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SECTION III.

PHYSIOGRAPHY.

§ 1. General Description of Australia.

1. **Geographical Position.**—The Australian Commonwealth, which includes the island continent of Australia proper and the island of Tasmania, is situated in the Southern Hemisphere, and comprises 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]

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 AND TERRITORY WITHIN TROPICS.

Areas.	Queensland.	Western Australia.	Northern Territory.	Total.
	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.
Within Tropical Zone	359,000	364,000	426,320	1,149,320
Within Temperate Zone	311,500	611,920	97,300	1,020,720
Ratio of Tropical part to whole State ...	0.535	0.373	0.814	0.530
Ratio of Temperate part to whole State ...	0.465	0.627	0.186	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 3, page 57.

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 nearly 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 more than 25 times as large as any one of the following, viz., the United Kingdom, Hungary, 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," tenth edition, p. 787, are respectively 113° 5′ E., 153° 16′ E., 10° 39′ S., and 39° 11½′ S., but these figures are obviously defective. A similar inaccuracy appears in the XI. edition of the Encyclopædia.

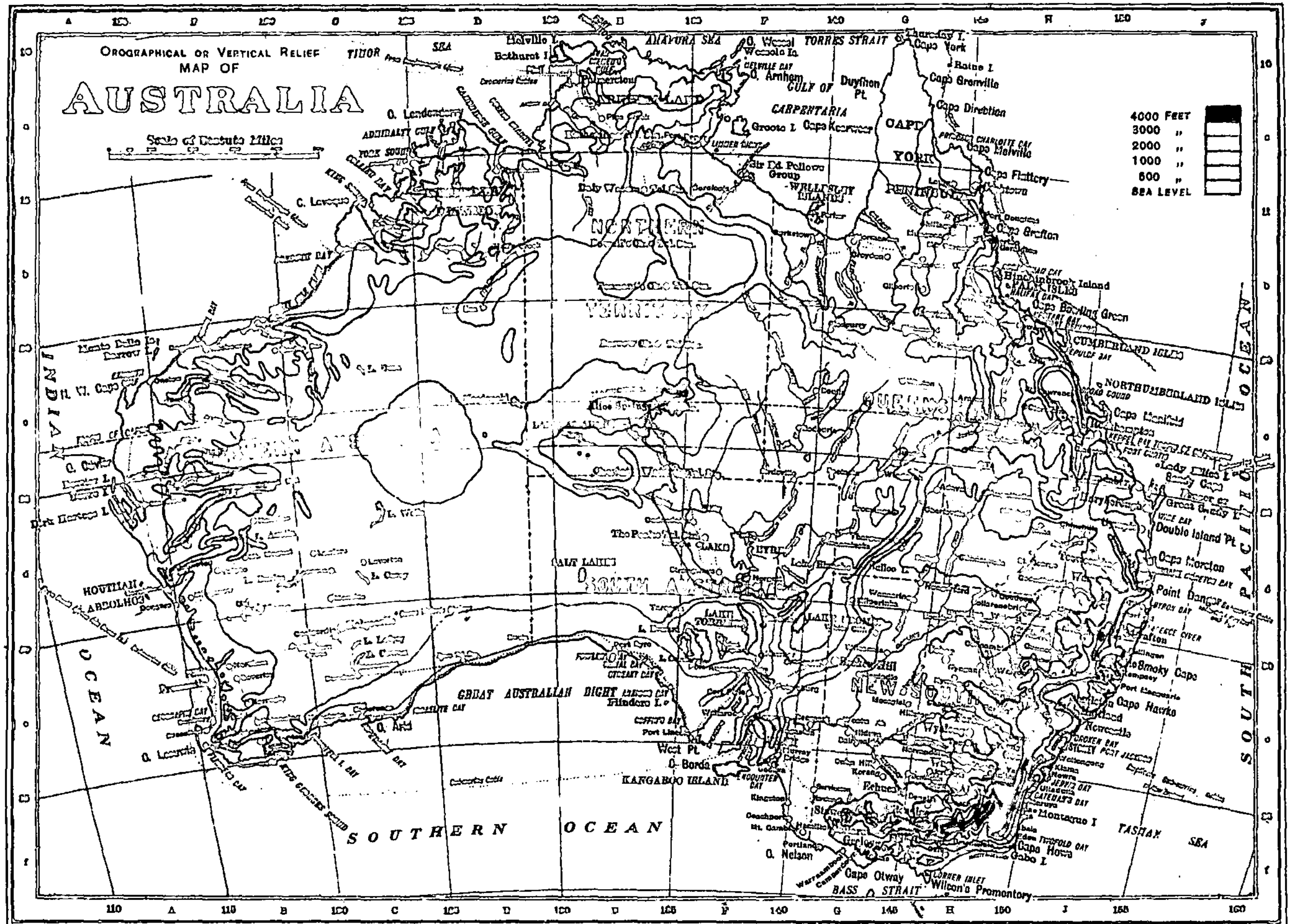
2. Its correct value for 1918 is 23° 26′ 59.83″, and it decreases about 0″.47 per annum.

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 (1.29679) as large as Australia, 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.
Continents—	Sq. miles.		
Europe	3,857,411	0.77	1.29679
Asia	16,852,098	0.17	5.66537
Africa	12,236,834	0.24	4.11380
North and Central America and West Indies ...	8,566,278	0.35	2.87983
South America	7,446,201	0.40	2.50328
Australasia and Polynesia	3,462,366	0.86	1.16398
Total, exclusive of Arctic and Antarctic Conts.	52,421,188	0.06	17.62305
Europe—			
Russia (inclusive of Poland, Ciscaucasia & Finland)	2,122,998	1.40	0.71371
Austria-Hungary (incl. of Bosnia & Herzegovina)	261,259	11.39	0.08783
Germany	208,780	14.25	0.07018
France	207,054	14.37	0.06969
Spain	194,778	15.27	0.06548
Sweden	173,035	17.19	0.05817
Norway	124,643	23.86	0.04190
United Kingdom	121,633	24.45	0.04089
Italy	110,632	26.89	0.03719
Denmark (inclusive of Iceland)	55,338	53.73	0.01861
Rumania	53,489	55.61	0.01798
Bulgaria	43,305	68.69	0.01455
Greece	41,933	70.94	0.01409
Portugal	35,490	83.82	0.01193
Serbia	33,891	87.76	0.01139
Switzerland	15,976	186.22	0.00537
Netherlands	12,582	236.42	0.00423
Belgium	11,373	261.78	0.00382
Albania	11,317	262.84	0.00380
Turkey	10,882	273.34	0.00366
Montenegro	5,603	530.88	0.00188
Luxemburg	998	2941.18	0.00034
Andorra	191	15573.72	0.00006
Malta	118	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	3,857,411	0.77	1.29679
Asia—			
Russia (inclus. of Transcaucasia, Siberia, Steppes, Transcaspia, Turkestan and inland waters) ...	6,641,587	0.45	2.23278
China and Dependencies...	3,913,560	0.76	1.31567
British India...	1,093,074	2.72	0.36747
Independent Arabia	1,000,000	2.97	0.33618
Feudatory Indian States...	709,555	4.19	0.23854
Turkey (including Samos)	699,522	4.25	0.23516
Persia	628,000	4.74	0.21112
Dutch East Indies	583,211	5.10	0.19606
Japan (and Dependencies)	262,331	11.34	0.08819



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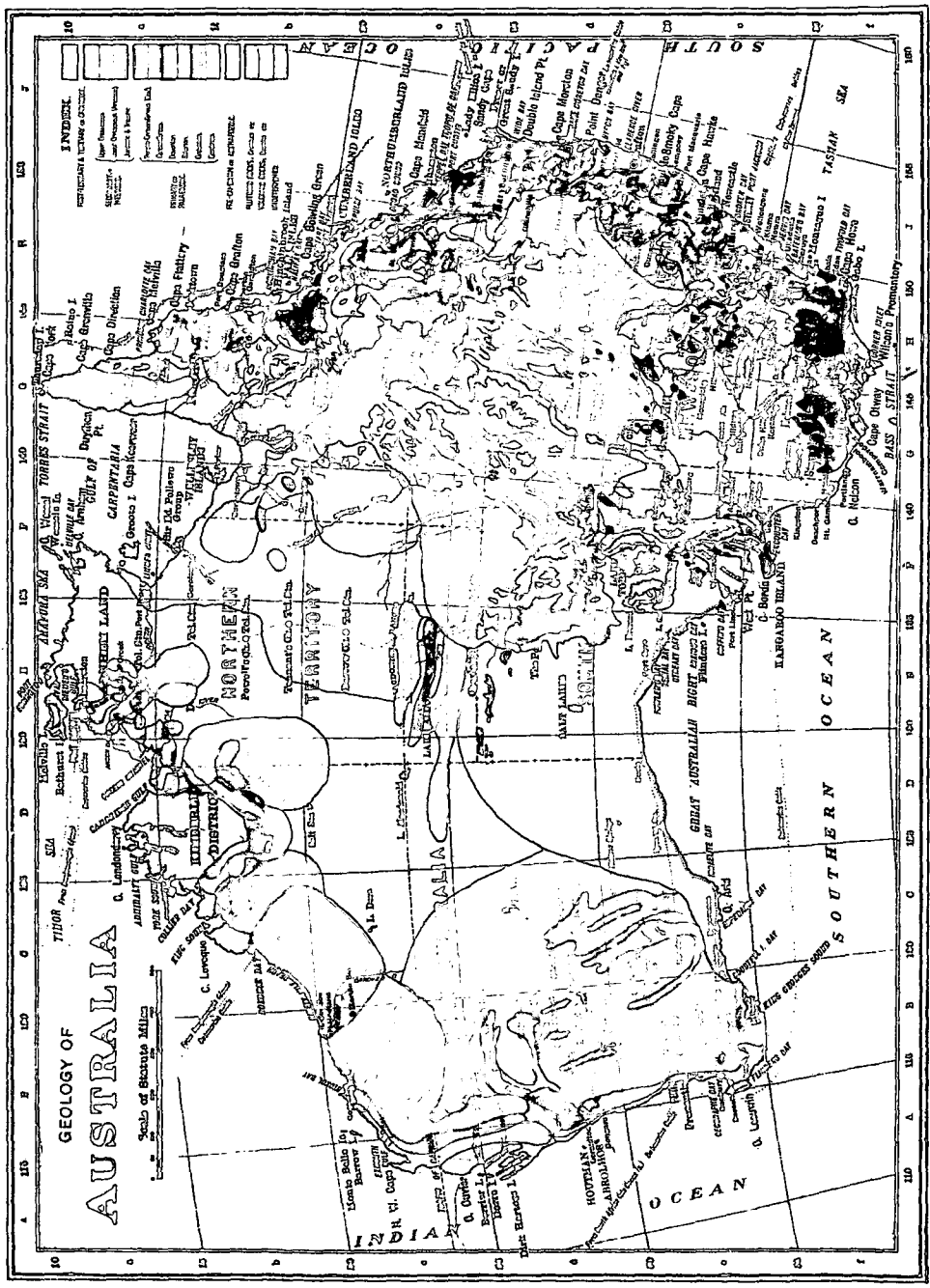

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Country.	Area.	Australian Commonwe'lth in comparison with—	In comparison with Australian C'wealth.
ASIA (continued)—	Sq. Miles.		
Afghanistan	250,000	11.90	0.08405
Siam	195,000	15.25	0.06555
Philippine Islands (inclusive of Sulu Archipelago)	120,000	23.60	0.04034
Laos	111,940	26.57	0.03763
Bokhara	83,000	35.83	0.02790
Omán	82,000	36.27	0.02757
British Borneo and Sarawak	73,106	40.68	0.02457
Cambodia	67,724	43.92	0.02277
Annam	61,718	48.20	0.02075
Nepál	54,000	55.10	0.01815
Tonking	46,223	64.35	0.01554
Federated Malay States	27,506	108.14	0.00925
Ceylon	25,332	117.42	0.00852
Malay Protectorate (including Johore) ...	24,970	119.13	0.00839
Khiva	24,000	123.94	0.00807
Cochin China...	21,988	135.28	0.00739
Bhután	20,000	148.73	0.00672
Aden and Dependencies	9,005	330.32	0.00303
Timor, etc. (Portuguese Indian Archipelago) ...	7,330	406.50	0.00246
Brunei	4,000	743.64	0.00134
Cyprus	3,584	833.33	0.00120
Kiauchau (Neutral Zone)	2,500	1189.83	0.00084
Goa, Damaõ, and Diu	1,638	1818.18	0.00055
Straits Settlements	1,600	1851.85	0.00054
Sokotra	1,382	2152.22	0.00046
Hong Kong and Dependencies	391	7607.62	0.00013
Kwang Chan Wan	386	7706.17	0.00013
Wei-hai-wei	285	10623.50	0.00009
Bahrein Islands	250	11898.32	0.00008
Kiauchau (German)	200	14872.90	0.00007
French India (Pondicherry, etc.)	196	15176.43	0.00007
Macao, etc.	4	743643.25	...
Total, Asia	16,852,098	0.17	5.66537
Africa—			
French Sahara	1,544,000	1.93	0.51907
French Equatorial Africa	1,003,600	2.96	0.33739
Sudan	984,520	3.02	0.33098
Belgian Congo	909,654	3.27	0.30582
French Military District of the Niger ...	534,124	5.57	0.17956
Angola	484,800	6.14	0.16298
Union of South Africa	473,075	6.29	0.15904
Rhodesia	438,575	6.78	0.14744
Portuguese East Africa	426,712	6.97	0.14345
Tripoli and Benghezi	406,000	7.33	0.13649
German East Africa	384,180	7.74	0.12915
Abyssinia	350,000	8.50	0.11766
Egypt	350,000	8.50	0.11766
Mauretania	344,967	8.62	0.11597
Algeria (including Algerian Sahara)... ...	343,500	8.66	0.11548
Nigeria and Protectorate	336,000	8.85	0.11296
German South-west Africa	322,450	9.23	0.10840
Senegambia and Niger	302,136	9.84	0.10157
Bechuanaland Protectorate	275,000	10.82	0.09245
British East Africa Protectorate	246,822	12.05	0.08298
Madagascar	226,016	13.16	0.07598
Morocco	219,000	13.58	0.07362
Kamerun	191,130	15.56	0.06425

Country.	Area.	Australian Commonw'lth in comparison with—	In comparison with Australian C'wealth.
AFRICA (continued)—	Sq. miles.		
Italian Somaliland	139,430	21.34	0.04687
Ivory Coast	125,538	23.69	0.04220
Uganda Protectorate	109,119	27.26	0.03668
French Guinea	92,249	32.25	0.03101
Gold Coast Protectorate (with North. Territories)	80,000	37.18	0.02689
Senegal	74,012	40.19	0.02488
Rio de Oro, etc.	73,000	40.75	0.02454
British Somaliland	68,000	43.74	0.02286
Tunis	50,000	59.49	0.01681
French Somali Coast	46,320	64.21	0.01557
Eritrea	45,800	64.95	0.01540
Liberia	40,000	74.36	0.01345
Nyassaland Protectorate...	39,573	75.17	0.01330
Dahomey	37,527	79.26	0.01261
Togoland	33,700	88.26	0.01133
Sierra Leone and Protectorate	31,000	95.95	0.01042
Portuguese Guinea	13,940	213.22	0.00469
Spanish Guinea (Rio Muni, etc.)	12,000	247.88	0.00403
Basutoland	11,716	253.89	0.00393
Swaziland	6,536	455.10	0.00219
Gambia and Protectorate	4,504	660.43	0.00151
Cape Verde Islands	1,480	2000.00	0.00050
Zanzibar	1,020	2941.18	0.00034
Réunion	965	3082.47	0.00032
Fernando Po, etc.	814	3654.28	0.00027
Mauritius and Dependencies	809	3676.86	0.00027
Comoro Islands	694	4286.14	0.00023
St. Thomas and Prince Islands	360	8262.73	0.00012
Seychelles	156	19067.82	0.00005
Mayotte, etc....	143	20801.27	0.00005
Spanish North and West Africa	87	34190.59	0.00003
St. Helena	47	63288.95	0.00002
Ascension	34	87487.65	0.00001
Total, Africa	12,236,834	0.24	4.11380
North and Central America and West Indies—			
Canada	3,729,665	0.80	1.25385
United States (exclusive of Alaska, etc.) ...	2,973,890	1.00	0.99976
Mexico	785,881	3.78	0.26420
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	44,275	67.18	0.01488
Cuba	44,164	67.35	0.01485
Costa Rica	23,000	129.32	0.00773
San Domingo...	18,045	164.74	0.00607
Haiti	10,204	291.55	0.00343
British Honduras	8,598	345.96	0.00289
Salvador	13,176	225.76	0.00443
Bahamas	4,404	675.43	0.00148
Jamaica	4,207	707.05	0.00141
Porto Rico	3,606	824.90	0.00121
Trinidad and Tobago	1,868	1592.39	0.00063
Leeward Islands	715	4160.25	0.00024
Guadeloupe and Dependencies	688	4323.52	0.00023
Windward Islands	527	5644.37	0.00018

* Danish colony only. Total area has been estimated as between 827,000 and 850,000 square miles.

Country.	Area.	Australian Commonwe'lth in comparison with—	In comparison with Australian C'wealth.
N. & C. AMERICA & W. INDIES (continued)—	Sq. miles.		
Curaçao and Dependencies	403	7381.09	0.00014
Martinique	378	7869.26	0.00013
Turks and Caicos Islands	224	13279.38	0.00008
Barbados	166	17925.18	0.00005
Danish West Indies	142	20947.75	0.00005
St. Pierre and Miquelon	96	30985.22	0.00003
Cayman Islands	89	33422.26	0.00003
Bermudas	19	156556.89	...
Total, N. and C. America and W. Indies ...	8,566,278	0.35	2.87983
South America—			
Brazil (inclusive of Acré)...	3,364,564	0.88	1.13110
Argentine Republic	1,153,119	2.58	0.38766
Peru	722,461	4.12	0.24288
Bolivia	514,155	5.79	0.17285
Colombia (exclusive of Panama)	440,846	6.75	0.14820
Venezuela	398,594	7.46	0.13400
Chile	289,829	10.26	0.09744
Paraguay	165,000	18.03	0.05546
Ecuador	116,000	25.64	0.03900
British Guiana	89,480	33.24	0.03008
Uruguay	72,153	41.22	0.02426
Dutch Guiana	46,060	64.60	0.01548
French Guiana	34,060	87.33	0.01145
Panama	32,380	91.86	0.01088
Falkland Islands	6,500	456.62	0.00219
South Georgia	1,000	2974.58	0.00034
Total, South America	7,446,201	0.40	2.50328
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
Kaiser Wilhelm Land	70,000	42.50	0.02353
Bismarck Archipelago	20,000	148.73	0.00672
British Solomon Islands	14,573	204.12	0.00490
New Caledonia and Dependencies	8,548	347.99	0.00287
Fiji	7,435	400.08	0.00250
Hawaii	6,449	460.83	0.00217
German Solomon Islands, etc.	5,160	576.46	0.00173
New Hebrides	5,100	583.25	0.00171
French Establishments in Oceania	1,520	1960.78	0.00051
German Samoa	1,000	2974.58	0.00034
Tonga	390	7627.13	0.00013
Guam	210	14164.67	0.00007
Gilbert and Ellice Islands	208	14300.87	0.00007
Samoa (U.S.A. part)	102	29162.56	0.00003
Norfolk Island	10	297458.10	...
Total, Australasia and Polynesia ...	3,462,366	0.86	1.16398
British Empire...	12,755,743	0.23	4.28825

It should be noted that in the table above the figures quoted for areas refer to conditions prevailing prior to the outbreak of war.

3. **Relative Size of Political Subdivisions.**—As already stated, Australia consists of six States and the Northern and Federal Territories. The areas of these, in relation to one another and to the total of Australia, are shewn in the following table :—

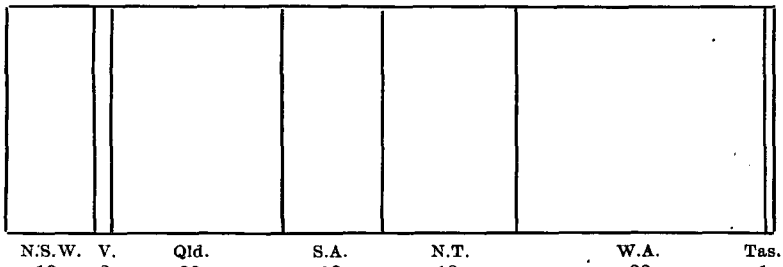
RELATIVE SIZE OF STATES, TERRITORIES, AND COMMONWEALTH.

State or Territory.	Area.	Ratio which the Area of each State and Territory bears to that of other States, Territories and Commonwealth.							
		N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N. Ter.	C'wlth.
	Sq. miles.								
New South Wales	309,460	1.000	3.522	0.462	0.814	0.317	11.806	0.591	0.104
Victoria ...	87,884	0.284	1.000	0.131	0.231	0.090	3.352	0.168	0.030
Queensland ...	670,500	2.166	7.629	1.000	1.764	0.687	25.577	1.280	0.225
South Australia	380,070	1.228	4.325	0.567	1.000	0.389	14.498	0.726	0.128
West. Australia	975,920	3.153	11.105	1.455	2.568	1.000	37.228	1.864	0.328
Tasmania ...	26,215	0.085	0.298	0.039	0.069	0.027	1.000	0.050	0.009
North. Territory	523,620	1.691	5.958	0.781	1.378	0.537	19.974	1.000	0.176
Federal Territory	912	0.003	0.010	0.001	0.003	0.001	0.034	0.002	0.000[1]
Commonwealth	2,974,581	9.610	33.847	4.436	7.827	3.048	113.469	5.681	1.000

1. The correct decimal is 0.0003.

Thus, looking at the top line, New South Wales is seen to be over three-and-a-half times as large as Victoria (3.522) and less than one-half the size of Queensland (0.462); 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 (9.610), 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. The comparatively small size of the Federal Territory prevents its being shewn in this diagram.



