	88	66	4.61	12.1	13.21 1900	0.12 1862	5.72 28/08	0.024	6.8
August	74	84	64	3.29	11.5	14.89 1889	0.04 1885	5.33 2/60	0.021	5.7
September	70	79	61	2.87	12.3	14.05 1879	0.08 1862	5.69 10/79	0.008	3.4
October	68	77	55	2.86	12.6	10.81 1902	0.21 1867	6.37 13/02	0.004	1.6
November	68	79	58	3.00	12.6	9.88 1865	0.20 1867	4.23 19/00	0.006	2.7
December	68	77	59	2.46	12.9	7.80 1870	0.45 1876	2.75 1/88	0.002	1.0
Year Totals	—	—	—	48.28	158.7	—	—	—	0.151	45.5
Year Averages	73	—	—	—	—	—	—	—	—	—
Year Extremes	—	90	55	—	—	24.49 4/1861	0.04 8/1885	8.90 25/2/73	—	—

CLIMATOLOGICAL DATA FOR MELBOURNE, VICTORIA.

LAT. 37° 50′ S., LONG. 144° 59′ E. HEIGHT ABOVE M.S.L. 91 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Min. Sea Level and Standard Gravity from 9 a.m., 3 p.m. and 9 p.m.	Wind.				Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds.	No. of Clear Days.
		Greatest Number of Miles in one day.	Mean Hourly Pressure. (lbs.)	Total Miles.	Prevailing Direction.				
No. of yrs. over which observation extends.	51	43	43	43	43	37	—	51	—
January	29.911	583 10/97	0.29	7,345	S W, S E	6.33	—	5.1	—
February	29.962	566 8/68	0.28	6,441	S W, S E	4.98	—	5.1	—
March	30.040	677 9/81	0.22	6,398	S W, S E	3.83	—	5.5	—
April	30.102	597 7/68	0.19	5,719	S W, N W	2.30	—	5.9	—
May	30.107	693 12/65	0.19	5,958	N W, N E	1.49	—	6.5	—
June	30.077	761 13/76	0.24	6,461	N W, N E	1.11	—	6.7	—
July	30.102	755 8/74	0.23	6,482	N W, N E	1.07	—	6.3	—
August	30.066	637 14/75	0.26	6,882	N W, N E	1.48	—	6.3	—
September	29.997	617 11/72	0.20	7,108	N W, S W	2.28	—	6.1	—
October	29.943	899 5/66	0.29	7,377	S W, N W	3.27	—	6.0	—
November	29.953	734 13/66	0.29	7,083	S W, S E	4.50	—	5.9	—
December	29.900	655 1/75	0.30	7,503	S W, S E	5.76	—	5.5	—
Year Totals ...	—	—	—	—	—	38.40	—	—	—
Year Averages ...	30.013	—	0.26	6,730	S W, N W	—	—	5.9	—
Year Extremes ...	—	899 5/10/66	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature.			Extreme Shade Temperature.		Greatest Range.	Extreme Temperature.		Sea water mn. 3 ft. below surface.
	Mean Max.	Mean Min.	Mean	Highest.	Lowest.		Highest in Sun.	Lowest on Grass.	
No. of yrs. over which observation extends.	53	53	53	53	53	53	50	48	—
January	78.3	56.6	67.5	111.2 14/62	42.0 28/85	69.2	178.5 14/62	30.2 28/85	—
February	77.7	56.6	67.2	109.5 7/01	40.3 9/65	69.2	167.5 15/70	30.9 6/91	—
March	74.9	54.5	64.7	105.5 2/93	37.1 17/84	68.4	164.5 1/68	28.9 †	—
April	68.6	50.7	59.6	94.0 6/65	34.8 24/88	59.2	152.0 8/61	25.0 23/97	—
May	61.5	46.6	54.0	83.7 7/1905	31.3 26/95	52.4	142.6 2/59	23.2 21/97	—
June	56.8	43.9	50.3	68.1 *	28.0 11/66	40.1	129.0 11/61	20.4 17/95	—
July	55.5	41.5	48.5	68.4 24/78	27.0 21/69	41.4	125.8 27/80	20.5 12/03	—
August	58.7	43.1	50.9	77.0 20/85	28.3 11/63	48.7	137.4 29/69	21.3 14/02	—
September	62.5	45.3	53.9	82.3 30/07	31.1 16/08	49.8	142.1 20/67	24.7 13/07	—
October	67.0	48.1	57.5	96.1 30/85	32.1 3/71	64.0	154.3 28/68	25.9 3/71	—
November	71.4	51.0	61.2	105.7 27/94	36.5 2/96	69.2	159.6 29/65	24.6 2/96	—
December	75.4	53.7	64.6	110.7 15/76	40.0 4/70	70.7	170.3 20/69	33.2 1/04	—
Year Averages ...	67.4	49.3	58.3	—	—	—	—	—	—
Year Extremes ...	—	—	—	111.2 14/1/62	27.0 21/7/69	84.2	178.5 14/1/62	20.4 17/6/95	—