% on total ...	N.S.W. 10	V. 3	Qld. 22	S.A. 13	N.T. 18	W.A. 33	Tas. 1

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.

STATES, TERRITORY, AND CONTINENT.

State.	Coast-line.	Area ÷ Coast-line.	State.	Coast-line.	Area ÷ Coast-line.
	Miles.	Sq. miles.		Miles.	Sq. miles.
New South Wales[1]	700	443	South Australia ...	1,540	247
Victoria	680	129	Western Australia	4,350	224
Queensland ...	3,000	223	Continent[2] ...	11,310	261
Northern Territory	1,040	503	Tasmania ...	900	29

1. Including Federal Territory. 2. Area 2,948,366 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 Nuyt's 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 recognised 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. **Geographical Features of Australia.**—In each preceding issue of this Year Book, fairly complete information has been given concerning some special geographical element. Thus No. 1 Year Book, pp. 60-68, contains an enumeration of Coastal features, No. 2, pp. 66-67, deals with Hydrology, No. 3, pp. 59-72, with Orography, No. 4, pp. 59-82, with the Lakes of Australia, No. 5, pp. 51-80, with the Islands of Australia, No. 6, pp. 55-66, with the Mineral Springs of Australia, and No. 7, pp. 56-58, with the Salient Features in the Geological History of Australia, with special reference to changes of climate. This practically completes the description of the ordinary physical features. An orographical or vertical relief map of Australia will be found on p. 49.

§ 2. The Fauna of Australia.

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), while a synoptical statement appeared in No. 3 (see pp. 73 to 76). Considerations of space will, however, preclude the inclusion in this issue of more than a passing reference to the subject.

§ 3. The Flora of Australia.

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, and in Year Book No. 3 similar information in a greatly condensed form will be found on pp. 76 to 78. Space in this issue will not permit of more than a mere reference to preceding volumes.

A special article dealing with Australian fodder plants, contributed by J. H. Maiden, Esq., F.L.S., Government Botanist of New South Wales, and Director of the Botanic Gardens, Sydney, appeared in Official Year Book No. VI., pp. 1190-6. A special article on the grasses and saltbushes of Australia, contributed by E. Breakwell, B.A., B.Sc., Agrostologist at the Botanic Gardens, Sydney, appeared in Year Book No. 9, pp. 84-90. Year Book No. 10 contained two special articles, one dealing with Australian eucalyptus timbers contributed by R. T. Baker, F.L.S., appeared on pp. 85 to 92, and one by H. G. Smith, F.C.S., dealing with the chemical products of Australian eucalypts appeared on pp. 92-8.

§ 4. Seismology in Australia.

A brief statement regarding the position of seismology and seismological record in Australia appears in Year Book No. 4, pp. 82 and 83.

§ 5. 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 50, shews the geographical distribution of the more important geological systems and formations.

3. **The Building Stones of Australia.**—Independent and authoritative descriptions of the building stones of each State (with the exception of Queensland) will be found in Official Year Book No. 9, pp. 446-466. It is not proposed to repeat the information in this issue.

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

1. **Introductory.**—In preceding Year Books some account was given of the history of Australian meteorology, including reference to the development of magnetic observations and the equipment for the determination of various climatological records. (See Year Book No. 3, pp. 79, 80.) In Year Book No. 4, pp. 84 and 87, will be found a short sketch of the creation and organisation of the Commonwealth Bureau of Meteorology and a resumé of the subjects dealt with at the Meteorological Conference of 1907. Space will not permit of the inclusion of this matter in the present issue.

2. **Meteorological Publications.**—The following publications are issued daily from the Central Meteorological Bureau, viz.:—(i.) Weather charts. (ii.) Rainfall maps. (iii.) Bulletins, Victorian and Interstate, shewing pressure, temperature, wind, rain, cloud extent, and weather. Similar publications are also issued from the divisional offices in each of the State Capitals.

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

The Bulletins of Climatology are as follow:—No. 1.—A general discussion of the climate and meteorology of Australia, illustrated by one map and diagrams. No. 2.—A discussion of the rainfall over Australia during the ten years (1897-1906) compared with the normal, illustrated by one map. No. 3.—Notes and statistics of the remarkable flood rains over south-eastern Australia during the winter of 1909, illustrated by five maps and diagrams. No. 4.—A discussion of the monthly and seasonal rainfall over Australia, illustrated by one map and diagram. No. 5.—An investigation into the possibility of forecasting the approximate winter rainfall for Northern Victoria, illustrated by two diagrams. No. 6.—The physiography of the Federal Territory at Canberra, illustrated by a relief map and 21 plates. No. 7.—On the climate of the Yass-Canberra district, illustrated by one map. No. 8.—Physiography of Eastern Australia, with 28 text illustrations. No. 9.—The climate of Australia, with charts and diagrams, prepared for the Federal Handbook of Australia. No. 10.—Relation between cirrus directions as observed in Melbourne and the approach of the various storm systems affecting Victoria, illustrated by a number of charts. No. 11.—The climatic control of Australian production, with 43 illustrations. No. 12.—A graphical method of shewing the daily weather and especially cloud types, with two graphs. No. 13.—Initial investigations in the upper air of Australia, with 35 illustrations. No. 14.—The control of settlement by humidity and temperature, with 21 charts and diagrams.

Commencing with January 1910, the "Australian Monthly Weather Report," containing statistical records from representative selected stations, with rain maps and diagrams, etc., is being published. Complete rainfall and other climatological data are published in annual volumes of meteorological statistics for each State separately.

The first text book of Australian meteorology, "Climate and Weather of Australia," was published in 1913.

3. **General Description of Australia.**—In the general description of Australia, page 47, it is pointed out that a considerable portion (0.530) of three divisions of the Australian Commonwealth is north of the tropic of Capricorn, that is to say, within the States of Queensland and Western Australia, and the Northern Territory, 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 1.591). 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 luxuriance, 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. II., p. 946 (XI. Edition), 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."

4. **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 Western 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 population included within these boundaries at the Census of the 3rd April, 1911, was approximately as follows :—

Division	I.	II.	III.	IV.	V.
Population	282,000	429,000	607,000	1,540,000	1,597,000

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.

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	50	Darwin ...	97	12	28	130	51
Adelaide ...	140	34	56	138	35	Daly Waters ...	691	16	16	133	23
Brisbane ...	137	27	28	153	2	Alice Springs ...	1926	23	38	133	37
Sydney	146	33	52	151	12	Dubbo ...	870	32	18	148	35
Melbourne ...	115	37	49	144	58	Laverton ...	1530	28	40	122	23
Hobart	177	42	53	147	20	Coolgardie ...	1402	30	57	121	10

5. **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 other places in the Southern Hemisphere.

The comparison is even more favourable when the Northern Hemisphere is included therein, 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 approximately double the Australian range.

Along the northern shores of the Australian continent the temperatures are very equable. At Darwin, for example, the difference in the means for the hottest and coldest months is only 8.3°, 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.

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

(ii.) *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 of each for the entire year. In the diagram (on page 67) 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).

6. **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 six representative places the variations of humidity are shewn on the graph on page 67, which gives results based upon daily observations of the dry and wet bulb thermometers. 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.

The detailed humidity results for the several State capitals are given in the Climatological Tables hereinafter. From these, it is seen that, in respect of relative humidity, Sydney and Hobart have the first place, while Brisbane, Melbourne, Perth, and Adelaide follow in the order stated, Adelaide being the driest. The graphs on page 67 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.

7. **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

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

economic loss by evaporation will be appreciated from the records on pages 68 and 78 to 83, which shew that the yearly amount varies from about 33 inches at Hobart to 95 inches at Alice Springs in the centre of the Continent.

(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 the diagram shewing also rainfalls (see page 68).

(ii.) *Loss by Evaporation.* In the interior of Australia the possible evaporation is 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.

8. **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 trade and prevailing westerly 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 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.

(i.) *Factors determining Distribution and Intensity of Rainfall.*

(ii.) *Time of Rainfall.*

In preceding Year Books (see No. 6, pp. 72, 73, 74) some notes were given of the various factors governing the distribution, intensity and period of Australian rainfall.

(iii.) *Wettest and Driest Regions.* The wettest known part of Australia is on the north-east coast of Queensland, between Port Douglas and Cardwell, where three stations situated on, or adjacent to, the Johnstone and Russell Rivers have an average annual rainfall of between 148 and 166 inches. The maximum and minimum falls there are:—Goondi, 241.53 in 1894 and 67.88 inches in 1915, or a range of 165.29 inches; Innisfail, 211.24 in 1894 and 69.87 inches in 1902, or a range of 141.37 inches; Harvey's Creek, 238.45 in 1901 and 80.47 inches in 1902, or a range of 157.98 inches.

On four occasions more than 200 inches have been recorded at Goondi, the last of these being in 1910, when 204.82 inches were registered. The record at this station covers a period of 30 years.

Harvey's Creek in the shorter period of 20 years has twice exceeded 200 inches, the total for 1910 being 201.28 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 the fall 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 73, shewing the areas subject to average annual rainfalls lying between certain limits. The areas enjoying varying quantities of rainfall determined from the latest available information 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	44,997	nil	91,012	317,600	138,190	513,653	nil	1,105,452
10—15 ,,	77,268	19,912	87,489	33,405	141,570	232,815	nil	592,459
15—20 ,,	57,639	12,626	112,738	14,190	62,920	89,922	937	350,972
20—30 ,,	77,202	29,317	213,779	13,827	93,470	95,404	7,559	530,558
30—40 ,,	30,700	14,029	69,880	984	40,690	40,750	4,588	201,621
Over 40 ,,	22,566	12,000	95,602	64	46,780	3,376	10,101	190,489
Total area ...	310,372	87,884	670,500	380,070	523,620	975,920	26,215	2,974,581

* Over an area of 3030 square miles no records are available.

Referring first to the capital cities, the complete records of which are given on the following page, it is seen that Sydney with a normal rainfall of 48.33 inches occupies the chief place, Brisbane, Perth, Melbourne, Hobart and Adelaide following in that order, Adelaide with 21.05 inches being the driest. The extreme range from the wettest to the driest year is greatest at Brisbane (72.09 inches) and least at Adelaide (19.48 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. (See map on page 74). 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 for 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 about 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. (See page 68.) 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.

(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, 1840 to 1917.

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	74	...
2	...	...	...	20.32	122	...	28.81	...	...	48.32	138	...	31.16	...	...	23.60	88	...
3	...	...	...	17.19	104	...	51.67	...	...	62.78	168	...	21.54	...	...	13.43	87	...
4	...	...	...	16.88	136	...	63.20	...	...	70.66	156	...	30.74	...	...	26.25	94	...
5	...	...	...	18.83	125	...	39.09	...	...	62.01	133	...	23.93	...	...	16.68	76	...
6	...	...	...	26.89	114	...	31.41	...	41.83	43.83	139	...	30.53	...	...	21.96	99	...
7	...	...	...	27.61	109	...	...	...	(7 yr.)	42.81	142	...	30.18	...	...	13.86	89	...
8	...	...	...	19.74	114	21.07	42.59	...	...	59.17	155	58.27	33.15	...	28.22	23.62	115	19.24
9	...	...	...	25.44	110	(9 yr.)	...	...	...	21.49	140	(9 yr.)	44.25	...	(9 yr.)	33.52	103	(8 yr.)
1850	...	...	...	19.56	84	...	...	...	...	44.88	157	...	26.98	...	...	14.51	70	...
1	...	...	...	30.86	128	...	...	...	...	35.14	142	...	...	...	...	17.98	107	...
2	...	...	...	27.44	118	...	...	...	...	43.79	143	...	...	...	...	23.62	119	...
3	...	...	...	27.08	128	...	...	...	...	46.12	130	...	...	...	...	14.52	113	...
4	...	...	...	15.35	105	...	...	...	...	29.29	136	...	...	...	...	30.54	109	...
5	...	...	...	23.15	124	...	...	...	...	52.86	138	...	28.21	...	...	18.25	131	...
6	...	...	...	24.93	118	...	...	...	...	43.31	116	...	29.76	134	...	22.73	152	...
7	...	...	...	22.15	105	...	...	...	...	50.95	135	...	28.90	138	...	17.14	113	...
8	...	...	...	21.55	107	23.75	43.00	...	...	39.60	129	40.75	26.01	158	...	33.07	129	22.59
9	...	...	...	14.85	95	...	35.00	...	...	42.01	137	...	21.82	156	...	23.31	159	...
1860	...	...	...	19.67	119	...	54.63	144	...	82.76	180	...	25.38	133	...	21.05	142	...
1	...	...	...	24.04	147	...	69.45	155	...	59.36	157	...	29.16	159	...	28.19	167	...
2	...	...	...	21.85	119	...	28.27	98	...	23.99	108	...	22.08	139	...	21.72	148	...
3	...	...	...	23.68	145	...	68.83	146	...	47.08	152	...	36.42	165	...	40.67	163	...
4	...	...	...	19.75	121	...	47.00	114	...	69.12	185	...	27.40	144	...	28.11	142	...
5	...	...	...	15.51	108	...	24.11	52	...	36.15	140	...	15.94	119	...	23.07	146	...
6	...	...	...	20.11	116	...	51.18	142	...	36.91	156	...	22.41	107	...	23.55	127	...
7	...	...	...	19.05	112	...	61.04	112	...	59.56	140	...	25.79	133	...	22.27	139	...
8	...	...	...	19.99	113	19.85	35.98	110	47.55	42.98	161	49.99	18.27	120	24.47	18.08	112	25.00
9	...	...	...	14.74	117	...	54.39	114	...	48.00	150	...	24.58	129	...	23.87	131	...
1870	...	...	...	23.84	119	...	79.06	154	...	64.47	179	...	33.77	129	...	27.53	123	...
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	182	...
6	28.73	100	...	13.43	110	...	53.42	130	...	45.69	156	...	24.04	134	...	23.63	173	...
7	20.48	103	...	24.95	135	...	30.28	119	...	59.66	147	...	24.10	124	...	20.82	165	...
8	39.72	143	29.64	22.08	112	21.24	56.33	134	53.59	49.77	129	54.03	25.36	116	28.11	29.76	183	25.24
9	41.34	106	(3 yr.)	20.69	130	...	67.30	157	...	63.19	167	...	19.28	127	...	21.07	210	...
1880	31.79	116	...	22.48	142	...	49.12	134	...	29.51	142	...	28.48	147	...	...	...	...
1	24.78	101	...	18.02	135	...	29.39	117	...	40.99	163	...	24.08	134	...	...	...	...
2	35.68	109	...	15.70	134	...	42.62	121	...	42.28	112	...	22.40	131	...	30.69	...	...
3	39.65	122	...	26.76	161	...	32.22	114	...	46.92	157	...	23.71	130	...	24.05	161	...
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	190	...	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	42.94	19.42	123	24.66	18.45	151	23.71
9	39.96	123	...	30.87	143	...	49.36	155	...	57.16	186	...	27.14	125	...	30.80	180	(8 yr.)
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	...	18.62	120	...
3	40.12	145	...	21.49	129	...	88.26	147	...	49.90	209	...	26.80	140	...	27.46	146	...
4	23.72	103	...	20.78	134	...	44.02	143	...	38.22	188	...	22.60	138	...	27.39	141	...
5	33.01	123	...	21.28	130	...	59.11	105	...	31.86	170	...	17.04	131	...	25.40	121	...
6	31.50	103	...	15.17	121	...	44.97	121	...	42.40	157	...	25.16	124	...	21.61	135	...
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	143	51.12	15.61	102	23.61	20.40	164	24.29
9	32.40	107	...	18.84	119	...	38.85	141	...	55.90	174	...	28.87	116	...	20.68	170	...
1900	36.61	124	...	21.68	133	...	34.41	110	...	66.54	170	...	28.09	139	...	19.14	135	...
1	36.75	122	...	18.01	124	...	38.48	110	...	40.10	149	...	27.45	113	...	25.11	149	...
2	27.06	93	...	16.02	123	...	16.17	87	...	43.07	180	...	23.08	102	...	21.85	150	...
3	35.69	140	...	25.47	134	...	49.27	136	...	38.62	173	...	28.43	130	...	25.86	139	...
4	34.35	125	...	20.31	117	...	33.23	124	...	45.93	158	...	29.72	128	...	22.41	139	...
5	34.61	116	...	22.28	131	...	36.76	108	...	35.03	145	...	25.64	129	...	32.09	168	...
6	32.37	121	...	26.51	127	...	42.85	125	...	31.89	160	...	22.29	114	...	23.31	155	...
7	40.12	132	...	17.78	125	...	31.46	119	...	31.32	132	...	22.26	102	...	25.92	166	...
8	30.52	106	34.05	24.56	125	21.15	44.01	125	36.55	45.65	167	43.41	17.72	130	25.36	16.50	148	23.29
9	39.11	107	...	27.69	138	...	34.06	111	...	32.45	177	...	25.86	171	...	27.29	170	...
1910	37.02	135	...	24.62	116	...	49.00	133	...	46.91	160	...	24.61	167	...	25.22	205	...
11	23.38	108	...	15.99	127	...	35.21	128	...	50.24	155	...	36.61	168	...	26.78	193	...
12	27.85	123	...	19.57	116	...	41.30	114	...	47.51	172	...	20.37	157	...	23.14	181	...
13	38·28	141	...	18.16	102	...	40.81	115	...	57.70	141	...	21.17	157	...	19.36	165	...
14	20.21	128	...	11.39	91	...	33.99	141	...	56.42	149	...	18.57	129	...	15.42	154	...
15	43.61	164	...	19.38	117	...	25.66	93	...	34.83	117	...	20.95	167	...	20.91	196	...
16	35.16	128	...	28.16	142	...	52.80	136	..	44.91	161	...	38.04	170	...	43.39	203	...
17	45.64	146	...	28.90	153	...	40.92	127	...	52.40	151	...	30.57	171	...	30.62	214	...
Aver.	...	...	33.53	...	...	21.05	...	...	46.12	...	...	48.33	...	...	26.17	...	...	23.72
No. of Yrs.			(42)			(79)			(68)			(78)			(74)			(75)

NOTE.—The above average Rainfall figures for Brisbane, Sydney, and Melbourne differ slightly from the mean annual falls given in the Climatological Tables on pp. 78-83, which are for a less number of years.

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

HEAVY RAINFALLS, NEW SOUTH WALES, UP TO 1917, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Anthony	28 Mar., 1887	17.14	Major's Creek ...	14 Feb., 1898	12.32
,, ...	15 Jan., 1890	13.13	Marrickville ...	9 Mar., 1913	10.40
Araluen	15 Feb., 1898	13.36	Morpeth	9 ,, 1893	21.52
Berry	13 Jan., 1911	12.05	Mount Kembla ...	13 Jan., 1911	18.25
Billambil	14 Mar., 1894	12.94	Mt. Pleasant ...	24 Mar., 1914	10.30
Bomaderry... ...	13 Jan., 1911	13.03	Nepean Tunnel ...	14 Feb., 1898	12.30
Broger's Creek ...	14 Feb., 1898	20.05	Nowra	13 Jan., 1911	13.00
,, ,, ...	19 July, 1910	12.22	Padstow Park ...	9 Mar., 1913	10.64
,, ,, ...	13 Jan., 1911	20.83	Prospect	28 May, 1889	12.37
Bulli Mountain ...	13 Feb., 1898	17.14	Raleigh Central ...	10 Nov., 1917	13.20
Camden Haven ...	22 Jan., 1895	12.23	Richmond ...	28 May, 1889	12.18
Castle Hill... ...	28 May, 1889	13.49	Rosemount ...	23 Mar., 1914	12.62
Colombo Lyttleton ...	5 Mar., 1893	12.17	Rooty Hill ...	27 May, 1889	11.85
Comboyne	18 May, 1914	10.68	Taree	28 Feb., 1892	12.24
Condong	27 Mar., 1887	18.66	Terara	26 ,, 1873	12.57
Cordeaux River ...	14 Feb., 1898	22.58	The Hill(Shell Harb.)	24 Mar., 1914	12.00
,, ,, ...	13 Jan., 1911	14.52	Tomago	9 Mar., 1893	13.76
Dapto West ...	14 Feb., 1898	12.05	Tongarra Farm ...	14 Feb., 1898	15.12
Dunheved	28 May, 1889	12.40	Towamba	5 Mar., 1893	20.00
Dunoon	9 Nov., 1917	10.02	Tweed River Heads	9 Nov., 1917	13.50
Holy Flat	12 Mar., 1887	12.00	Sherwood	17 June, 1914	10.00
,, ,, ...	28 Feb., 1892	12.24	Stockyard Mt. ...	24 Mar., 1914	10.72
Jamberoo	23 Mar., 1914	10.22	South Head		
,, ...	24 ,, ,,	11.28	(near Sydney)...	29 Apr., 1841	20.12
Katoomba	7 Apr., 1913	10.50	,, ,, ...	16 Oct., 1844	20.41
Kembla Heights ...	13 Jan., 1911	17.46	Unanderra ...	24 Mar., 1914	11.68
Leconfield	9 Mar., 1893	14.53	Urunga	9 Nov., 1917	10.29
Madden's Creek ...	13 Jan., 1911	18.68	Wollongong ...	24 Mar., 1914	12 50
Maitland W. ...	9 Mar., 1893	14.79			

HEAVY RAINFALLS, QUEENSLAND, UP TO 1917, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Allomba (Cairns) ...	30 Jan., 1913	13.50	Burnett Head		
Anglesey	26 Dec., 1909	18.20	(Bundaberg) ...	16 Jan., 1913	15.22
,, ...	10 Feb., 1915	12.00	Burpengary ...	10 Feb,, 1915	11.11
Atherton (Cairns) ...	31 Jan., 1913	16.69	Bustard Head ...	17 Jan., 1913	14.93
Ayr	20 Sep., 1890	14.58	Cairns	11 Feb., 1889	14.74
Babinda (Cairns) ...	31 Jan., 1913	12.79	,, ...	21 Apr., ,,	12.40
,, ,, ...	1 Feb., 1913	20.51	,, ...	5 ,, 1891	14.08
,, ,, ...	24 Jan., 1916	22.30	,, ...	11 Feb., 1911	15.17
,, ,, ...	25 ,, 1916	13.45	,, ...	2 Apr., ,,	20.16
Banyan (Cardwell) ...	31 ,, 1913	13.79	,, ...	31 Jan., 1913	13.94
Barrine (Cairns) ...	31 ,, 1913	13.34	,, ...	24 ,, 1916	12.28
Batheaston ...	27 Dec., 1916	10.00	Calliope	9 Feb., 1915	12.09
Bloomsbury ...	14 Feb., 1893	17.40	Cape Grafton ...	5 Mar., 1896	13.37
,, ...	10 Jan., 1901	16.62	Cardwell	30 Dec., 1889	12.00
Bowen	13 Feb., 1893	14.65	,, ...	23 Mar., 1890	12.00
Boynedale	9 ,, 1915	11.20	,, ...	18 ,, 1904	18.24
Bracewell	9 ,, 1915	11.59	,, ...	3 Apr., 1911	12.84
Brisbane	21 Jan., 1887	18.31	Clare	26 Jan., 1896	15.30
Bromby Park (Bowen)	14 Feb., 1893	13.28	Clermont	28 Dec., 1916	12.28
Brookfield ...	14 Mar., 1908	14.95	Coen	17 Feb., 1914	12.03
Buderim Mountain ...	11 Jan., 1898	26.20	Collaroy	30 Jan., 1896	14.25
Bundaberg ...	16 ,, 1913	16.94	,, ...	28 Dec., 1916	12.79
Burketown ...	15 ,, 1891	13.58	Cooktown	22 Jan., 1903	12.49
,, ...	12 Mar., 1903	14.52	,, ...	23 ,, 1914	13.98

HEAVY RAINFALLS, QUEENSLAND—Continued.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Cooran	1 Feb., 1893	13.62	Halifax	5 Feb., 1899	15.37
,, ...	26 Dec., 1908	14.08	,, ...	6 Jan., 1901	15.68
Cooroy	9 June, 1893	13.60	,, ...	8 Apr., 1912	12.75
,, ...	10 Jan., 1898	13.50	Hambledon Mill ...	13 Jan., 1909	13.80
Crohamhurst (Blackall Range)	2 Feb., 1893	35.71	,, ,, ...	2 ,, 1911	18.61
,, ,, ...	9 June, ,,	13.31	,, ,, ...	10 Feb., ,,	13.97
,, ,, ...	9 Jan., 1898	19.55	,, ,, ...	30 Mar., ,,	13.04
,, ,, ...	6 Mar. ,,	16.01	,, ,, ...	31 ,, ,,	14.95
,, ,, ...	26 Dec., 1909	13.85	,, ,, ...	1 Apr., ,,	19.62
,, ,, ...	10 Feb., 1915	12.98	,, ,, ...	30 Jan., 1913	17.32
Crow's Nest ...	2 Aug., 1908	11.17	Harvey Creek ...	8 Mar., 1899	17.72
Croydon	29 Jan., 1908	15.00	,, ,, ...	25 Jan., 1900	12.53
Cryna (Beaudesert) ...	21 ,, 1887	14.00	,, ,, ...	25 May, 1901	14.00
Dungeness ...	16 Mar., 1893	22.17	,, ,, ...	14 Mar., 1903	12.10
,, ...	17 Apr., 1894	14.00	,, ,, ...	11 Jan., 1905	16.96
Dunira	9 Jan., 1898	18.45	,, ,, ...	28 ,, 1906	12.29
,, ...	6 Mar., ,,	15.95	,, ,, ...	14 ,, 1909	14.40
Eddington (Cloncurry)	23 Jan., 1891	10.33	,, ,, ...	3 ,, 1911	27.75
Emscote Farm ...	10 Feb., 1915	13.22	,, ,, ...	11 Feb., ,,	12.88
Emu Park	18 Jan., 1913	12.75	,, ,, ...	1 Apr., ,,	13.61
Enoggera Railway ...	14 Mar., 1908	12.14	,, ,, ...	2 ,, ,,	16.46
Ernest Junction ...	,, ,,	13.00	,, ,, ...	31 Jan., 1913	24.72
Fairymead Plantation (Bundaberg) ...	16 Jan., 1913	15.32	,, ,, ...	24 ,, 1916	13.17
Flat Top Island ...	22 Dec., 1909	12.96	Haughton Valley ...	26 Jan., 1896	18.10
Floraville	6 Jan., 1897	10.79	Herberton ...	31 Jan., 1913	14.00
,, ...	11 Mar., 1903	12.86	Hillcrest (Mooloolah)	26 Dec., 1909	13.35
Flying Fish Point ...	7 Apr., 1912	16.06	Holmwood (Woodf'd)	2 Feb., 1893	16.19
,, ,, ...	31 Jan., 1913	16.10	,, ,,	10 Jan., 1898	12.40
Gatcombe Head (Gladstone) ...	18 Jan., 1913	12.88	Homebush ...	3 Feb., ,,	12.04
Gin Gin	16 ,, 1905	13.61	Howard	15 Jan., 1905	19.55
,, ...	16 ,, 1913	12.27	Huntley	27 Dec., 1916	18.94
Gladstone	18 Feb., 1888	12.37	Ingham	18 Jan., 1894	12.60
,, ...	31 Jan., 1893	14.62	,, ...	6 ,, 1901	13.59
,, ...	4 Feb., 1911	18.83	,, ...	25 Dec., 1903	12.30
,, ...	9 ,, 1915	10.10	Inkerman	21 Sep., 1890	12.93
Glen Boughton ...	5 Apr., 1894	18.50	Inneshowen (Johnstone River)	30 Dec., 1889	14.01
,, ,, ...	31 Jan., 1913	14.92	Innisfail (formerly Geraldton) ...	11 Feb., 1889	17.13
,, ,, ...	24 ,, 1916	14.02	,, ,, ...	31 Dec., ,,	12.45
Glen Prairie ...	18 Apr., 1904	12.18	,, ,, ...	6 Apr., 1894	16.02
Gold Creek Reservoir	14 Mar., 1908	12.50	,, ,, ...	18 ,, 1899	13.20
Goldsborough (Cairns)	31 Jan., 1913	19.92	,, ,, ...	24 Jan., 1900	15.22
,, ,,	1 Feb., 1913	12.22	,, ,, ...	29 Dec., 1903	21.22
Goodwood (Bund'berg)	16 Jan., 1913	13.07	,, ,, ...	11 Feb., 1911	14.48
Goondi Mill (Innisfail)	6 Apr., 1894	15.69	,, ,, ...	1 Apr., 1911	12.35
,, ,,	18 Apr., 1899	14.78	,, ,, ...	2 ,, ,,	15.00
,, ,,	24 Jan., 1900	13.30	,, ,, ...	7 ,, 1912	20.50
,, ,,	29 Dec., 1903	17.83	,, ,, ...	8 ,, ,,	12.15
,, ,,	10 Feb., 1911	17.68	,, ,, ...	31 Jan., 1913	20.91
,, ,,	31 Mar., ,,	12.38	Invicta (Kolan R.) ...	16 Jan., 1913	14.58
,, ,,	1 Apr., ,,	13.60	Isis Junction ...	6 Mar., 1898	13.60
,, ,,	6 Apr., 1912	15.55	Kamerunga (Cairns)	20 Jan., 1892	13.61
Goondi	30 Jan., 1913	24.10	,, ,, ...	6 Apr., 1894	14.04
Granada (formerly Donaldson) ...	27 Jan., 1891	11.29	,, ,, ...	5 ,, 1895	12.31
,, ,, ...	8 ,, 1911	13.50	,, ,, ...	11 Feb., 1911	13.07
,, ,, ...	9 ,, ,,	14.30	,, ,, ...	1 Apr., ,,	14.20
			,, ,, ...	2 ,, ,,	21.00
			,, ,, ...	31 Jan., 1913	16.00

HEAVY RAINFALLS, QUEENSLAND—Continued.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Kulara (Cairns) ...	31 Jan., 1913	12.69	Nerang	15 June 1892	12.35
Kuranda (Cairns) ...	6 Mar., 1899	14.12	North Kolan (Bundaberg) ...	6 Jan., 1913	12.90
,, ,, ...	20 Apr., 1903	14.16	North Pine ...	16 Feb., 1893	14.97
,, ,, ...	14 Jan., 1909	12.37	Nundah	14 Mar., 1908	12.00
,, ,, ...	11 Feb., 1911	16.30	Oxenford	14 Mar., 1908	15.65
,, ,, ...	17 Mar., ,,	15.10	Palmwoods ...	4 Feb., 1893	12.30
,, ,, ...	31 ,, ,,	18.60	,, ...	10 Jan., 1898	15.85
,, ,, ...	1 Apr., ,,	24.30	,, ...	7 Mar., 1898	13.02
,, ,, ...	2 ,, ,,	28.80	,, ...	25 Dec., 1909	17.75
,, ,, ...	31 Jan., 1913	16.34	Peachester ...	26 ,, ,,	14.91
Lake Nash ...	10 Jan., 1895	10.25	Pialba (Maryborough)	16 Jan., 1913	17.22
,, ...	20 Mar., 1901	10.02	Pittsworth ...	11 Mar., 1890	14.68
Landsborough ...	2 Feb., 1893	15.15	Plane Creek (Mackay)	26 Feb., 1913	27.73
,, ...	9 June, ,,	12.80	Point Archer ...	23 Jan., 1914	13.47
,, ...	26 Dec., 1909	14.00	Port Douglas ...	5 Mar., 1887	13.00
Low Island ...	10 Mar., 1904	15.07	,, ,, ...	10 ,, 1904	16.34
,, ...	31 ,, 1911	14.70	,, ,, ...	11 Jan., 1905	14.68
,, ...	1 Apr., ,,	15.30	,, ,, ...	17 Mar., 1911	16.10
Lucinda	17 Feb., 1906	13.35	,, ,, ...	1 Apr., ,,	31.53
,, ...	10 Mar., 1906	14.60	Ravenswood ...	24 Mar., 1890	17.00
Lyndon (via Brixton)	3 ,, 1917	17.00*	Redcliffe	21 Jan., 1887	14.00
Lytton	21 Jan., 1887	12.85	,, ...	16 Feb., 1893	17.35
Mackay	23 Dec., 1909	13.96	Reid River ...	2 Feb., 1917	11.15
Sugar Experimental Farm, Mackay ...	23 Dec., 1909	12.00	Rosedale	6 Mar., 1898	12.60
Macnade Mill ...	18 Jan., 1894	12.56	,, ...	16 Jan., 1913	18.90
,, ...	17 Apr., ,,	14.26	Sandgate	16 Feb., 1893	14.03
,, ...	5 Feb., 1899	15.20	Somerset	28 Jan., 1903	12.02
,, ...	6 Jan., 1901	23.33	St. Helens (Mackay)	24 Feb., 1888	12.00
,, ...	7 Mar., 1914	12.44	St. Lawrence ...	17 Feb., 1888	12.10
,, ...	4 ,, 1915	22.00	,, ,, ...	30 Jan., 1896	15.00
Maleny	26 Dec., 1909	14.76	Tewantin	30 Mar., 1904	12.30
Mapleton	14 Mar., 1908	14.29	The Hollow (Mackay)	23 Feb., 1888	15.12
,, ...	26 Dec., 1909	15.72	Thornborough ...	20 Apr., 1903	18.07
,, ...	10 Feb., 1915	12.75	Townsville ...	24 Jan., 1892	19.20
Marlborough ...	17 ,, 1888	14.24	,, ...	28 Dec., 1903	15.00
Milton	14 Mar., 1908	12.24	Victoria Mill ...	6 Jan., 1901	16.67
,, ...	9 Feb., 1915	10.15	Walsh River ...	1 Apr., 1911	13.70
Mirani	12 Jan., 1901	16.59	Woodford	2 Feb., 1893	14.93
Miriam Vale (B'd'berg)	17 ,, 1913	15.80	Woodlands (Yeppoon)	25 Mar., 1890	14.25
,, ,,	9 Feb., 1915	10.22	,, ,, ...	31 Jan., 1893	23.07
Mooloolah	13 Mar., 1892	21.53	,, ,, ...	9 Feb., 1896	13.97
,, ...	2 Feb., 1893	19.11	,, ,, ...	7 Jan., 1898	14.50
,, ...	6 Mar., 1898	14.43	Woody Island ...	16 ,, 1913	12.66
Mount Crosby ...	14 Mar., 1908	14.00	Woombye	26 Dec., 1909	13.42
Mount Cuthbert ...	8 Jan., 1911	18.00	Wootha	10 Feb., 1915	15.93
Mount Molloy ...	31 Mar., 1911	20.00	Yandina	1 ,, 1893	20.08
,, ...	1 Apr., ,,	20.00	,, ...	9 June, ,,	12.70
,, ...	2 ,, ,,	20.00	,, ...	9 Jan., 1898	19.25
Mount Mee ...	10 Feb., 1915	12.00	,, ...	7 Mar., ,,	13.52
Mourilyan ...	14 Jan., 1909	13.00	,, ...	28 Dec., 1909	15.80
,, ...	3 ,, 1911	12.70	Yarrabah	11 Feb., 1911	12.00
,, ...	11 Feb., ,,	17.40	,, ...	2 Apr., ,,	30.65
,, ...	1 Apr., ,,	13.20	,, ...	24 Jan., 1916	27.20
,, ...	7 ,, 1912	18.97	,, ...	25 ,, 1916	18.60
,, ...	31 Jan., 1913	15.05	Yeppoon	31 ,, 1893	20.05
Mundoolun ...	21 Jan., 1887	17.95	,, ...	8 ,, 1898	18.05
Musgrave	6 Apr., 1894	13.71	,, ...	3 Feb., 1906	14.90
Nambour	9 Jan., 1898	21.00	,, ...	,, 1911	14.92
,, ...	7 Mar., ,,	13.28	,, ...	18 Jan., 1913	13.00
,, ...	27 Dec., 1909	16.80	,, ...	8 Oct., 1914	21.70

* Mr. Jas. Laidlaw, of Lyndon, states that this fell in 4 hours.

NOTE.—In Queensland falls of 12 or more inches on coast or 10 or more inches inland are taken.

HEAVY RAINFALLS, WESTERN AUSTRALIA, UP TO 1917, INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Alice Downs ...	20 Jan., 1914	8.12	Obagama	28 Feb., 1910	12.00
,, ...	21 ,, ,,	5.33	Point Torment ...	17 Dec., 1906	11.86
,, ...	22 ,, ,,	4.04	Port George, W. ...	17 Jan., 1915	11.24
Balla Balla ...	21 Mar., 1899	14.40	Roebuck Plains ...	5 Jan., 1917	14.01
Boodarie	21 ,, ,,	14.53	,, ,, ...	6 ,, ,,	22.36
Broome	6 Jan., 1917	14.00	Thangoo	17-19 Feb.'96	24.18
,, ...	7 ,, 1917	6.20	Whim Creek ...	2 Apr., 1898	7.08
Cossack	3 Apr., 1898	12.82	,, ,, ...	3 ,, ,,	29.41
,, ...	16 ,, 1900	13.23	,, ,, ...	20 Mar., 1899	8.89
Croydon	3 Mar., 1903	12.00	,, ,, ...	21 ,, ,,	18.17
Cocos Island ...	29 Nov., ,,	14.38	Woodstock ...	21 ,, 1912	13.00
Derby	29 Dec., 1898	13.09	Wyndham ...	27 Jan., 1890	11.60
,, ...	30 Dec., ,,	7.14	,, ...	11 ,, 1903	9.98
,, ...	6 Jan., 1917	5.97	,, ...	12 ,, ,,	6.64
,, ...	7 ,, ,,	16.47	,, ...	13 ,, ,,	4.20
Fortescue	3 May, 1890	23.36	Yeeda	28 Dec., 1898	8.42
Frazier Downs ...	3 Mar., 1916	11.25	,, ...	29 ,, ,,	6.88
Kerdiadary ...	7 Feb., 1901	12.00	,, ...	30 ,, ,,	6.12
Meda	9 Jan., 1914	2.87	,, ...	2 Mar., 1916	10.70
,, ...	10 ,, ,,	8.72	,, ...	3 ,, ,,	4.80
,, ...	2 Mar., 1916	10.55	,, ...	5 Jan., 1917	2.06
Mt. Anderson ...	6 Jan., 1917	2.16	,, ...	6 ,, ,,	10.20
,, ...	7 ,, ,,	8.60	,, ...	7 ,, ,,	11.75
,, ...	8 ,, ,,	1.17			

HEAVY RAINFALLS, NORTHERN TERRITORY, UP TO 1917, INCLUSIVE.

		ins.			ins.
Bonrook	24 Dec., 1915	10.60	Cosmopolitan Gold Mine	24 Dec., 1915	10.60
Borroloola... ...	14 Mar., 1899	14.00	Lake Nash ...	21 Mar., 1901	10.25
Brock's Creek ...	4 Jan., 1914	10.68	Pine Creek ...	8 Jan., 1897	10.35
,, ,, ...	24 Dec., 1915	14.33	Darwin	7 Jan., 1897	11.67
Burrundie ...	4 Jan., 1914	11.61			

HEAVY RAINFALLS, VICTORIA, UP TO 1917, INCLUSIVE.

		ins.			ins.
Balook	26 Sept., 1917	5.32	Mt. Buffalo ...	6 June, 1917	8.53
,, ...	27 ,, ,,	7.23	,, ...	7 ,, ,,	6.56
,, ...	28 ,, ,,	2.08			

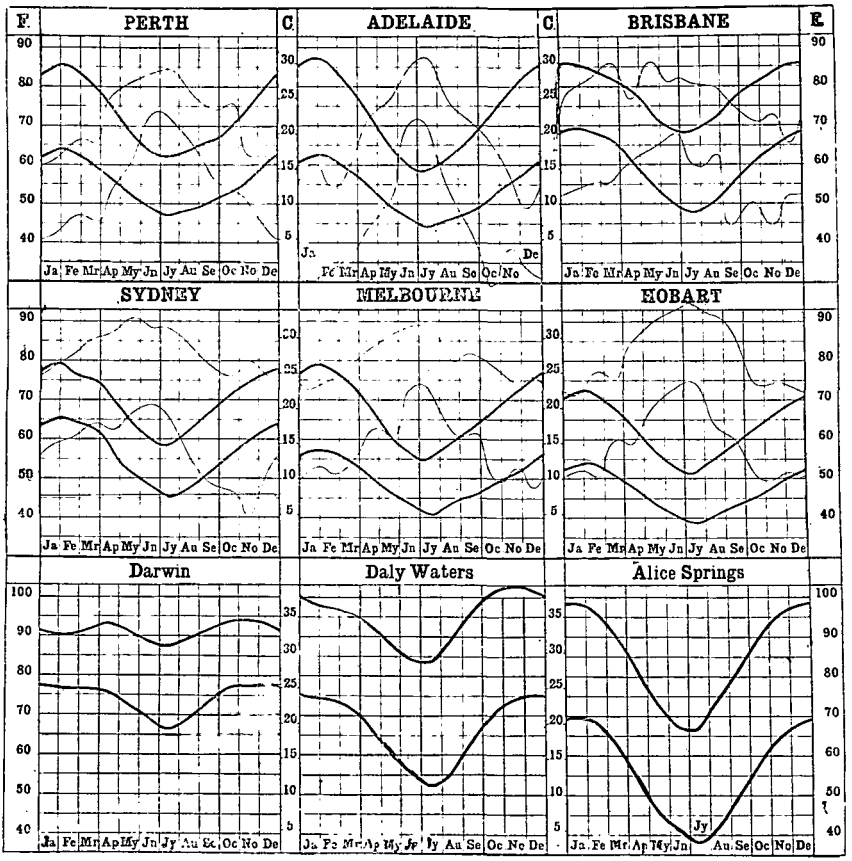
HEAVY RAINFALLS, TASMANIA, UP TO 1917, INCLUSIVE.

		ins.			ins.
The Springs ...	30 Jan., 1916	9.72	The Springs ...	31 Jan., 1916	1.03

10. **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.

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 Darwin, Daly Waters, and Alice Springs.

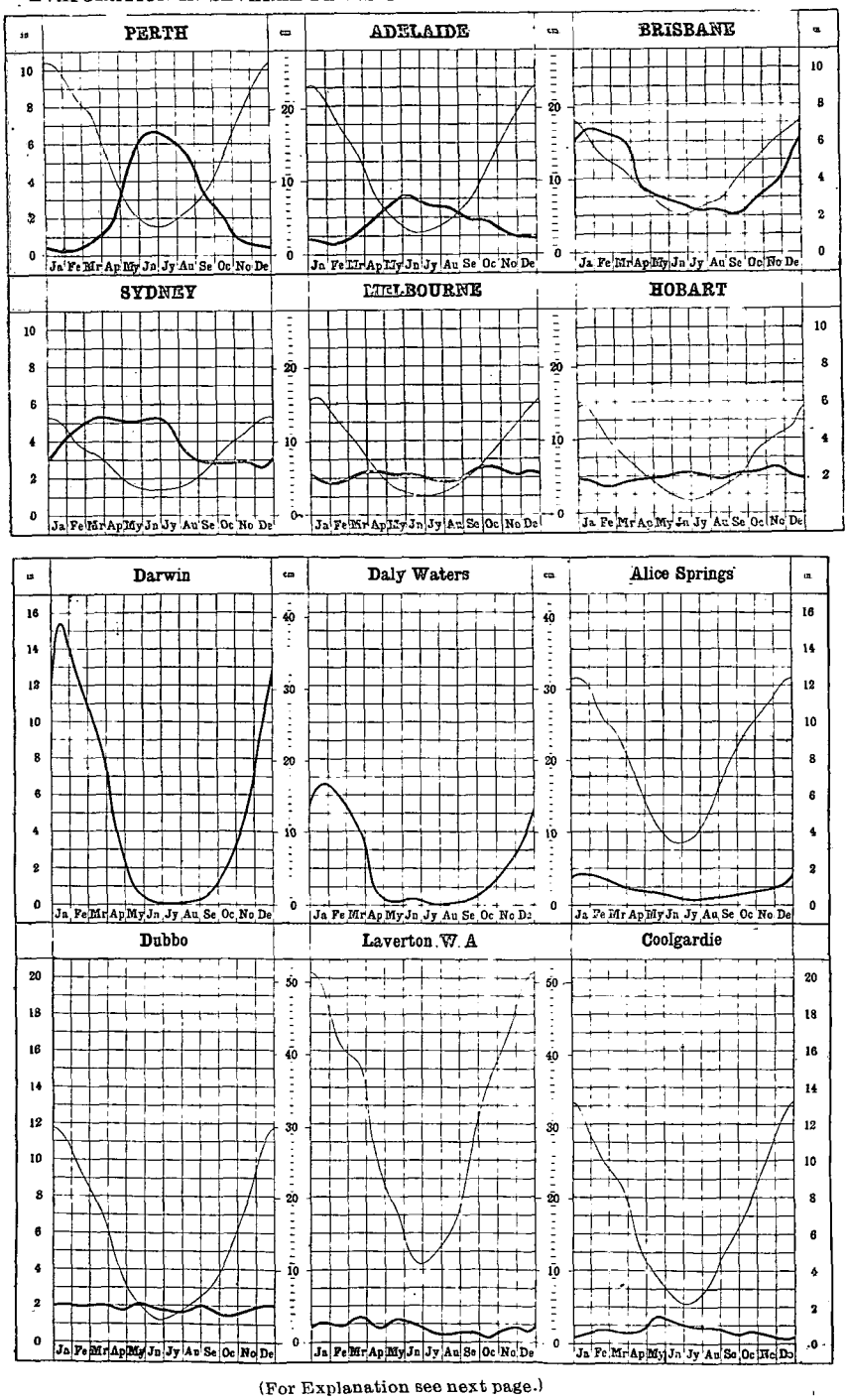
For the thin lines the degree numbers represent relative humidities, or the percentages of actual saturation (absolute saturation = 100).