* 21/1865 and 2/1884. † 17/1884 and 20/1897.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity.			Rainfall.					Dew.	
	Mean 9a.3p.9p.	Highest Mean.	Lowest Mean.	Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.	Least Monthly.	Greatest in One Day.	Mean Amount of Dew.	Mean No. days Dew
No. of yrs. over which observation extends.	51	51	51	53	53	53	53	50	—	—
January	64	73	57	1.88	7	5.68 1904	0.04 1878	2.97 9/97	—	—
February	65	75	54	1.72	7	6.24 1904	0.03 1870	2.14 7/04	—	—
March	68	78	61	2.13	8	6.36 1874	0.18 1859	3.05 15/78	—	—
April	73	83	63	2.38	10	6.71 1901	0.33 1908	4.50 22/86	—	—
May	79	86	70	2.11	12	4.31 1862	0.45 1901	1.85 7/91	—	—
June	80	88	75	2.09	13	4.51 1859	0.73 1877	1.74 21/04	—	—
July	80	88	74	1.85	15	7.02 1891	0.57 1902	2.71 12/91	—	—
August	75	81	65	1.80	13	3.58 1871	0.48 1903	1.87 17/81	—	—
September	72	81	63	2.31	14	5.87 1870	0.52 1907	2.62 12/80	—	—
October	70	79	63	2.68	13	7.61 1869	0.57 1895	3.00 17/69	—	—
November	67	75	56	2.24	10	5.05 1881	0.25 1895	2.57 16/76	—	—
December	65	75	49	2.24	9	7.18 1863	0.11 1904	2.62 28/07	—	—
Year Totals ...	—	—	—	—	—	—	—	—	—	—
Year Averages ...	71	—	—	25.43	131	—	—	—	—	—
Year Extremes ...	—	88	49	—	—	7.61 10/1869	0.03 2/1870	4.50 22/4/86	—	—

— Signifies no record kept.

CLIMATOLOGICAL DATA FOR HOBART, TASMANIA.