The upper temperature 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. The humidity curves shew the highest and lowest values of the mean monthly humidity at 9 a.m. recorded during a series of years.

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 greatest mean humidity, say for March, is about 66° and the least mean humidity for the month 46°; in other words, at Perth the degree of saturation of the atmosphere by aqueous vapour for the month of March ranges between 66 % and 46%.

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



(For Explanation see next page.)

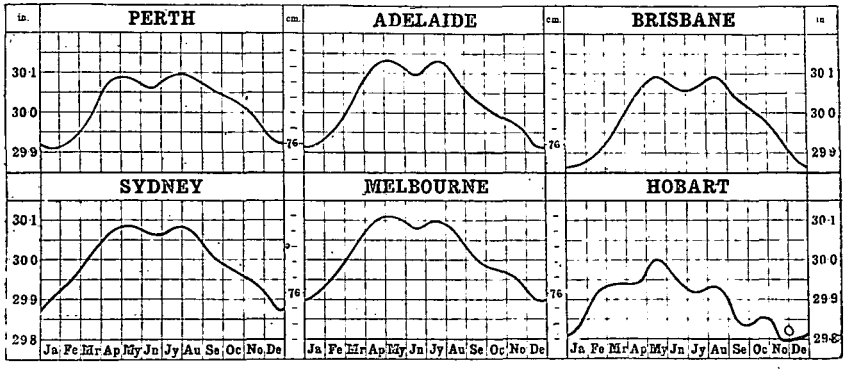
EXPLANATION OF THE GRAPHS OF RAINFALL AND EVAPORATION.—On the preceding graphs thick lines denote rainfall and thin lines evaporation, and shew the fluctuation of the mean rate of fall *per month* throughout the year. The results, plotted from the Climatological Tables hereinafter, are shewn in inches (see the outer columns), and the corresponding metric scale (centimetres) is shewn in the two inner columns. The evaporation is not given for Darwin and 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 11¼ inches per month about the middle of January, and only about 1½ inches at the middle of June.

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

—	Rainfall.	Evaporation.	—	Rainfall.	Evaporation.
Perth ...	33.53	66.09	Darwin... ...	61.88	—
Adelaide	21.05	54.35	Daly Waters ...	26.33	—
Brisbane ...	46.34	50.65	Alice Springs...	10.73	95.26
Sydney ...	48.08	37.39	Dubbo ...	22.40	—
Melbourne ...	25.54	38.68	Laverton, W.A.	9.42	143.96
Hobart ...	23.72	32.57	Coolgardie ...	9.81	85.02

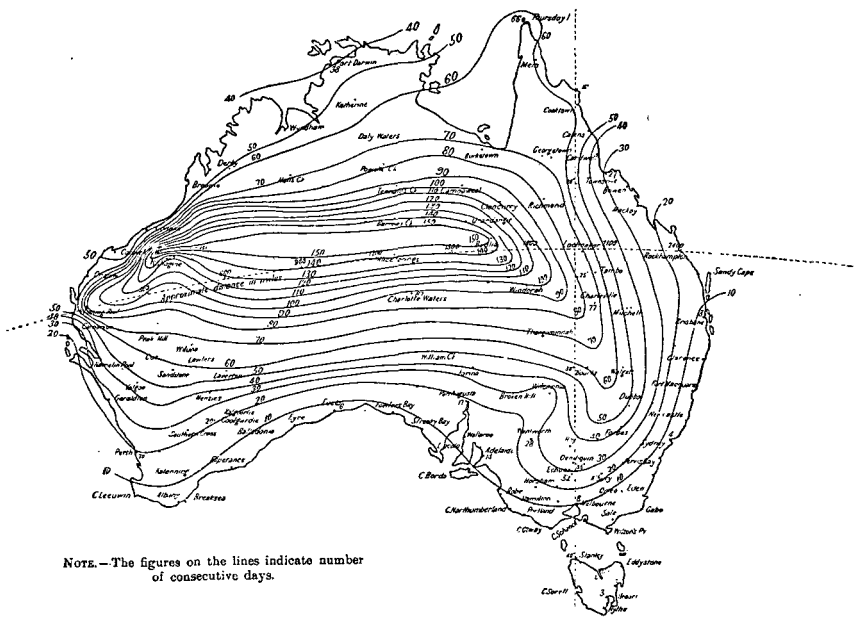
GRAPHS SHEWING ANNUAL FLUCTUATIONS OF MEAN BAROMETRIC PRESSURE FOR THE CAPITALS OF THE SEVERAL STATES OF THE COMMONWEALTH OF AUSTRALIA.



EXPLANATION OF THE GRAPHS OF BAROMETRIC PRESSURE.—On the above graphs the lines representing the yearly fluctuation of barometric pressure at the State capital cities are means for long periods, and are plotted from the Climatological Tables given hereinafter. The pressures are shewn in inches on about 2⅔ times the natural scale, and the corresponding pressures in centimetres are also shewn in the two inner columns, in which each division represents one millimetre.

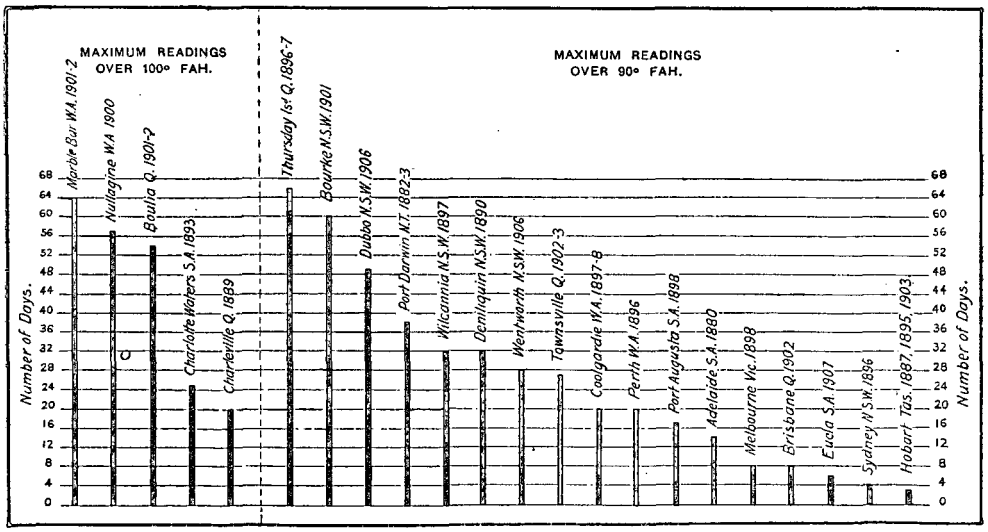
INTERPRETATION OF THE BAROMETRIC GRAPHS.—Taking the Brisbane graph for purposes of illustration, it will be seen that the mean pressure on 1st January is about 29.87 inches, and there are maxima in the middle of May and August of about 30.09 inches.

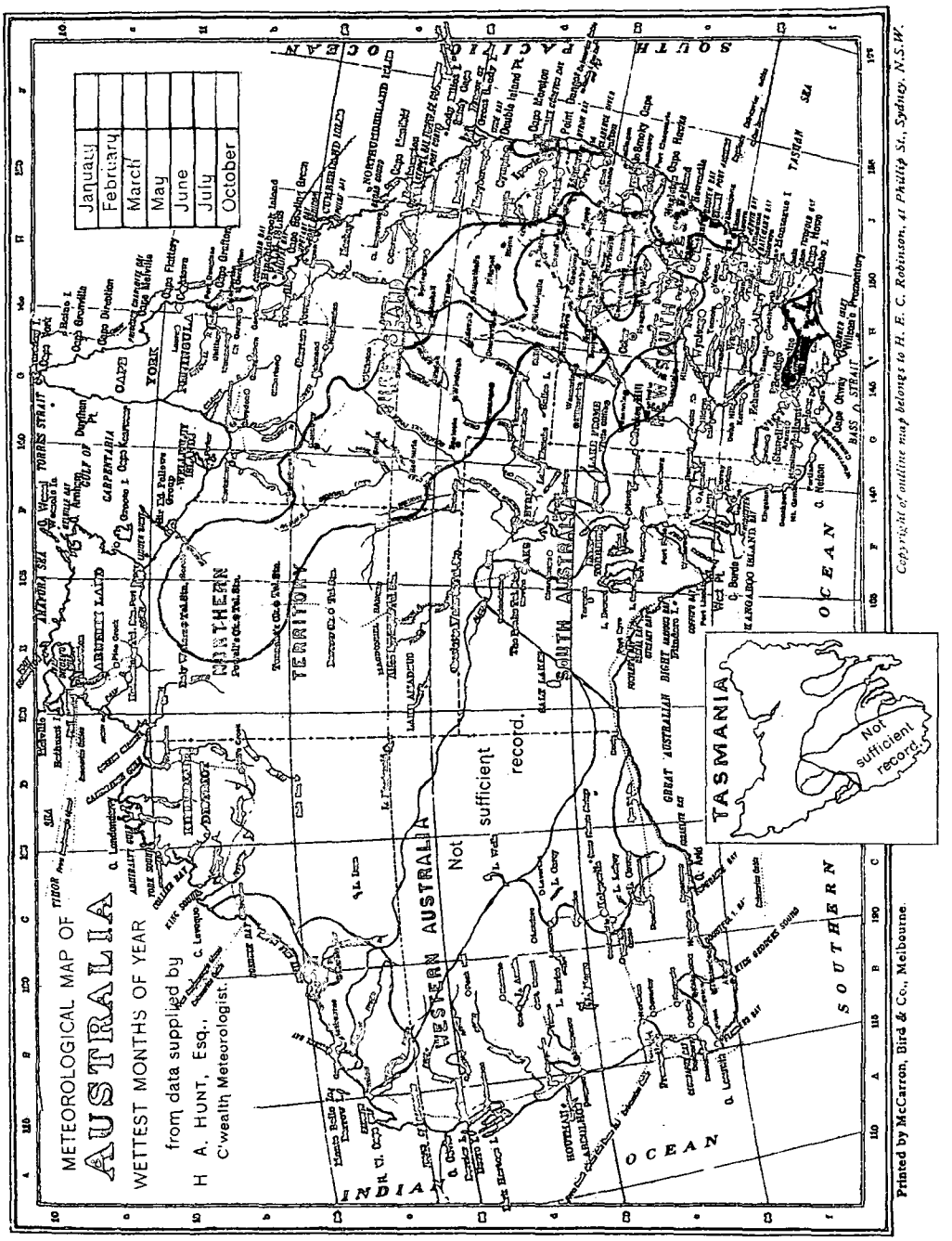
Chart indicating the area affected and period of duration of the Longest Heat Waves when the Maximum Temperature for consecutive 24 hours reached or exceeded 90° Fah.



NOTE.—The figures on the lines indicate number of consecutive days.

Diagram showing the greatest number of consecutive days on which the Temperature in the shade was over 100° and also over 90° at the places indicated.





METEOROLOGICAL SUB-DIVISIONS.

WEST AUSTRALIA.

No.
1. East Kimberley.
2. West Kimberley.
3. North-West.
4. Gascoyne.
5. South-West.
6. Eucla.
7. Eastern.

SOUTH AUSTRALIA.

8. Northern Territory.
9. Far North and N.W.
10. West.

No.
11. Upper North.
12. North-East.
13. Lower North.
14. Central.
15. Murray Valley.
16. South-East.

QUEENSLAND.

17. Peninsular.
18. Gulf.
19. Far West.
20. Central.
21. Nth-East Coast.

No.
22. Central Coast.
23. South-East Coast.
24. Darling Downs.
25. Maranoa.
26. South-West.

NEW SOUTH WALES.

27. Western.
28. North-West Plain.
29. North-West Slope.
30. Northern Tableland
31. North Coast.
32. Hunter & Manning.

No.
33. Central Tableland.
33a. Metropolitan.
34. Cent. Westn. Slope.
35. Cent. Westn. Plain.
36. Riverina.
37. South-West Slope.
38. Southern Tableland
39. South Coast.

VICTORIA.

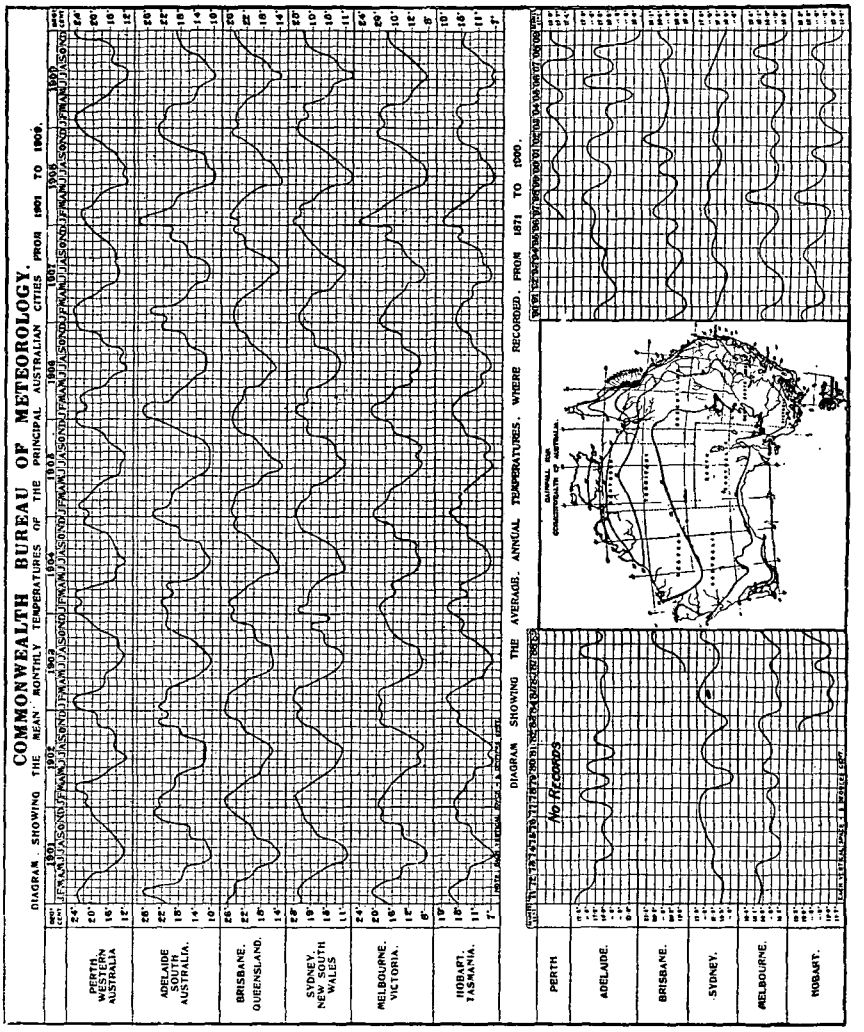
40. Gippsland.
41. North-East.
42. Central.

No.
43. North Central.
44. Northern Country.
45. Mallee.
46. Winmera.
47. Western.

TASMANIA.

48. Northern.
49. W.Coast Mt.Region
50. Central Plateau.
51. Midland.
52. East Coast.
53. Derwent.
54. South-Eastern.

The above are the meteorological sub-divisions adopted by H. A. HUNT, Esq., C'wealth. Meteorologist.

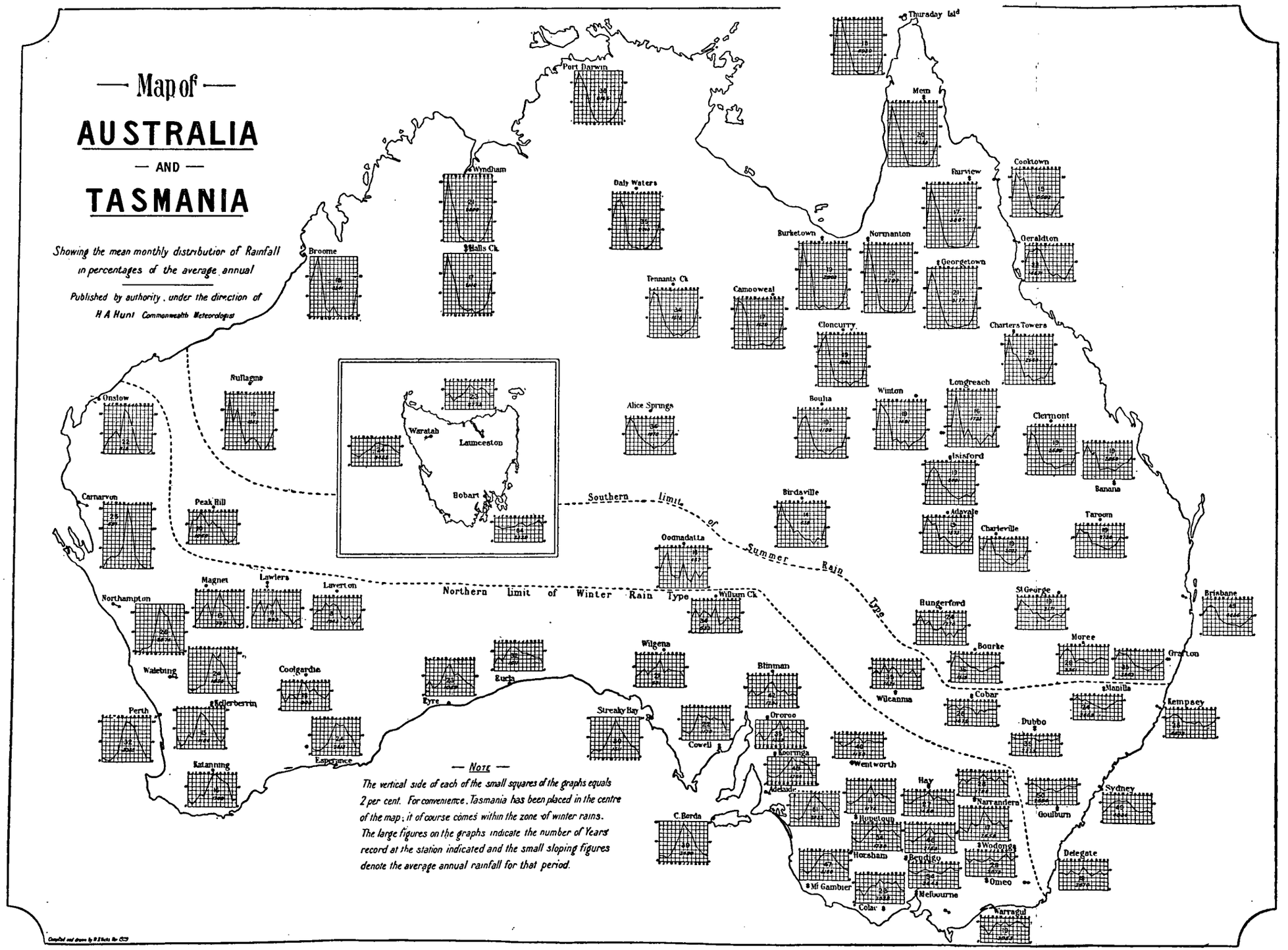


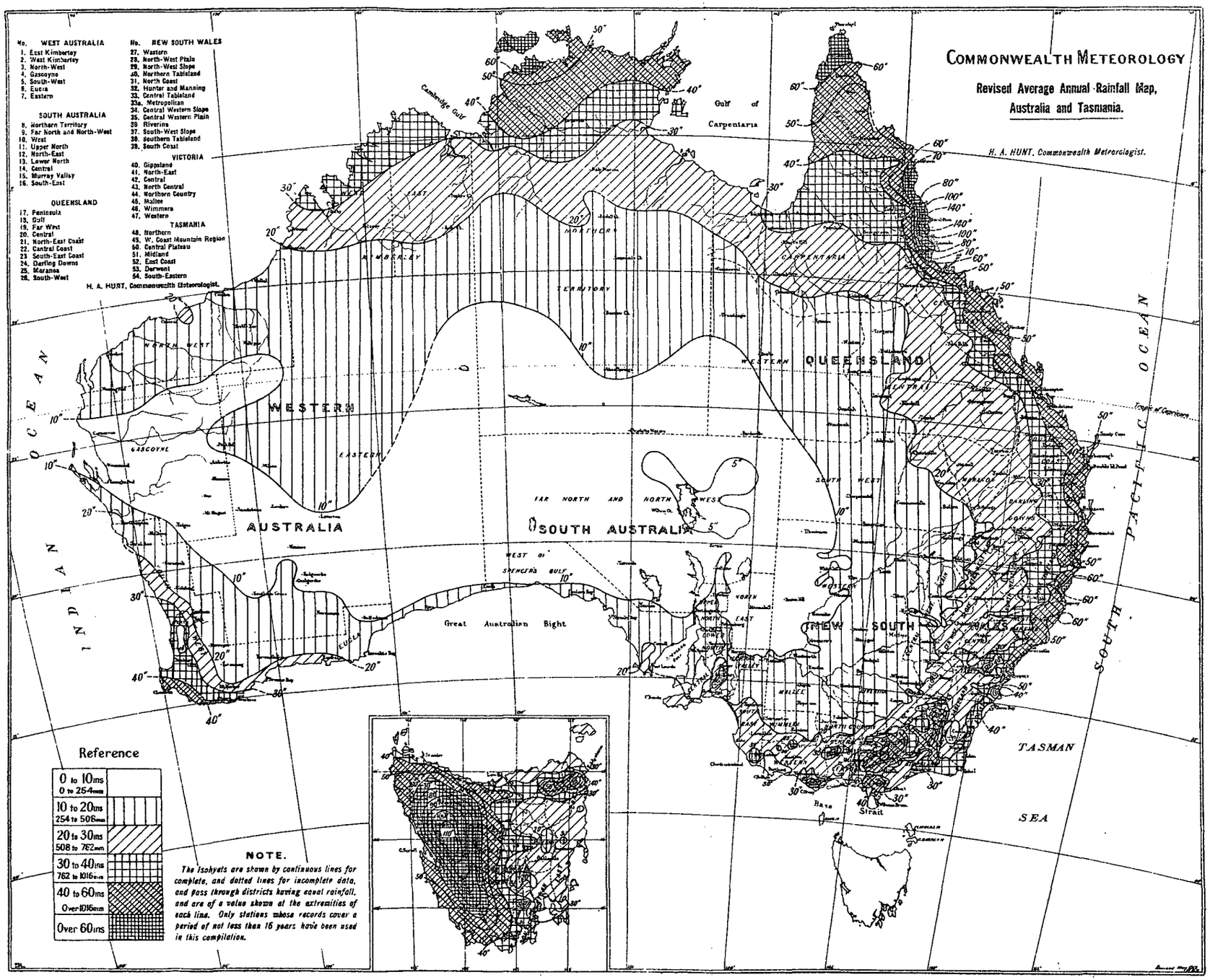
EXPLANATION OF GRAPH.

The six continuous curves on the upper part of the diagram shew the fluctuations of mean monthly temperatures of the Australian capitals from 1901 to 1909. The base of each small square denotes one month, and the vertical side 2° Centigrade or 3.6° Fahrenheit.

The six curves in lower portion of the diagram similarly shew the fluctuations of the mean annual temperatures, from 1871 in the case of Adelaide, Sydney and Melbourne, from 1883, 1887 and 1897 in the case respectively of Hobart, Brisbane and Perth. The base of each rectangle represents one year, and the vertical side 0.3° Centigrade or 0.54° Fahrenheit.

The map shews the areas affected by given amounts of annual rainfall, and is elsewhere given.


— Map of —
AUSTRALIA
— AND —
TASMANIA
Showing the mean monthly distribution of Rainfall in percentages of the average annual
Published by authority, under the direction of H A Hunt Commonwealth Meteorologist
Thursday Isl
Port Darwin
Mem
Wyndham
Daly Waters
Burketown
Normanton
Normanton
Cooktown
Normanton
Geraldton
Georgetown
Broome
Halls Ck
Tennants Ck
Camooweal
Cloncurry
Charters Towers
Winton
Longreach
Bourke
Alice Springs
Clermont
Isisford
Banana
Nullagine
Unslow
Waratah
Launceston
Hobart
Southern limit of Summer Rain Type
Carnarvon
Peak Hill
Birdsville
Adavale
Charleville
Tarcom
Oodnadatta
Northern limit of Winter Rain Type
William Ck
Hungerford
St George
Brisbane
Magnet
Lawlers
Laverton
Northampton
Moree
Bourke
Wilcannia
Cobar
Manilla
Kempsey
Wiluna
Blinman
Coolgardie
Eucla
Eyre
Wallebing
Kalgoorlie
Perth
Esperance
Streaky Bay
Cowell
Ororoo
Dubbo
Wentworth
Hay
Narrandera
Goulburn
Sydney
Adelaide
Koringa
C. Borda
Hamilton
Horsham
Bendigo
Wodonga
Delegate
Mt Gambier
Melbourne
Colac
Omeo
Warragul
— 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.


COMMONWEALTH METEOROLOGY
Revised Average Annual Rainfall Map, Australia and Tasmania.
H. A. HUNT, Commonwealth Meteorologist.
No. WEST AUSTRALIA
1. East Kimberley
2. West Kimberley
3. North-West
4. Gascoyne
5. South-West
6. Eucla
7. Eastern
SOUTH AUSTRALIA
8. Northern Territory
9. Far North and North-West
10. West
11. Upper North
12. North-East
13. Lower North
14. Central
15. Murray Valley
16. South-East
QUEENSLAND
17. Peninsula
18. Gulf
19. Far West
20. Central
21. North-East Coast
22. Central Coast
23. South-East Coast
24. Darling Downs
25. Maranoa
26. South-West
No. NEW SOUTH WALES
27. Western
28. North-West Plain
29. North-West Slope
30. Northern Tableland
31. North Coast
32. Hunter and Manning
33. Central Tableland
33a. Metropolitan
34. Central Western Slope
35. Central Western Plain
36 Riverina
37. South-West Slope
38. Southern Tableland
39. South Coast
VICTORIA
40. Gippsland
41. North-East
42. Central
43. North Central
44. Northern Country
45. Mallee
46. Wimmera
47. Western
TASMANIA
48. Northern
49. W. Coast Mountain Region
50. Central Plateau
51. Midland
52. East Coast
53. Derwent
54. South-Eastern
H. A. HUNT, Commonwealth Meteorologist.
Gulf of Carpentaria
Cambridge Gulf
WESTERN AUSTRALIA
NORTHERN TERRITORY
WESTERN QUEENSLAND
FAR NORTH AND NORTH-WEST
SOUTH AUSTRALIA
NEW SOUTH WALES
Great Australian Bight
INDIAN OCEAN
SOUTH PACIFIC OCEAN
TASMAN SEA
Reference
0 to 10ins 0 to 254mm
10 to 20ins 254 to 508mm
20 to 30ins 508 to 762mm
30 to 40ins 762 to 1016mm
40 to 60ins
Over 1016mm
Over 60ins
NOTE.
The Isohyets are shown by continuous lines for complete, and dotted lines for incomplete data, and pass through districts having equal rainfall, and are of a value shown at the extremities of each line. Only stations whose records cover a period of not less than 15 years have been used in this compilation.

11. **Hail.**—Hail falls throughout Australia most frequently along the southern shores of the continent in the winter, and over south-eastern Australia during 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-gauge galvanised iron bear evidence of 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 almost 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.

12. **Barometric Pressures.**—The mean annual barometric pressure (corrected to sea-level and standard gravity) in Australia varies from 29.80 inches on the north coast to 29.92 inches over the central and 30.03 inches in the southern parts of the continent. In January the mean pressure ranges from 29.70 inches in the northern and central areas to 29.91 inches in the southern. The July mean pressure ranges from 29.90 inches at Darwin to 30.12 inches 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 69.

13. **Wind.**—Notes on the distinctive wind currents in Australia were given in preceding Year Books (see No. 6, page 83) and are here omitted to save space.

14. **Cyclones and Storms.**—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 four 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 to the east of New Caledonia.

Very severe cyclones, popularly known as "Willy Willies," are peculiar to the north-west coast of Western Australia from the months of November to April inclusive. They apparently originate in the ocean, in the vicinity of 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 in 24 hours at Whim Creek from one such occurrence. Falls of 10 inches and over have frequently been recorded in the northern interior of Western Australia from similar storms.

Some further notes on severe cyclones and on "Southerly Bursters," a characteristic feature of the eastern part of Australia, will be found in previous issues of the Year Book (see No. 6, pp. 84, 85, 86).

15. **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.

(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 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.

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.

It is the rapid rate of evaporation, 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.

In previous issues some notes on observations made in other countries were added (see Year Book No. 6, pp. 86 and 95).

16. **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 the site of the Federal capital, and for the capitals of the Australian States:—

COMPARISONS 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 ...	6	27.29	40.59	17.60	63.2	36.8	90.0	4.1	64.4	35.4
Auckland ...	125	43.31	63.72	26.32	66.1	52.5	91.0	31.9	67.2	51.8
Athens	351	15.48	33.32	4.55	79.2	49.1	106.5	19.6	81.1	47.5
Bergen	146	89.10	102.80	73.50	56.8	34.5	88.5	4.8	57.9	33.6
Berlin	115	22.95	30.04	14.25	64.7	32.2	98.6	—13.0	66.0	30.0
Berne	1,877	36.30	58.23	24.69	62.2	30.1	91.4	— 3.6	64.4	28.0
Bombay	37	71.15	114.89	33.41	83.5	75.1	100.0	55.9	84.8	74.2
Breslau	482	22.00	28.01	16.45	63.9	30.0	100.0	—23.4	65.5	29.3
Brussels	328	28.35	41.18	17.73	62.6	36.0	95.5	— 4.4	63.7	34.5
Budapest... ...	500	25.20	35.28	16.79	68.6	30.2	98.6	— 5.1	70.4	28.2
Buenos Ayres ...	72	36.82	80.73	21.53	73.2	51.5	103.1	25.9	74.2	50.5
Calcutta	21	61.98	89.32	39.38	84.9	67.1	108.2	44.2	85.4	65.5
Capetown ...	40	25.50	36.72	17.71	68.1	54.7	102.0	34.0	68.8	53.9
Caracas	3,420	30.03	47.36	23.70	68.3	65.3	87.8	48.2	69.2	63.7
Chicago	823	33.54	45.86	24.52	69.2	25.4	103.0	—23.0	72.3	24.0
Christchurch ...	25	25.45	35.30	13.54	61.1	43.4	95.7	21.3	61.6	42.4
Christiania ...	82	22.52	31.73	16.26	61.0	24.4	95.0	—21.1	62.6	23.9
Colombo... ...	40	83.83	139.70	51.60	81.5	79.9	95.8	65.0	82.6	79.1
Constantinople ...	245	28.75	42.74	14.78	74.0	43.5	103.6	13.0	75.7	42.0
Copenhagen ...	46	22.33	28.78	13.94	60.7	32.1	90.5	—13.0	62.2	31.4
Dresden	115	26.80	34.49	17.72	62.9	32.4	93.4	—15.3	64.4	31.6
Dublin	47	27.66	35.56	16.60	59.4	42.0	87.2	13.3	60.5	41.7
Dunedin	300	37.06	53.90	22.15	57.3	43.1	94.0	23.0	57.9	42.0
Durban	260	40.79	71.27	27.24	75.6	64.4	110.6	41.1	76.7	63.8
Edinburgh ...	441	25.21	32.05	16.44	55.8	38.8	87.7	5.0	57.2	38.3
Geneva	1,328	33.48	46.89	21.14	64.4	33.7	...	...	66.2	32.2
Genoa	157	51.29	108.22	28.21	73.8	46.8	94.5	16.7	75.4	45.5
Glasgow	184	38.49	56.18	29.05	52.7	41.0	84.9	6.6	58.0	38.4
Greenwich ...	159	24.12	35.54	16.38	61.3	39.3	100.0	4.0	62.7	38.6
Hong Kong ...	110	84.10	119.72	45.83	81.3	60.3	97.0	32.0	81.8	58.1
Johannesburg ...	5,750	31.63	50.00	21.66	65.4	54.4	94.0	23.3	68.2	48.9
Leipzig	384	24.69	31.37	17.10	63.1	31.5	97.3	—14.8	64.8	30.6
Lisbon	312	29.18	52.79	17.32	69.6	51.3	94.1	32.5	70.2	49.3
London	18	24.04	38.20	18.23	61.2	39.3	100.0	9.4	62.8	38.7
Madras	22	49.06	88.41	18.45	86.7	76.0	113.0	57.5	87.6	75.3
Madrid	2,149	16.23	27.48	9.13	73.0	41.2	107.1	10.5	75.7	39.7
Marseilles ...	246	21.88	43.04	12.28	70.3	45.3	100.4	11.5	72.1	43.3
Moscow	526	18.94	29.28	12.07	63.4	14.7	99.5	—44.5	66.1	11.9
Naples	489	34.00	56.58	21.75	73.6	48.0	99.1	23.9	75.4	46.8
New York ...	314	42.47	59.68	28.78	72.1	31.7	100.0	— 6.0	74.5	30.3
Ottawa	294	33.40	44.44	26.36	67.2	14.1	98.5	—33.0	69.7	12.0
Paris	165	21.92	29.56	16.44	63.5	37.1	101.1	—14.1	65.8	36.1
Pekin	143	24.40	36.00	18.00	77.7	26.6	114.0	— 5.0	79.2	23.6
Quebec	296	40.46	47.57	32.12	63.5	12.4	95.5	—34.3	66.3	10.1
Rome	166	32.57	57.89	12.72	74.3	46.0	104.2	17.2	76.1	44.6
San Francisco ...	155	22.83	38.82	9.31	59.0	51.0	101.0	29.0	61.0	50.0
Shanghai ...	14	44.13	62.52	27.91	77.4	39.4	102.9	10.2	79.7	37.4
Singapore ...	8	91.99	158.68	32.71	81.2	78.6	94.2	63.4	81.5	78.3
Stockholm ...	146	18.31	25.46	11.78	59.7	27.0	91.8	—22.0	62.1	25.7
Petrograd ...	16	21.30	29.52	13.75	61.1	17.4	97.0	—38.2	63.7	15.2
Tokio	70	59.17	77.10	45.72	73.9	38.9	97.9	15.4	77.7	37.1
Trieste	85	42.94	63.14	26.57	73.9	41.3	99.5	14.0	76.3	39.9
Vienna	663	24.50	33.90	16.50	65.7	30.4	97.7	— 8.0	67.1	28.0
Vladivostock ...	55	19.54	33.60	9.39	63.9	11.0	95.7	—21.8	69.4	6.1
Washington ...	75	43.80	61.33	18.79	74.7	34.5	104.0	—15.0	76.8	32.9
Wellington (N.Z.)	110	49.70	67.68	30.02	61.7	48.4	98.0	30.0	62.4	47.5
Zurich	1,542	45.15	78.27	29.02	63.3	31.3	94.1	— 0.8	65.1	29.5
FEDERAL CAPITAL SITE.										
Canberra (Dist.) Queanbeyan ...	2,000 to 2,900	22.50	41.29	10.45	* 68.5	† 43.9	101.0	20.0	69.7	43.0
THE STATE CAPITALS.										
Perth	197	33.53	46.73	20.21	* 72.8	† 55.8	107.9	34.2	74.0	55.0
Adelaide ...	140	21.05	30.87	11.39	73.1	53.0	116.3	32.0	74.1	51.6
Brisbane ...	137	46.34	88.26	16.17	76.7	59.6	108.9	36.1	77.3	58.3
Sydney	146	48.08	92.76	21.49	70.9	53.9	108.5	35.9	71.7	52.4
Melbourne ...	115	25.54	44.25	15.61	66.5	50.0	111.2	27.0	67.4	48.6
Hobart	177	23.72	43.39	13.43	61.7	46.7	105.2	27.0	62.3	45.4

* Mean of the three hottest months. † Mean of the three coldest months.

17. **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 up to and including the year 1917. These are given in the following tables:—

CLIMATOLOGICAL DATA FOR PERTH, W.A.

LAT. 31° 57′ S., LONG. 115° 50′ 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. & 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, 9a.m 3 p.m. & 9 p.m.	No. of Clear Days.
No. of yrs. over which observation extends	33	20	20	20	20	19	20	21	21
January	29.908	797 27/98	0.70	11,387	S	10.43	1.6	2.8	14.1
February	29.927	650 6/08	0.64	9,948	S S E	8.66	1.2	3.0	11.5
March	29.987	651 6/13	0.55	10,141	S S E	7.66	1.2	3.4	11.6
April	30.076	955 25/00	0.42	8,581	S E	4.77	1.0	4.6	7.4
May	30.086	768 5/12	0.35	8,040	E N E	2.76	1.8	5.4	5.4
June	30.060	861 27/10	0.37	8,009	N N E	1.73	2.0	6.2	3.1
July	30.089	949 11/99	0.40	8,578	N N E	1.65	2.7	5.7	4.8
August	30.085	966 15/03	0.43	8,922	W	2.38	1.6	5.6	4.9
September	30.056	864 11/05	0.50	9,295	S W	3.32	1.6	5.4	5.1
October	30.030	809 6/16	0.52	9,987	S S W	5.24	1.2	5.2	5.6
November	29.990	777 18/97	0.62	10,274	S	7.70	1.0	4.0	7.9
December	29.926	672 31/98	0.66	11,008	S	9.79	1.6	3.2	11.9
Year Totals	—	—	—	114,170	—	66.09	18.5	—	93.3
Year Averages	30.018	—	0.51	9,514	S	—	—	4.5	—
Year Extremes	—	966 15/8/03	—	—	—	—	—	—	—

TEMPERATURE AND SUNSHINE.

Month.	Mean Temperature. Mean Max.	Mean Temperature. Mean Min.	Mean	Extreme Shade Temperature. Highest.	Extreme Shade Temperature. Lowest.	Extreme Range.	Extreme Temperature. Highest in Sun.	Extreme Temperature. Lowest on Grass.	Mean Hours of Sunshine.
No. of yrs. over which observation extends	21	21	21	21	21	21	20	19	20
January	84.3	53.1	73.7	107.0 16/97	50.6 25/01	56.4	177.3 22/14	42.4 25/02	323.8
February	84.7	63.3	74.0	107.3 12/15	47.7 1/02	59.6	169.0 4/99	39.8 1/13	274.9
March	81.0	60.6	70.8	106.1 6/14	45.8 8/03	60.3	164.0 6/14	36.7 8/03	268.5
April	75.8	56.8	66.3	99.7 9/10	39.3 29/14	60.4	157.0 8/16	31.0 20/14	217.9
May	68.6	52.3	60.4	90.4 2/07	34.3 11/14	56.1	139.1 7/14	25.3 11/14	181.5
June	63.7	49.2	56.4	81.7 2/14	36.3 29/14	45.4	135.5 9/14	29.0 20/16	145.9
July	62.4	47.5	55.0	73.8 24/99	34.2 7/16	39.6	133.2 13/15	25.2 6,7/16	165.8
August	63.8	48.1	56.0	81.0 12/14	35.3 31/08	45.7	139.1 21/13	27.9 10/11	186.7
September	66.0	50.3	58.2	86.7 30/13	38.9 17/13	47.8	153.6 29/16	29.2 21/16	200.9
October	69.3	52.7	61.0	93.4 17/06	40.9 4/17	52.5	154.0 29/14	30.5 4/17	236.5
November	75.1	56.3	65.7	104.6 24/13	42.0 1/04	62.6	166.6 23/15	35.5 *	293.0
December	80.8	60.6	70.7	107.9 20/04	48.0 2/10	59.9	168.7 25/15	39.1 2/10	325.3
Year Averages	73.0	55.1	64.0	—	—	—	—	—	2820.7†
Year Extremes	—	—	—	107.9 20/12/04	34.2 7/7/16	73.7	177.3 22/1/14	25.2 6,7/7/16	—

* 6/1910 and 14/1912. † Total for year.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean 9 a.m.	Humidity. Highest Mean.	Humidity. Lowest Mean.	Rainfall. Mean Monthly.	Rainfall. Mean No. of Days Rain.	Rainfall. Greatest Monthly.	Rainfall. Least Monthly.	Rainfall. Greatest in One Day.	Dew. Mean Amount of Dew.	Dew. Mean No. days Dew
No. of yrs. over which observation extends	21	21	21	42	42	42	42	42	—	21
January	53	61	42	0.34	3	2.17 1879	nil. *	1.74 28/79	—	2.8
February	54	65	46	0.43	3	2.98 1915	nil. †	1.09 15/16	—	2.9
March	58	66	46	0.70	4	4.50 1896	nil. ‡	1.53 17/76	—	5.7
April	63	72	53	1.60	7	4.97 1882	0.05 ‖	2.62 30/04	—	9.1
May	72	81	61	4.73	14	12.13 1879	0.98 1903	2.80 20/79	—	12.7
June	78	83	72	6.69	17	12.11 1890	2.16 1877	2.65 16/00	—	11.9
July	79	84	72	6.58	17	11.29 1917	2.42 1876	3.00 4/91	—	12.8
August	74	79	67	5.62	18	10.33 1882	0.46 1902	2.79 7/03	—	11.2
September	68	75	58	3.34	14	7.72 1903	0.34 1916	1.73 23/09	—	8.6
October	62	75	54	2.11	11	7.87 1890	0.49 1892	1.38 15/10	—	5.7
November	55	63	50	0.80	6	2.78 1916	nil. 1891	1.11 30/03	—	4.3
December	52	62	44	0.59	4	3.05 1888	nil. 1886	1.72 1/88	—	3.0
Year Totals	—	—	—	33.53	118	—	—	—	—	90.7
Year Averages	62	—	—	—	—	—	—	—	—	—
Year Extremes	—	84	42	—	—	12.13 5/79	nil. §	3.00 4/7/91	—	—

* 1888, 1894, 1897, and 1911. † 1885, 1891, 1896, 1903, and 1913. ‡ 1877, 1884, 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. Min. Sea Level and Standard Gravity from 9 a.m. & 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. & 9 p.m.	No. of Clear Days.
No. of yrs. over which observation extends	61	40	40	40	40	48	46	50	36
January	29.916	758 19/99	0.34	7,952	S x W	8.97	2.4	3.5	7.8
February	29.952	691 22/96	0.30	6,850	S	7.32	2.0	3.4	7.1
March	30.034	628 9/12	0.25	6,794	S x W	5.79	2.3	4.0	6.6
April	30.118	773 10/96	0.22	6,206	S W x S	3.38	1.7	5.0	3.9
May	30.126	760 9/80	0.21	6,233	N N E	1.99	1.7	5.7	1.7
June	30.098	750 12/78	0.25	6,645	N x E	1.23	2.1	6.2	1.3
July	30.127	674 25/82	0.25	6,843	N x W	1.29	1.7	5.8	1.6
August	30.097	773 31/97	0.28	7,240	N N W	1.87	2.3	5.6	2.2
September	30.037	720 2/87	0.32	7,414	W S W	2.83	2.4	5.2	2.8
October	29.999	768 28/93	0.34	7,970	S W x W	4.76	3.5	4.9	3.9
November	29.972	677 2/04	0.34	7,654	S S W	6.50	3.8	4.6	5.1
December	29.919	675 12/91	0.34	7,992	S S W	8.42	2.8	3.8	7.1
Year Totals	—	—	—	—	—	54.35	28.7	—	51.1
Year Averages	30.033	—	0.29	7,150	S W x S	—	—	4.8	—
Year Extremes	—	773*	—	—	—	—	—	—	—

* 10/4/96 and 31/8/97.