LAT. 42° 53′ S., LONG. 147° 20′ E. HEIGHT ABOVE M.S.L. 160 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mn. Sea Level and Gravity from 9 a.m. Readings	Wind. Greatest Number of Miles in one day.	Wind. Mean Hourly Pressure. (lbs.)	Wind. Total Miles.	Wind. Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds.	No. of Clear Days.
No. of yrs. over which observation extends.	14	—	25	—	25	—	—	25	—
January	29.828	—	0 51	—	S E, N W	—	—	6.3	—
February	29.926	—	0.51	—	N W, S E	—	—	6.2	—
March	29.957	—	0.47	—	N W, S E	—	—	6.0	—
April	29 978	—	0.43	—	N W, S E	—	—	6.2	—
May	30.047	—	0.47	—	N W	—	—	6.3	—
June	29.970	—	0.43	—	N W	—	—	6.5	—
July	29.948	—	0.47	—	N W	—	—	5.7	—
August	29.994	—	0.51	—	N W	—	—	6.0	—
September	29.851	—	0.63	—	N W, S E	—	—	6.2	—
October	29.830	—	0.63	—	N W, S E	—	—	6.6	—
November	29.829	—	0.63	—	N W, S E	—	—	6.4	—
December	29.808	—	0.60	—	N W, S E	—	—	6.4	—
Year Totals ...	—	—	—	—	—	—	—	—	—
Year Averages ...	29.914	—	0.51	—	N W, S E	—	—	6.2	—
Year Extremes ...	—	—	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.		Lowest.		Greatest Range.	Extreme Temperature. Highest in Sun.		Lowest on Grass.		Sea water mn. 3 ft. below surface
No. of yrs. over which observation extends.	25	25	25	25		25		25	23		21*a*		—
January	71.1	53.2	62.2	105.0	1/00	40.3	2/06	64.7	160.0	‡	30.6	1897	—
February	71.2	53.0	62.1	104 4	12/99	39.0	20/87	65.4	165.0	24/98	28.3	1887	—
March	67.9	50.5	59.3	97.5	7/91	36.0	31/05	61.5	147.5	1/06	27.5	30/02	—
April	63.0	47.8	55.4	82.4	6/88	33.3	24/88	49.1	138.5	12/05	25.0	1886	—
May	57.6	43.4	50.5	75.3	3/88	29.2	20/02	46.1	128.0	1889	20.0	19/02	—
June	53.0	41.4	47.2	69.2	1/07	29.5	26/02	39.7	122.0	12/94	21.0	6/87	—
July	52.1	39.4	45.8	65.4	15/98	27.7	11/95	37.7	118.7	19/96	18.7	16/86	—
August	55.1	41.0	48.1	71.5	17/02	30.5	4/97	41.0	129.0	1887	21.0	1887	—
September	58.5	42.8	50.7	79 5	*	31.0	16/97	48.5	134.0	7/94	22.7	1886	—
October	62.6	45.3	54.0	86.0	29/07	32.0	12/89	54.0	146.0	1885	23.8	§	—
November	66.2	48.1	57.2	98.0	23/88	37.0	†	61.0	151.0	17/03	26.0	1/08	—
December	69.2	50.9	60.1	105.2	30/97	38.0	3/06	67.2	156.0	18/05	27.2	1886	—
Year Averages ...	62.3	46.4	54.4	—		—		—	—		—		—
Year Extremes ...	—	—	—	105.2	30/12/97	27.7	11/7/95	77.5	165.0	24/2/98	18.7	16/7/86	—

a Records only continuous since 1893.

* 30/91 and 17/97. † 24/84, 13/87, 11/85, and 7/00. ‡ 5/86 and 13/05. § 1886 and 1899.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean 9 a.m.	Highest Mean.	Lowest Mean.	Rainfall. Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.		Least Monthly.		Greatest in One Day.		Dew. Mean Amount of Dew.	Mean No. days Dew
No of yrs. over which observation extends	14	14	14	64	51	64		64		26		—	—
January	63	72	55	1.83	9	5.91	1893	0.03	1841	2.59	30/05	—	—
February	64	76	51	1.50	8	9.15	1854	0.07	1847	1.60	22/03	—	—
March	69	76	63	1.62	9	7.60	1854	0.02	1843	1.45	1/83	—	—
April	75	84	68	1.73	10	4.99	1852	0.07	1904	1.66	22/01	—	—
May	79	85	68	1.80	12	6.37	1905	0.10	1843	1.62	31/05	—	—
June	82	92	75	2.16	13	8.15	1889	0.22	1852	4.11	14/89	—	—
July	79	88	73	2.15	13	5.98	1849	0.30	1850	1.56	8/94	—	—
August	79	82	71	1.81	12	10.16	1858	0.23	1854	2.28	13/90	—	—
September	74	82	65	2.09	14	7.14	1844	0.39	1847	1.57	24/85	—	—
October	68	75	61	2.17	14	6.67	1906	0.26	1850	2.58	4/06	—	—
November	64	76	55	2.56	12	8.92	1849	0.16	1868	3.70	30/85	—	—
December	60	73	51	1.87	10	9.00	1875	0.11	1842	2.27	27/07	—	—
Year Totals ...	—	—	—	23.29	136	—		—		—		—	—
Year Averages ...	71	—	—	—	—	—		—		—		—	—
Year Extremes ...	—	92	51	—	—	10.16	8/1858	0.02	3/1843	4.11	14/6/89	—	—

— Signifies no record kept.