TEMPERATURE AND SUNSHINE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.	Lowest.	Extreme Range.	Extreme Temperature. Highest in Sun.	Lowest on Grass.	Mean Hours of Sunshine.
No. of yrs. over which observation extends	61	61	61	61	61	61	40	57	36
January	86.5	61.6	74.1	116.3 26/58	45.1 21/84	71.2	180.0 18/82	36.5 14/79	307.5
February	86.1	62.0	74.1	113.6 12/99	46.4 13/05	67.2	170.5 10/00	36.7 24/78	264.1
March	80.8	58.9	69.9	108.0 12/61	44.8 –/57	63.2	174.0 17/83	33.8 27/80	236.9
April	73.1	54.5	63.8	98.0 10/66	39.6 15/59	58.4	155.0 1/83	30.2 16/17	176.6
May	65.4	50.0	57.7	88.3 5/66	36.9 *	51.4	148.2 12/79	25.9 10/91	149.0
June	60.2	46.6	53.4	76.0 23/65	32.5 27/76	43.5	138.8 18/79	22.9 12/13	119.8
July	58.7	44.5	51.6	74.0 11/06	32.0 24/08	42.0	134.5 26/90	23.3 25/11	137.5
August	62.0	45.9	53.9	85.0 31/11	32.3 17/59	52.7	140.0 31/92	23.5 7/88	162.1
September	66.2	47.8	57.0	90.7 23/82	32.7 4/58	58.0	160.5 23/82	26.2 15/08	182.9
October	72.5	51.4	61.9	102.2 24/14	36.0 –/57	66.2	158.8 19/82	28.5 7/96	228.6
November	78.6	55.3	66.9	113.5 21/65	40.8 2/09	72.7	166.9 20/78	31.5 2/09	261.6
December	83.4	58.9	71.2	114.2 14/76	43.0 †	71.2	175.7 7/99	33.5 4/84	302.5
Year Averages	72.8	53.1	63.0	—	—	—	—	—	2529.1‡
Year Extremes	—	—	—	116.3 26/1/58	32.0 24/7/08	84.3	180.0 18/1/82	22.9 12/6/13	—

* 26/1895 and 24/1904. † 16/1861 and 4/1906. ‡ Total for year.

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	50	50	50	79	79	79	79	79	—	46
January	38	59	30	0.72	4	4.00 1850	nil. *	2.30 2/89	—	4
February	41	56	33	0.63	4	2.67 1858	nil. †	2.24 14/13	—	5
March	47	58	36	1.06	6	4.60 1878	nil. ‡	3.50 5/78	—	11
April	57	72	44	1.85	9	6.78 1853	0.06 1910	3.15 5/60	—	14
May	68	76	49	2.71	14	7.75 1875	0.20 1891	2.75 1/53	—	16
June	77	84	69	3.10	16	8.58 1916	0.42 1886	1.97 26/16	—	16
July	76	87	69	2.65	16	5.38 1865	0.36 1899	1.75 10/65	—	17
August	69	77	54	2.50	16	6.24 1852	0.35 1914	2.23 19/51	—	16
September	61	72	44	1.98	14	4.64 1840	0.45 1896	1.42 25/93	—	16
October	51	67	29	1.72	11	3.83 1870	0.17 1914	2.24 16/08	—	12
November	43	57	37	1.17	8	3.55 1851	0.04 1885	1.82 28/58	—	7
December	39	50	33	0.96	6	3.98 1861	nil. 1904	2.42 23/13	—	5
Year Totals	—	—	—	21.05	124	—	—	—	—	139
Year Averages	53	—	—	—	—	—	—	—	—	—
Year Extremes	—	87	29	—	—	8.58 6/16	nil. §	3.50 5/3/78	—	—

* 1848, 1849, 1878 and 1906. † 1848, 1860, etc. ‡ 1859, etc.
§ 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. & 3 p.m. readings.	Wind.* Greatest Number of Miles in one day.		Wind.* Total Miles.	Wind.* Mean Hourly Pressure. (lbs.)	Wind.* Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds 9a.m. 3 p.m. & 9 p.m.	No. of Clear Days.
No. of yrs. over which observation extends	31	7		7	7	31	7	31	31	9
January	29.867	315	24/14	4,016	0.08	E	5.605	5.5	5.1	3.2
February	29.893	340	10/15	4,501	0.13	S E	5.040	5.1	6.2	1.8
March	29.947	305	29/16	3,585	0.07	S	4.554	4.0	5.9	4.1
April	30.040	215	8/16	3,437	0.07	S	3.675	3.3	5.0	8.6
May	30.088	196	3/17	3,566	0.07	S	2.843	2.8	4.8	8.6
June	30.059	307	23/16	3,477	0.07	S	2.094	2.0	4.4	7.8
July	30.064	279	19/17	3,424	0.07	S	2.257	2.3	3.9	10.9
August	30.087	250	22/17	3,794	0.08	S W to S	2.724	3.5	4.0	10.3
September	30.025	239	25/17	3,553	0.07	S & N E	3.605	5.5	3.9	11.2
October	30.004	308	19/15	3,970	0.08	N E	4.958	6.8	4.5	7.1
November	29.948	265	27/14	4,288	0.10	E & N E	5.813	8.1	5.1	5.9
December	29.881	295	21/13	4,515	0.11	E & N E	6.482	8.2	5.7	2.9
Year Totals	—	—		—	—	—	50.648	56.8	—	82.4
Year Averages	29.992	—		3,844	0.08	S'ly to N E	—	—	5.0	—
Year Extremes	—	340	10/2/15	—	—	—	—	—	—	—

* Figures published previously are unreliable.

TEMPERATURE AND SUNSHINE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.		Lowest.		Extreme Range.	Extreme Temperature. Highest in Sun.		Lowest on Grass.		Mean Hours of Sunshine.
No. of yrs. over which observation extends	31	31	31	31		31		31	31		31		9
January	85.6	68.9	77.3	108.9	14/02	58.8	4/93	50.1	166.4	10/17	49.9	4/93	221.8
February	84.5	68.4	76.5	101.9	11/04	58.7	*	43.2	165.2	6/10	49.3	9/89	199.8
March	82.4	66.4	74.4	96.8	16/88	52.4	29/13	44.4	160.0	1/87	45.4	29/13	196.4
April	79.2	61.6	70.4	95.2	†	48.6	17/00	46.6	153.8	11/16	37.0	17/00	208.8
May	73.5	55.2	64.4	88.8	18/97	41.3	24/99	47.5	147.0	1/10	29.8	8/97	193.8
June	69.2	50.8	60.0	83.2	28/15	36.3	29/08	46.9	133.9	6/06	25.4	23/88	155.4
July	68.3	48.2	58.3	83.4	28/98	36.1	‡	47.3	146.1	20/15	23.9	11/90	183.5
August	71.2	49.8	60.5	87.5	28/07	37.4	6/87	50.1	141.9	20/17	27.1	9/99	214.8
September	75.9	54.7	65.3	95.2	16/12	40.7	1/96	54.5	155.5	26/03	30.4	1/89	227.5
October	79.8	59.8	69.7	101.4	18/93	43.3	3/99	58.1	156.5	31/89	34.9	8/89	242.9
November	83.0	64.0	73.5	106.1	18/13	48.5	2/05	57.6	162.3	7/89	38.8	1/05	232.3
December	85.3	67.4	76.3	105.9	26/93	56.4	13/12	49.5	160.4	7/14	49.1	3/94	236.8
Year Averages	78.2	59.6	68.9	—		—		—	—		—		2513.8¶
Year Extremes	—	—	—	108.9	14/1/02	36.1	‖	72.8	166.4	10/1/17	23.9	11/7/90	—

* 10-11/04. † 9/96 and 5/03. ‡ 12/94 and 2/96. ‖ 12/7/94 and 2/7/96. ¶ Total for year.

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	31	31	31	66	58	66		66		—		—	21
January	65	79	53	6.49	14	27.72	1895	0.61	1882	18.31	21/87	—	3.9
February	69	82	55	6.63	14	40.39	1893	0.77	1904	8.36	16/93	—	4.1
March	72	85	56	5.97	12	34.04	1870	0.58	1868	11.18	14/08	—	7.0
April	72	79	60	3.65	12	15.28	1867	0.05	1897	4.47	13/16	—	10.3
May	74	85	64	2.91	10	13.85	1876	0.00	1846	5.62	9/79	—	11.1
June	75	82	67	2.62	8	14.03	1873	0.00	1847	6.01	9/93	—	8.5
July	74	81	61	2.28	8	8.46	1889	0.00	1841	3.54	‡	—	10.0
August	71	80	61	2.25	7	14.67	1879	0.00	*	4.89	12/87	—	7.8
September	66	76	47	2.09	9	5.43	1886	0.10	1907	2.46	2/94	—	7.6
October	62	72	49	2.70	10	9.99	1882	0.14	1900	1.95	20/89	—	5.8
November	59	72	46	3.73	10	12.40	1917	0.00	1842	4.46	16/86	—	9.8
December	61	67	52	5.02	12	13.99	1910	0.35	1865	6.60	28/71	—	9.5
Year Totals	—	—	—	46.34	129	—		—		—		—	81.4
Year Averages	68	—	—	—	—	—		—		—		—	—
Year Extremes	—	85	46	—	—	40.39	2/1893	0.00	†	18.31	21/1/87	—	—

* 1862, 1869, 1880. † 5/1846, 7/1841, 8/1862, 1869, 1880, 11/1842. ‡ 15/76, 16/89.

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.	Bar. corrected to 32° F. Mn. Sea Level and Standard Gravity from 24 hourly 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. & 9 p.m.	No. of Clear Days.
No. of yrs. over which observation extends.	58	51	51	51	51	38	58	56	54
January	29.900	721 1/71	0.35	8,218	N E	5.189	4.7	5.8	1.9
February	29.944	871 12/69	0.33	7,046	N E	4.016	4.3	6.1	1.3
March	30.010	943 20/70	0.25	6,822	N E	3.440	4.2	5.6	1.8
April	30.071	803 6/82	0.23	6,234	N E	2.456	3.9	5.0	2.6
May	30.081	758 6/98	0.22	6,416	W	1.670	3.4	4.8	3.1
June	30.060	712 7/00	0.29	7,052	W	1.357	2.2	4.9	3.4
July	30.076	930 17/79	0.28	7,186	W	1.443	2.5	4.5	4.1
August	30.068	756 22/72	0.26	6,950	W	1.791	3.3	4.1	4.4
September	30.003	964 6/74	0.30	7,198	W	2.596	4.2	4.4	4.0
October	29.971	926 4/72	0.33	7,820	N E	3.713	4.9	5.0	2.3
November	29.936	720 13/68	0.34	7,679	N E	4.459	5.5	5.6	1.6
December	29.882	938 3/84	0.35	8,073	N E	5.264	5.7	5.6	1.8
Year Totals	—	—	—	—	—	37.394	48.8	—	32.1
Year Averages	30.000	—	0.30	7,225	N E	—	—	5.1	—
Year Extremes	—	964 6/9/74	—	—	—	—	—	—	—

TEMPERATURE AND SUNSHINE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.	Lowest.	Extreme Range.	Extreme Temperature. Highest in Sun.	Lowest on Grass.	Mean Hours of Sunshine.
No. of yrs. over which observation extends.	59	59	59	59	59	59	59	59	7
January	78.5	64.9	71.7	108.5 13/96	51.2 14/65	57.3	164.3 26/16	44.2 18/97	207.7
February	77.4	64.9	71.1	101.0 19/66	49.3 28/63	51.7	162.1 16/98	43.4 25/91	170.1
March	75.5	63.0	69.2	102.6 3/69	48.8 14/86	53.8	172.3 4/89	39.9 17/13	185.1
April	71.0	57.9	64.4	89.0 4/09	44.6 27/64	44.4	144.1 10/77	33.3 24/09	144.3
May	65.0	52.0	58.5	83.5 1/59	40.2 22/59	43.3	129.7 1/96	29.3 25/17	115.6
June	60.5	48.2	54.3	74.7 24/72	38.1 29/62	36.6	123.0 14/78	28.1 24/11	90.9
July	59.0	45.8	52.4	74.9 17/71	35.9 12/90	39.0	144.3 15/98	24.0 4/93	111.3
August	62.3	47.6	54.9	82.0 31/84	36.8 3/72	45.2	149.0 30/78	26.1 4/09	167.7
September	66.6	51.5	59.0	91.1 24/07	40.8 18/64	50.3	142.2 12/78	30.1 17/05	176.1
October	71.1	55.9	63.5	99.7 19/98	43.3 2/99	56.4	151.9 *	32.7 9/05	193.4
November	74.4	59.6	67.0	102.7 21/78	45.8 1/05	56.9	158.5 28/99	36.0 6/06	182.1
December	77.2	62.9	70.0	107.5 21/04	49.3 2/59	58.2	171.5 4/88	41.5 6/09	195.3
Year Averages	69.9	56.2	63.0	—	—	—	—	—	1939.6†
Year Extremes	—	—	—	108.5 13/1/96	35.9 12/7/90	72.6	172.3 4/3/89	24.0 4/7/93	

* 30 and 31/14. † Total for year.

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	59	59	59	59	59	59	59	59	58	58
January	69	78	58	3.44	14.0	15.26 1911	0.42 1888	7.08 13/11	0.002	1.3
February	72	81	60	4.54	14.2	18.56 1873	0.31 1902	8.90 25/73	0.004	2.1
March	75	85	63	5.16	15.0	18.70 1870	0.11 1866	6.52 9/13	0.008	3.4
April	77	87	63	5.47	13.2	24.49 1861	0.06 1868	7.52 29/60	0.017	5.6
May	76	90	66	4.98	15.1	20.87 1889	0.18 1860	8.36 28/89	0.022	6.3
June	78	89	68	5.12	12.9	16.30 1885	0.19 1902	5.17 16/84	0.018	5.3
July	77	88	65	4.82	12.6	13.21 1900	0.12 1862	5.72 28/08	0.016	5.4
August	73	84	56	3.12	11.4	14.89 1899	0.04 1885	5.32 2/60	0.014	4.9
September	69	79	49	2.91	12.0	14.05 1879	0.08 1882	5.69 10/79	0.008	3.5
October	67	77	47	2.97	12.7	11.14 1916	0.21 1867	6.37 13/02	0.007	3.1
November	67	79	42	2.91	12.5	9.88 1865	0.07 1915	4.23 19/00	0.004	2.2
December	67	77	52	2.64	12.9	8.47 1910	0.23 1913	4.75 13/10	0.003	1.5
Year Totals	—	—	—	48.08	158.5	—	—	—	0.123	44.5
Year Averages	72	—	—	—	—	—	—	—	—	—
Year Extremes	—	90	42	—	—	24.49 April/61	0.04 Aug./85	8.90 25/2/73	—	—

CLIMATOLOGICAL DATA FOR MELBOURNE, VICTORIA.

LAT. 37° 49′ S., LONG. 144° 58′ E. HEIGHT ABOVE M.S.L. 115 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., 3 & 9 p.m. readings.	Wind.				Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds, 9 a.m. 3 p.m. & 9 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.	60	48	48	48	48	44	10	60	10
January	29.913	583 10/97	0.29	7,301	S W, S E	6.40	1.9	5.1	7.8
February	29.962	566 8/68	0.27	6,347	S W, S E	5.04	2.4	5.1	6.9
March	30.032	677 9/81	0.22	6,313	S W, S E	3.94	1.8	5.5	5.2
April	30.100	597 7/68	0.19	5,697	S W, N W	2.36	0.9	5.8	4.2
May	30.105	693 12/65	0.19	5,894	N W, N E	1.46	0.4	6.5	2.7
June	30.077	761 13/76	0.24	6,387	N W, N E	1.09	1.1	6.7	2.0
July	30.094	755 8/74	0.22	6,350	N W, N E	1.05	0.9	6.3	3.3
August	30.066	637 14/75	0.25	6,813	N W, N E	1.48	0.9	6.3	2.4
September	29.995	617 11/72	0.28	6,993	N W, S W	2.28	1.8	6.1	2.8
October	29.969	899 5/66	0.29	7,277	S W, N W	3.32	2.2	5.9	4.8
November	29.948	734 13/66	0.28	7,000	S W, S E	4.52	2.7	5.9	3.4
December	29.898	655 1/75	0.30	7,439	S W, S E	5.74	2.1	5.5	4.4
Year Totals	—	—	—	—	—	38.68	19.1	—	49.9
Year Averages	—	—	0.25	6,651	S W, N W	—	—	5.9	—
Year Extremes	30.013	899 5/10/66	—	—	—	—	—	—	—

TEMPERATURE AND SUNSHINE.

Month.	Mean Temperature.			Extreme Shade Temperature.				Extreme Range.	Extreme Temperature.				Mean Hours of Sunshine.
	Mean Max.	Mean Min.	Mean	Highest.		Lowest.			Highest in Sun.		Lowest on Grass.		
No. of yrs. over which observation extends.	62	62	62	62		62		62	58		58		36
January	78.2	56.7	67.4	111.2	14/62	42.0	28/85	69.2	178.5	14/62	30.2	28/85	246.6
February	77.8	56.9	67.4	109.5	7/01	40.3	9/65	69.2	167.5	15/70	30.9	6/91	208 8
March	74.4	54.7	64.5	105.5	2/93	37.1	17/84	68.4	164.5	1/68	28.9	*	173.3
April	68.3	50.6	59.5	94.0	6/65	34.8	24/88	59.2	152.0	8/61	25.0	23/97	136.6
May	61.4	46.6	54.0	83.7	7/05	29.9	29/16	53.8	142.6	2/59	21.1	26/16	107.7
June	56.8	44.0	50.4	72.2	1/07	28.0	11/66	44.2	129.0	11/61	20.4	17/95	83.8
July	55.5	41.6	48.6	68.4	24/78	27.0	21/69	41.4	125.8	27/80	20.5	12/03	99.8
August	58.8	43.4	51.1	77.0	20/85	28.3	11/63	48.7	137.4	29/69	21.3	14/02	123.9
September	62.5	45.6	54.0	82.3	30/07	31.1	16/08	51.2	142.1	20/67	24.7	13/07	143.7
October	67.0	48.1	57.6	98.4	24/14	32.1	3/71	66.3	154.3	28/68	25.3	8/17	177.7
November	71.4	51.1	61.3	105.7	27/94	36.5	2/96	69.2	159.6	29/65	24.6	2/96	209.4
December	75.3	54.1	64.7	110.7	15/76	40.0	4/70	70.7	170.3	20/63	33.2	1/04	233.7
Year Averages	67.3	49.4	58.4	—		—		—	—		—		1945.0†
Year Extremes	—	—	—	111.2	14/1/62	27.0	21/7/69	84.2	178.5	14/1/62	20.4	17/6/95	

* 17/1884 and 20/1897. † Total for year.

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	61	61	61	62	62	62		62		59		—	10
January	60	73	52	1.86	7	5.68	1904	0.04	1878	2.97	9/97	—	2.2
February	61	75	52	1.70	7	6.24	1904	0.03	1870	2.14	7/04	—	3.1
March	65	78	53	2.16	9	7.50	1911	0.18	1859	3.05	15/78	—	7.5
April	70	83	62	2.28	11	6.71	1901	0.33	1908	2.28	22/01	—	9.1
May	76	86	62	2.18	13	4.31	1862	0.45	1901	1.85	7/91	—	7.7
June	77	88	72	2.11	14	4.51	1859	0.73	1877	1.74	21/04	—	8.9
July	78	88	72	1.82	13	7.02	1891	0.57	1902	2.71	12/91	—	11.3
August	72	81	63	1.81	14	3.59	1909	0.48	1903	1.87	17/81	—	8.7
September	69	81	61	2.42	14	7.93	1916	0.52	1907	2.62	12/80	—	6.4
October	67	79	52	2.61	13	7.61	1869	0.29	1914	3.00	17/69	—	7.6
November	63	75	52	2.27	11	6.71	1916	0.25	1895	2.57	16/76	—	1.9
December	60	75	49	2.32	9	7.18	1863	0.11	1904	2.62	28/07	—	1.4
Year Totals	—	—	—	25.54	135	—		—		—		—	75.8
Year Averages	68	—	—	—	—	—		—		—		—	—
Year Extremes	—	88	49	—	—	7.93	9/16	0.03	2/70	3.05	15/3/79	—	—

CLIMATOLOGICAL DATA FOR HOBART, TASMANIA.

LAT. 42° 53′ S., LONG. 147° 20′ E. HEIGHT ABOVE M.S.L. 177 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. & 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. & 9 p.m.	No. of Clear Days.
No. of yrs. over which observation extends.	33	7	7	7	13	7	10	55	11
January	29.824	500 30/16	0.20	6,030	N W & S E	5.70	0.6	5 9	3.3
February	29.919	393 19/13	0.12	4,319	S E & N	3.98	1 3	5 9	2.7
March	29.939	406 8/15	0.11	4,539	N & S E	3.00	1 1	5.9	1.7
April	29.947	432 7/17	0.14	4,884	N W & S E	2.02	0 8	6.0	1.8
May	29.987	411 3/16	0.12	4,667	N N W	1.32	0.6	6 0	1.8
June	29.952	415 17/12	0.11	4,365	N N W	0.77	0 8	6.0	1.8
July	29.927	396 17/11	0.11	4,517	N N W	0.88	0.4	5 7	2.8
August	29.926	459 30/11	0.13	4,909	N N W	1.25	0.9	5.9	2.3
September	29.838	516 26/15	0.19	5,671	N N W	1.98	0.7	6 1	1.7
October	29.841	461 8/12	0.18	5,762	N W & S E	3.27	1.1	6 2	1.6
November	29.793	508 18/15	0.19	5,703	N W & S E	3.83	1.1	6.3	1.8
December	29.809	375 21/16	0.17	5,581	N W & S E	4.57	1.6	6 2	1.1
Year Totals	—	—	—	60,947	—	32.57	11.0	—	24 4
Year Averages	29.892	—	0.15	5,079	N	—	—	6.0	—
Year Extremes	—	516 26/9/15	—	—	—	—	—	—	—

TEMPERATURE AND SUNSHINE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.	Lowest.	Extreme Range.	Extreme Temperature. Highest in Sun.	Lowest on Grass.	Mean Hours of Sunshine.
No. of yrs. over which observation extends.	47	47	47	71	71	71	30	51	23
January	71.6	53.0	62.3	105.0 1/00	40.3 *	64.7	160.0 †	30.6 19/97	210.9
February	71.5	53.2	62.3	104.4 12/99	39.0 20/87	65.4	165.0 24/98	28.3 -/87	177.2
March	68.0	50.8	59.4	98.8 5/46	36.0 31/05	62.8	150.0 3/05	27.5 30/02	167.6
April	62.7	47.6	55.1	90.0 2/56	30.0 25/56	60.0	142.0 18/93	25.0 -/86	135.5
May	57.2	43.5	50.4	77.5 1/41	29.2 20/02	48.3	128.0 ‡	20.0 19/02	128.7
June	52.7	40.9	46.8	75.0 7/74	28.0 22/79	47.0	122.0 12/94	21.0 6/87	100 1
July	51.8	39.1	45.4	72.0 22/77	27.0 18/66	45.0	118.7 19/96	18.7 16/86	123.1
August	55.0	40.9	47.9	77.0 3/76	30.0 10/73	47.0	129.0 -/87	20.1 7/09	140 8
September	58.6	43.0	50.8	80.0 9/72	30.0 12/41	50.0	138.0 23/93	22.7 -/86	137.7
October	62.8	45.3	54.0	97.0 24/14	32.0 12/89	60.0	156.0 9/93	23.8 §	162.9
November	66.2	48.2	57.2	98.0 20/88	35.2 5/13	62.8	154.0 19/92	26.0 1/08	191.2
December	69.5	51.2	60.4	105.2 30/97	38.0 13/06	67.2	156.0 18/05	27.2 -/86	185.4
Year Averages	62.3	46.4	54.3	—	—	—	—	—	1564.3¶
Year Extremes	—	—	—	105.2 30/12/97	27.0 18/7/66	78.2	165 0 24/2/98	15.7 16/7/86	

* 3/72 and 2/06. † 5/86 and 13/05. ‡ 1888 and 1892. § 1/86, 1899. ¶ Total for year.

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	38	38	38	75	74	75	75	51	—	8
January	64	75	51	1.80	9	5.91 1893	0.03 1841	2.96 30/16	—	1.1
February	65	76	51	1.45	8	9.15 1854	0.07 1847	4.50* 25/54	—	2.0
March	70	76	59	1.65	10	7.60 1854	0.02 1843	2.06 14/11	—	4.8
April	74	85	60	1.90	11	6.50 1909	0.07 1904	5.02 20/09	—	9.6
May	79	90	68	1.87	13	6.37 1905	0 10 1843	3 22 14/58	—	12.6
June	83	94	73	2.19	14	8.15 1889	0.22 1852	4.11 14/89	—	5.9
July	82	97	74	2.12	14	5.98 1849	0.30 1850	2.00 27/78	—	7.2
August	78	92	64	1 93	13	10.16 1858	0.23 1854	4.35 12/58	—	6.4
September	72	87	60	2.14	14	7 14 1844	0.39 1847	3 50 29/44	—	3.4
October	68	75	51	2.24	15	6.67 1906	0.26 1850	2.58 4/06	—	3.2
November	64	74	50	2.56	14	8.92 1849	0.16 1868	3.97 6/49	—	1.6
December	62	73	51	1 97	11	9.00 1875	0.11 1842	2.48 13/16	—	1.4
Year Totals	—	—	—	23.72	146	—	—	—	—	59.3
Year Averages	72	—	—	—	—	—	—	—	—	—
Year Extremes	—	97	50	—	—	10.16 8/1858	0.02 3/1843	5.02 20/4/09	—	—

* 4.18, 26/54 also.

§ 7. The Climatic Factors Influencing Settlement in Australia.*

1. **Introduction.**—There is an impression among some Australians that the climate of the continent does not vary to any great extent from one end to the other. Of all the large land masses, Australia has probably the least average elevation and the most unbroken coastline; both of these conditions make for uniformity. But the area of the continent is very large, and it lies in one of the most variable climatic belts on the earth's surface. It would, therefore, be a serious error to judge the Australian climate only by the southern types thereof, with which alone, probably some three-quarters of the inhabitants are personally familiar.

It will be useful for comparison to glance for a moment at the better appreciated diversity of climates in the region lying between Britain and India. Facing the almost permanent westerly gales is the rugged west coast of Ireland. It receives a perpetual drenching from the moisture-laden winds, and the result is that Western Ireland has large areas of bog land and much deciduous forest, but is too wet for cereals. Somewhat similar conditions obtain in Western Tasmania. (See Fig. 1.)

Passing further to the south-east the Mediterranean lands are reached. Here is an absence of deciduous trees, their place being taken largely by evergreens. A sharply-marked winter rainfall, with considerable periods of drought, is experienced. The same features are characteristic of most of southern Australia. South of the Mediterranean the desert regions of the Sahara are bordered by a grassland belt watered by scanty winter rains, and these conditions also characterise the region of the new Trans-Australian railway. To the east of the Mediterranean, and somewhat remote from the sea, are the Steppes of the Caspian. These are to some extent paralleled by the Australian Riverina —though the latter is warmer.

The true desert of Sahara, with a rainfall below five or six inches, has its counterpart in the region around Lake Eyre, and perhaps in Western Australia. Nearer the Equator are the Savanna regions, grass lands watered by scanty summer rain. The Sudan is of this type, and it is represented in Australia by the inland regions along the Tropic.

The survey has now reached the tropical regions of India, which have a good monsoonal rainfall. Here a distinction should be made between the centre of the Peninsula with its well-marked winter drought, and the East coast. The former agrees in the matter of rainfall with Northern Australia, while the Madras coast resembles the North Queensland coast with a much heavier and more uniform rainfall.

In addition to the eight climatic regions already noted, there is a special type along the coast of New South Wales which differs somewhat from any so far touched upon. Its homoclimes are in China and Uruguay.

It would be quite proper to include Papua and Macquarie Island in a survey of the climate of the Commonwealth. Macquarie Island lies in 55° S. latitude, to the south of Tasmania, and its climate resembles that of Iceland. Hence one could extend the scale through the whole of the regions possessing tropical, temperate and sub-polar climates.

There can be little doubt that climate is the major factor in determining the permanent settlement of the various regions of the earth. It controls agriculture and grazing, which in their turn largely determine manufacturing industries. It controls comfort and health—very potent factors in the spread of white civilisations. In fact, were it not for certain valuable mineral deposits, one would find that practically all the main centres of white settlement could be defined in terms of temperature, humidity and rainfall.

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* Contributed by Griffith Taylor, D.Sc., B.E., B.A., F.G.S., F.R.G.S., Physiographer, Commonwealth Meteorological Service. Prepared with the approval of the Commonwealth Meteorologist, H. A. Hunt, Esq., F. R. Met. Soc., who has generously placed the resources of the Bureau of Meteorology at the disposal of the author.

Similar controls, no doubt, operate in connection with the other races. Probably the black race flourishes within narrower limits, and the yellow race within wider limits than the white race; but a very short survey will shew that the Australian Commonwealth contains regions akin to those inhabited by types of each of the great races of mankind.

Thus there are in Australia, as shewn by Fig. 1, climatic factors such as are associated with all the following peoples and products :—

Nordic races as in parts of Ireland—tall, fair-haired men interested in pigs, potatoes and peat. Shorter Alpine "roundheads," as in Central France, concerned with sheep and cattle. Short dark Mediterranean people, as in Italy, busy with wheat, olives and wine. In the irrigated districts of Egypt are the Copts growing rice and cotton; while in the drier regions near by are the Syrians, concerned *inter alia* with tobacco and goats. In the true desert is the Tuareg, whose environment has made him a nomad. Belonging also to the "white race" are the Hindus of the North of India, who grow cotton, rice, jute, and oilseeds.

The yellow Kirghiz of the Caspian Steppes are pastoral nomads whose southern lands are becoming important cotton areas. Corresponding to the New South Wales coast is Eastern China with tea, maize and sugar cane grown by pure Mongolians.

The Savannas of the Sudan are peopled by negroes interested in cattle, millet and various gums. The South of India, containing dark Dravidians of uncertain origin, produces coffee, tea and tropical oilseeds.

Here, indeed, is a "diversity of creatures," whose whole scheme of life is largely determined by their environment. In Australia the environment is as diverse, and it is logical to assume that it will exert a potent, if slow, influence on Australians.

2. **Temperature.**—Early in the study of climatology it was discovered that the Southern Hemisphere is cooler than the Northern. This fact has been taken by many people to imply that Tropical Australia is much cooler than similarly situated regions in other continents. Moreover, it has been stated that the heat equator is confined to the Northern Hemisphere, and hence that only a mere coastal fringe along the north coast can properly be assigned to Tropical Australia.

The above general statements are true—but the deductions are wrong, for the reason that Australia is an exception to both rules. There is no mysterious virtue about the Southern Hemisphere—it is merely the great preponderance of ocean which keeps its average temperature low. But the few large land masses—of which Australia is one—are hot enough, as it is only too easy to shew.

TABLE I.—LATITUDE AND TEMPERATURE.

Latitude.	Average Temperature.*		Temperature in Australian Regions along 135° E. Long.	
	N. Hemisphere.	S. Hemisphere.		
	° F.	° F.	° F.	
0° ...	78.5	78.5	80	Tropic.
5° ...	79.0	77.9	80	
10° ...	79.5	77.0	82	
15° ...	79.4	75.7	81	
20° ...	78.0	73.0	76	
25° ...	74.7	69.7	70	Temperate.
30° ...	68.5	65.4	66	
35° ...	63.0	59.4	61	
40° ...	57.2	53.2	55	

* From Hann.

Note.—The last column shews smoothed temperatures along longitude 135° E., which fairly represent the "continental" portion of Australia.

Hence we see that Tropical Australia is not only hotter than the average for the Southern Hemisphere, but is hotter than the average for the Northern Hemisphere. It is indeed much hotter than any land between us and the North Pole. It is, therefore, obvious that the heat equator must be drawn through Northern Australia.

There are two further reasons why Australian climates have not been properly estimated in the past.

Almost all maps shewing world temperatures are so constructed that the effect of elevation is removed by reducing the temperature readings to sea level. Thus authoritative maps shew the city of Mexico as having an average annual temperature of 80° F., much the same as Broome, in the same latitude. But actually the average temperature of Mexico is under 60° F.; and the same applies to many other tropical areas. As will be seen later, no continent has so small a proportion of highlands as Australia.

Furthermore, if a tabulation is made of those localities having an average annual temperature over 84° F., it will be found that there are only four such regions of greatest heat recorded in the authoritative work by Hann.

TABLE II.—HOTTEST REGIONS OF THE GLOBE.

Region.	Average Temperature.	Average Rainfall.
1. Timbuktu and vicinity	84° F.	0-10 inches
2. Massowah to Khartum	86° F.	10-20 „
3. Tinnevelly in South India	84.3° F.	40-60 „
4. Wyndham in North-west Australia ...	84.6° F.	40-60 „

If the moistness of the heat be considered, it will be seen that Wyndham has an unenviable position among the world's climates—at any rate in the rainy season.

3. **Effect of Elevation.**—Large portions of the British tropical areas are, luckily, situated at high altitudes. Thus, in Rhodesia approximately 90 per cent. (some 400,000 square miles) is over 2000 feet above sea level. This lowers the temperature by about 7° F., and is a vital factor in regard to settlement. It will be interesting to see how the elevation affects settlement in Australia. In the Tropics there are only three areas which are worth considering.

TABLE III.—TROPICAL HIGHLANDS IN AUSTRALIA.

Tropical Highlands.*	Approximate Area over 2000 feet.	Per cent. of State or Territory.
A. Atherton Tableland, Queensland ...	12,000 sq. miles	2
B. Macdonnell Ranges, N. Territory ...	14,000 „	2.6
C. Fortescue River area, W. Australia ...	11,000 „	1

* The index letters correspond with those on Fig. 8.

Adding a few much smaller areas it will be found that only four per cent. of Tropical Australia is high enough to benefit in this respect. The result is that no injustice will be done if the Tropic of Capricorn be taken as truly representing the southern limit of the tropics in Australia.

As regards temperate Australia, there are but few noteworthy features in the distribution of temperature. Only in the east and south-east are the settled highlands extensive enough to be important.

The following tables give approximate areas for the temperate regions above 2000 feet in Eastern Australia. These all have an adequate rainfall:—

TABLE IV.—EASTERN TEMPERATE HIGHLANDS.

Well-watered Highlands.*	Approximate Area over 2000 feet.	Rainfall.
D. Darling Downs and Tambo Downs, Queensland	2,300 sq. miles	30 inches
E. New England Plateau, N. S. Wales, including Macpherson Ranges ...	23,500 ,,	35 ,,
F. Blue Mountain Plateau, N. S. Wales	14,800 ,,	30 ,,
G. Monaro Plateau, N. S. Wales ...	13,300 ,,	25 ,,
H. Victorian Highlands, Victoria ...	7,700 ,,	50 ,,
J. Tasmanian Highlands	4,400 ,,	40 ,,
	66,000 ,,	...

* The index letters correspond with those on Fig. 8.

Of less important temperate highlands—all situated in regions of low rainfall—there are several in other States.

TABLE V.—DRY TEMPERATE HIGHLANDS.

Dry Highlands.*	Approximate Area.	Estimated Rainfall.
K. Flinders Range, S. Australia ...	1,300 sq. miles	10 inches.
L. Musgrave Ranges, S. Australia ...	6,300 ,,	10 ,,
M. Macdonnells (temperate), N. Territory	7,600 ,,	9 ,,
N. Wiluna Highlands, W. Australia ...	11,600 ,,	9 ,,
O. Ashburton Highlands, W. Australia...	21,200 ,,	9 ,,
	48,000 ,,	...

* The index letters correspond with those on Fig. 8.

There are a few other small areas, such as the Stirling Range, Western Australia, which average less than 1000 square miles each—so that the total highland areas of Australia may be summed up as follows:—

TABLE VI.—AUSTRALIAN HIGHLANDS OVER 2000 FEET.

Tropical—Dry	25,000 sq. miles	40,000 sq. miles
Wet	15,000 ,,	
Temperate—Dry... ...	48,000 ,,	114,000 ,,
Wet ...	66,000 ,,	
Total		154,000 ,,

This is a very small proportion (about five per cent.) of the total area of the Commonwealth.

4. **Range of Temperature.**—The range of temperature during the year depends on two factors; distance from the coast, and distance from the Equator. Both of these operate to increase the range. There is nothing unusual in the range of temperature in Australia, but it has considerable bearing on the health and comfort of the inhabitants, and so deserves a brief mention. (See Fig. 2.) The isopleth for a range of 15° F. almost agrees with the southern coastline; while the 20° isopleth runs along the east from Mackay to Gabo Island, and along the west from Perth to Broome. The north coast is bathed by tropical seas and the range is very little, usually about 10°.

The highest range occurs in a central belt between Bourke and Wiluna, at each of which the temperature of the coldest month is 33° degrees below that of the hottest month. The other isopleths run in concentric fashion around this central belt of high range.

In the cooler regions an equable climate is often desirable from the point of view of health. The following table shews many favourable localities :—

TABLE VII.—TEMPERATE LOCALITIES WITH LOW RANGE.

Locality.	Range.	
Breaksea Island, Western Australia ...	11.0° F.	
Cape Leeuwin, ,, ...	11.8° ,,	Difference between
Cape Sorell, Western Tasmania ...	12.0° ,,	average temperature
Cape Otway, Victoria	12.3° ,,	of hottest month and
Wilson's Promontory, Victoria ...	13.8° ,,	average temperature
Robe, South Australia	13.9° ,,	of coldest month.
Gabo Island, Victoria	14.4° ,,	

In the tropics, however, a large range is always advantageous, and this is only experienced away from the coast. (As will be seen, the humidity unfortunately follows the same rule.) Hence, during the cooler months of the year, in the inland tropical regions the climate is delightful. But on the north coast the range is reduced to a minimum, as the following table shews :—

TABLE VIII.—TROPICAL LOCALITIES WITH LOW RANGE OF TEMPERATURE.

Locality.	Range.
Thursday Island	5.5° F.
Darwin	8.2° ,,
Cooktown	9.9° ,,
Cairns	11.9° ,,

Almost all the region north of 18° S. latitude (Broome to Daly Waters to Mackay) experiences a range of less than 18° F.

5. **Humidity.**—Humidity is an element which requires somewhat more elaborate apparatus for recording purposes than do temperature and rainfall, hence it is not so generally recorded. However, the Commonwealth has a very well distributed corps of observers, and Australia is, in consequence, one of the first continents to be adequately mapped in this respect. (See Fig. 3.)

MEAN MONTHLY HUMIDITY.

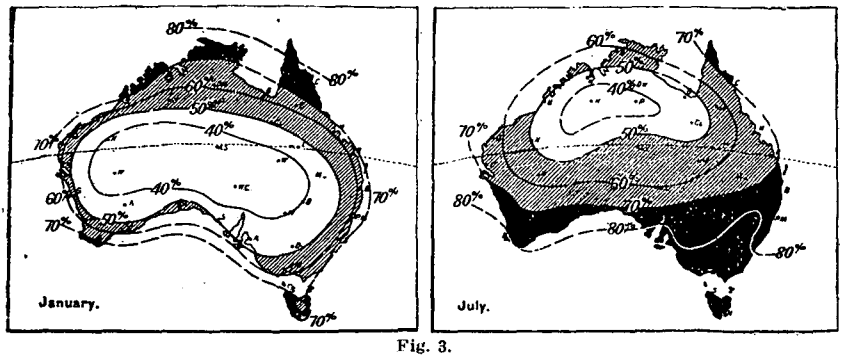

Fig. 3.

If the relative humidity for each of the twelve months be plotted for Australia, it is found that the isopleths are concentric, and more or less parallel with the coastline. The "centre of minimum humidity" moves north and south with the sun, being near Powell's Creek, Northern Territory, in June, and in higher latitudes in summer. There seem indeed to be two summer "centres," one just north-east of Lake Eyre, and the other north-east of Wiluna. These districts have long been known as Sturt's Stony Desert and Gibson's Desert respectively, and it is probable that the association is by no means accidental.

The two extreme months are June, when the general humidity is greatest, and October, when it is least. Luckily, in Australia by far the greatest area of high humidity occurs in winter in the cooler southern portion of the continent. (This is, of course, directly related to the fact that the southern rains occur chiefly in winter.) Here the high humidity has no harmful effect on the population, and may be beneficial to crops.

There is, unfortunately, a season of high humidity in the tropics, and it is this which is of great interest in considering the effect of climate on settlement. It is usually granted that the tropical regions having, in the warm season, a mean monthly humidity exceeding seventy per cent. are distinctly uncomfortable to live in, even if this be not positively injurious to the stamina of the race.

Considering the six hottest months only (from November to April, inclusive), the following tropical stations, together with the intermediate areas, are the most humid. All occur along the north or north-east coast :—

TABLE IX.—HIGH RELATIVE HUMIDITY IN AUSTRALIAN SUMMER.

Locality.	Nov.	Dec.	Jan.	Feb.	March.	April.	Average Summer.
	%	%	%	%	%	%	%
Broome ...	59	67	71	72	66	56	65
Wyndham ...	62	65	68	69	65	50	63
Darwin ...	67	71	77	79	75	70	73
Thursday Island	67	71	82	83	85	77	77
Cairns	69	71	76	75	74	76	73
Townsville ...	69	73	73	73	71	67	71
Brisbane ...	59	62	66	70	72	73	67
Sydney ...	67	67	70	72	75	77*	71*

* In April Sydney is cool enough to nullify the high humidity.

6. **Rainfall.**—There is no doubt that rainfall is the chief factor governing settlement in Australia as in other temperate regions of the world. In the United States, the relation between the 20-inch isohyet and the population isopleth is striking. All to the east (over twenty inches) has over six persons per square mile, almost all to the west (under twenty inches) has less than two persons per square mile.

The average annual rainfall map† is now fairly complete except in the central belt across Western Australia, where rains are very variable and records short or wanting. But this map alone gives a very incomplete statement of the value of the rains. Thus, each of the four following stations has a rainfall of about fifteen inches per year; but the settler would make a grave mistake if he assumed that the rains were all of the same type:—Roebourne (lat. 21°) and Northam (lat. 32°) in Western Australia, Tennant's Creek (lat. 20°) in Northern Territory, and Cobar (lat. 32°) in Central New South Wales, have all annual totals of fifteen inches. None of these is debarred from settlement by excessive heat or dryness, but two of them will never support a large population.

The Roebourne region is marked by the most unreliable rainfall in Australia. In 1891 it received only 0.13 inches, while in 1900 there fell 42 inches. Tennant's Creek is chiefly characterised by a totally dry period of seven months, which extends from April to

† See article by H. A. Hunt, Esq., F. R. Met. Soc., Commonwealth Meteorologist, in this Year Book p. 56.

October. Cobar receives its fifteen-inch rainfall spread out almost uniformly through the year. Northam, Western Australia, obtains practically all of it during the wheat period, and is consequently a much more important farming region than Cobar, which is only barely within the dry-farming area.

It is, therefore, obvious that the season at which the rain occurs, and the certainty of its occurrence, are matters as important as the total amount. Hence it is appropriate to base the classification of the climatic regions on a consideration of these factors.

7. **Rain Reliability.**—From the previous section it will be seen that in some regions of Australia the rainfall is more reliable than in others—quite irrespective of the total amounts. Thus, the twenty inches that the wheat farmer can expect to receive with some certainty in the Katanning district, Western Australia, is much more valuable than the twenty inches which may fall in the course of a few days at Wiluna, Western Australia.* To obtain the rain reliability map shewn in Fig. 4 the following procedure was adopted :—

A table of annual rainfalls for twenty years (1891-1910) was consulted. At each of the localities listed the departures from the normal rainfall were obtained. These departures (ignoring sign) were then averaged and the result expressed as a percentage of of the total rainfall. Thus (taking a striking example), the average rainfall at Onslow, Western Australia, is about eight and a-half inches, but it has varied from one inch in 1896, to twenty-seven inches in 1900. The average of all such departures is five inches, and this is inserted on the map (as a percentage of eight and a-half inches) as sixty per cent.

The map shews two "poles." Near Perth, Western Australia, is the most reliable region, where a variation of less than ten per cent. from the average is all that is likely. All along the south coast the variation is of the order of fifteen per cent., and thence becomes greater as one proceeds north and north-west. The maximum variation or least reliability, occurs at Onslow, sixty per cent., and Charlotte Waters, fifty-seven per cent.

Most of the north coast shews a variation of twenty per cent., or moderate reliability, and the same is true for the east coast. A region of unexpected unreliability is the Barkly Tableland, which seems to vary by about forty-five per cent. In fact, all the cooler portions of the Northern Territory have a very unreliable, as well as a low, rainfall; and this chart certainly indicates that agriculture without irrigation will always be a risky speculation anywhere in the inland portions of the Northern Territory and of Queensland.

It explains, also, why a low average rainfall of ten inches in Swanland, south-west Western Australia, and Eyre's Peninsula is able to give better crops than ten inches in Victoria or New South Wales. It is much more to be counted on in the south-west than in the south-east.

It is to be noted that in the arid interior receiving less than ten inches per year the warmer northern portion has a much more erratic rainfall than the southern cooler portion. Since, moreover, evaporation is so much greater in the northern moiety, this leads to the vegetation and pasture being less scanty in the south than it is along the same isohyet in the north.

8. **Rain Regions.**—Two further rain boundaries deserve discussion. The chief is of course that separating the region of winter rains from the region of summer rains.† (Fig. 5.) The winter rains are, speaking generally, associated with the westerly winds of the Antarctic depressions. These latter Lows travel eastwards along tracks which depend on the season, i.e. on the declination or the apparent track of the overhead sun. They affect Australia chiefly in winter.

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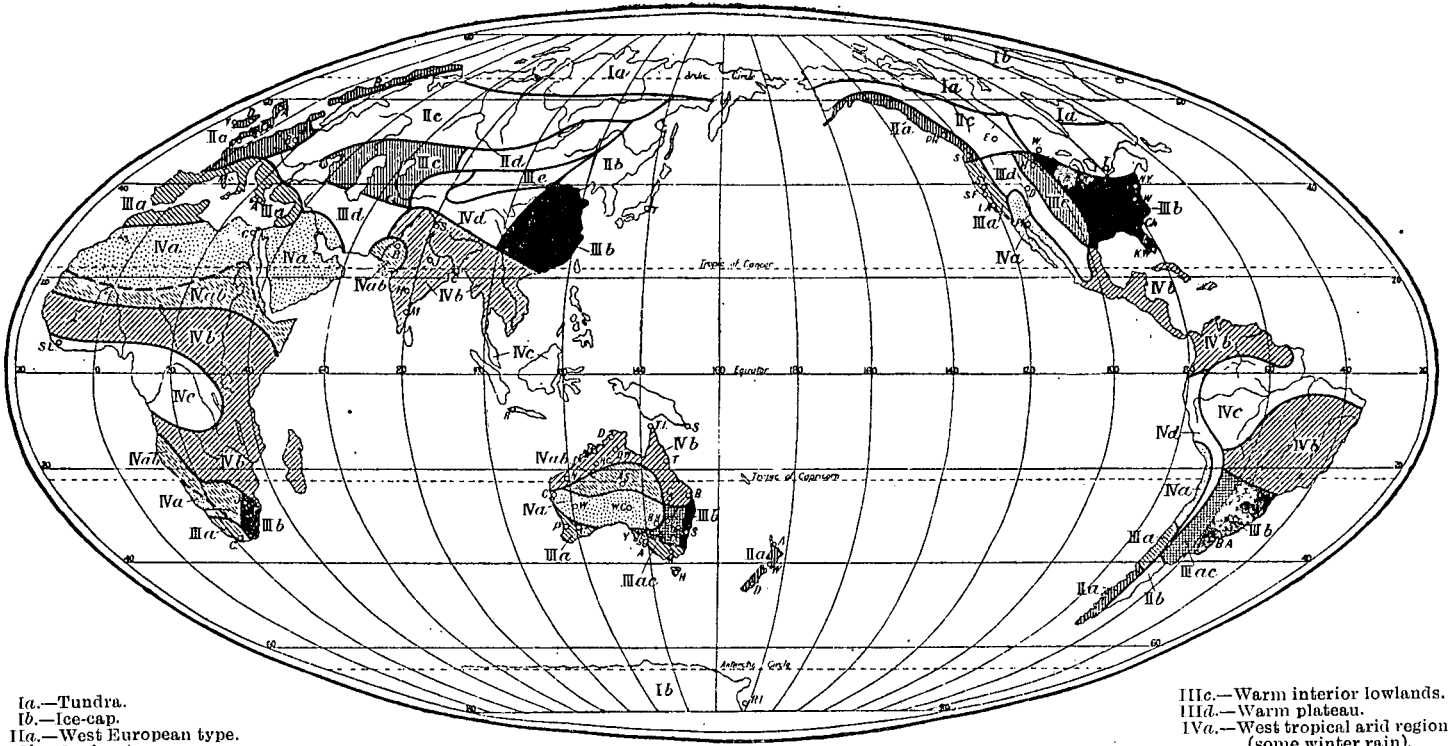
* *Vide* "The Australian Environment," Griffith Taylor, 1918.
† See H. A. Hunt, Bulletin 4, Melbourne, 1909.



Reference.

Fig. 1.

Ia.—Tundra.
Ib.—Ice-cap.
IIa.—West European type.
IIb.—Quebec type.
IIc.—Siberian type.
IId.—Rockies type.
IIIa.—Mediterranean type.
IIIac.—Murray basin type.
IIIb.—Warm eastern margin
IIIc.—Warm interior lowlands.
IIId.—Warm plateau.
IVa.—West tropical arid region (some winter rain).
IVab.—West tropical arid region (some summer rain).
IVb.—Monsoon and Sudan type.
IVc.—Equatorial lowlands.
IVd.—Hot plateau.

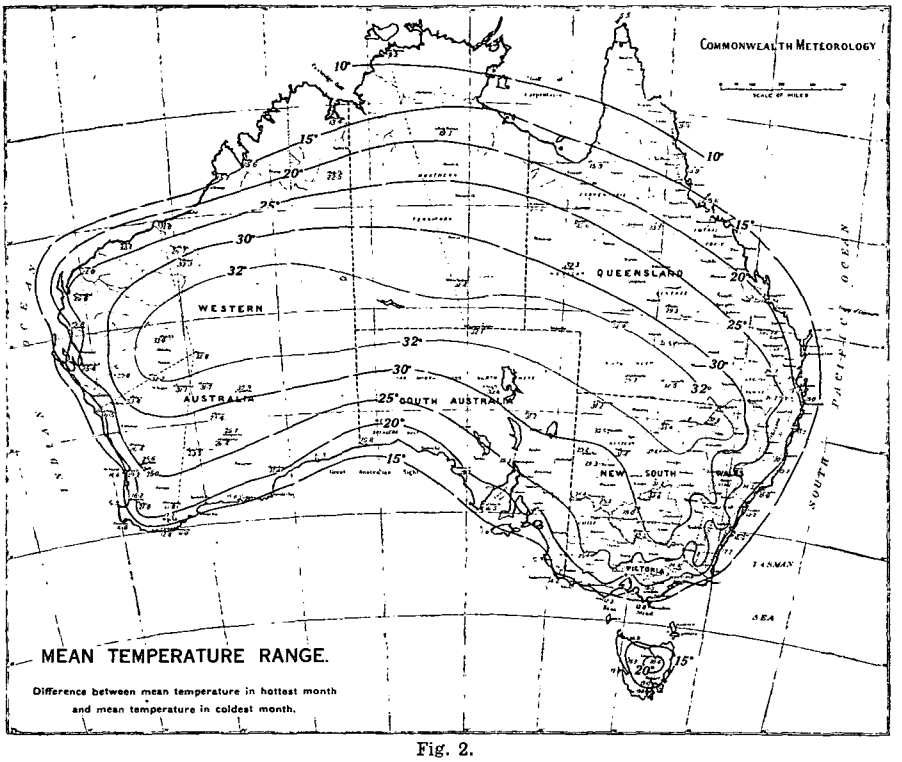


Fig. 2.

RAIN RELIABILITY.

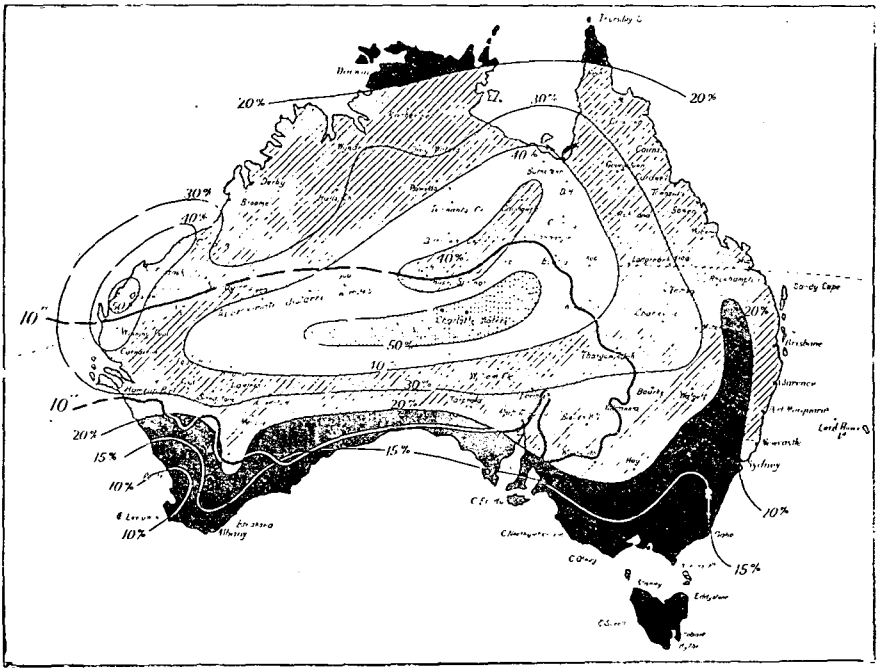


Fig. 4.

Mean Percentage Variations from annual normal years, 1891-1910.
Regions with most reliable rainfall are shewn black.

ECONOMIC REGIONS OF AUSTRALIA BASED ON VARIATIONS IN THE AMOUNT, SEASON, UNIFORMITY AND RELIABILITY OF THE RAINFALL.

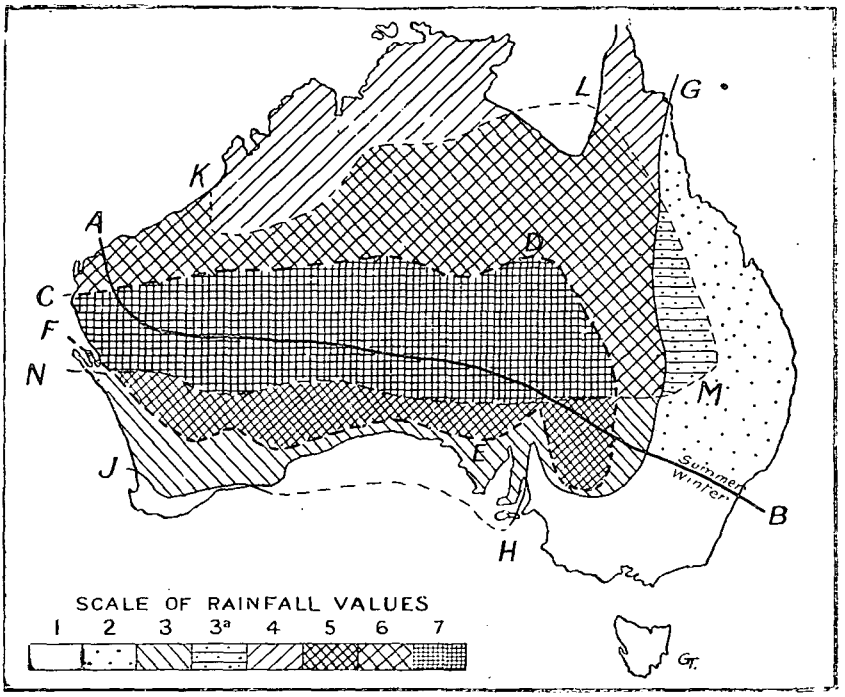


Fig. 5.

The grades are described in Table 10, page 97.

HYTHERGRAPHS FOR TROPICAL AUSTRALIA.

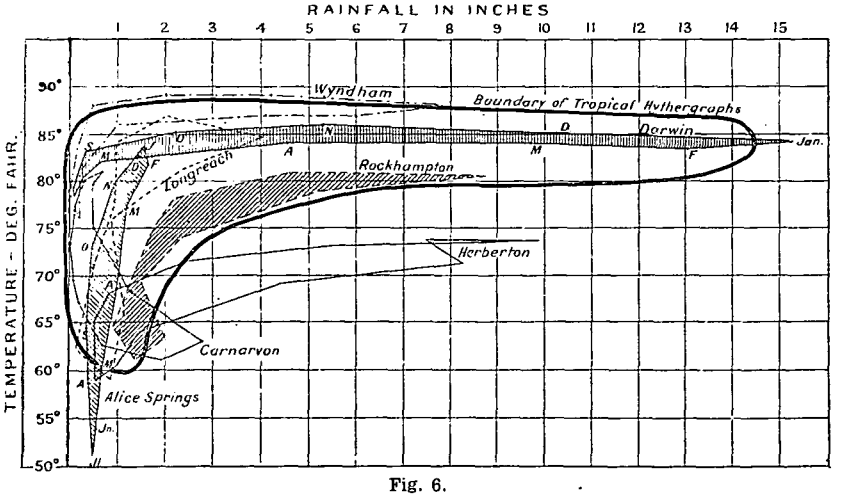


Fig. 6.

The heavy black line includes almost all tropical localities.

HYTHERGRAPHS FOR TROPICAL AREAS GROWING WHEAT, RICE, COTTON, TEA AND COFFEE.

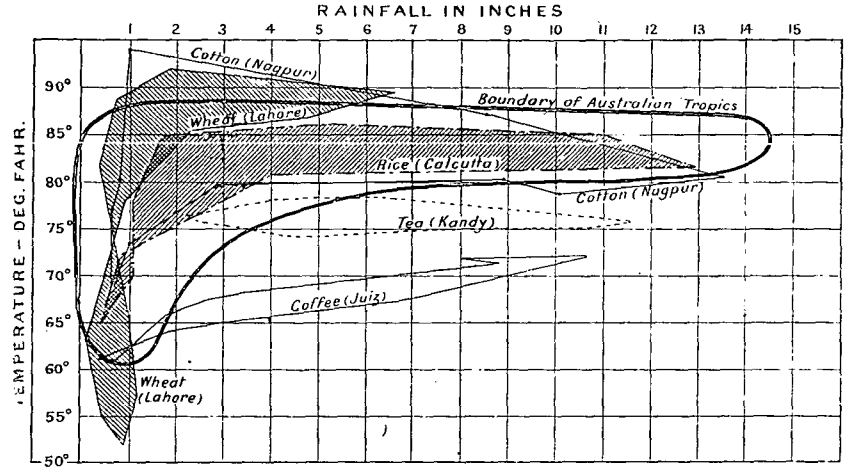


Fig. 7.

The heavy black line shews the limits of almost all the tropical localities in Australia.

ISOPLETHS OF DISCOMFORT.

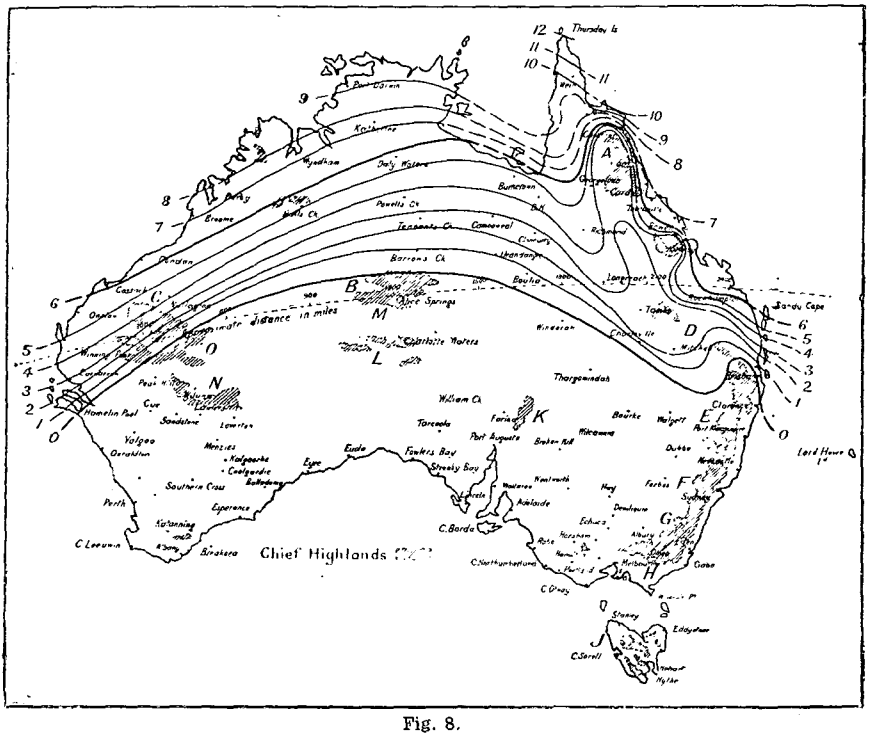
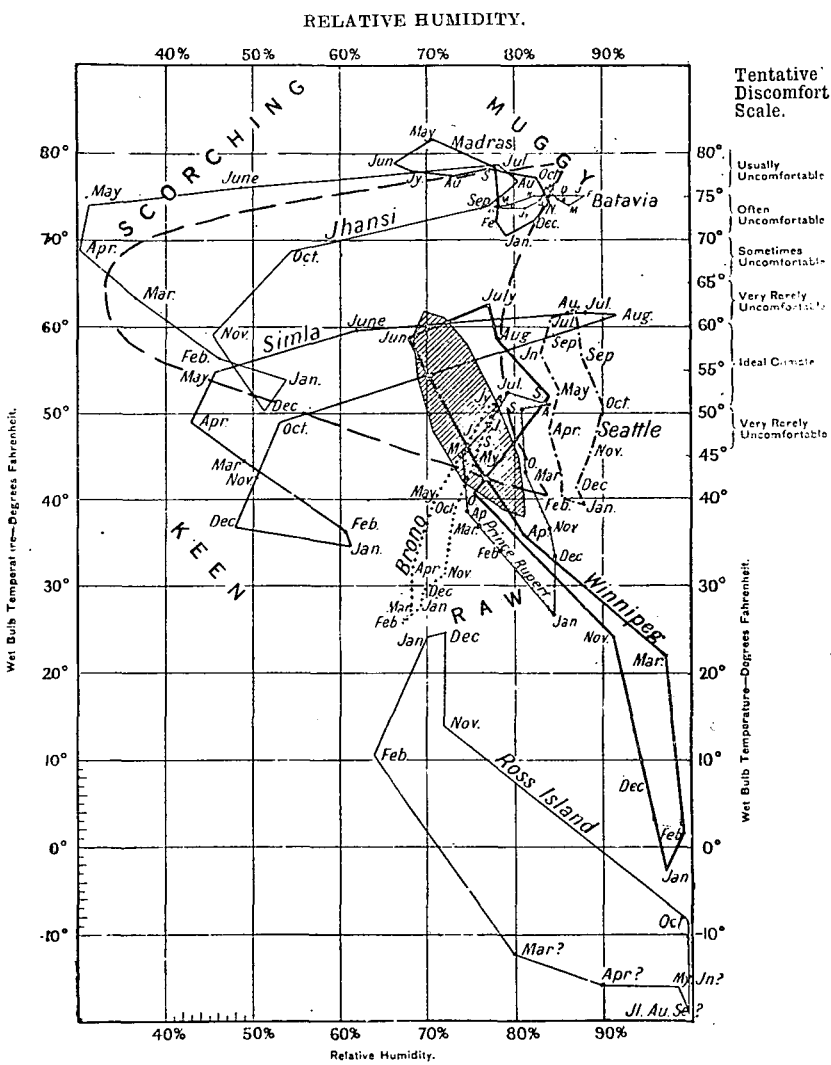


Fig. 8.

The figures shew the number of months with an average wet bulb over 70° F. The shaded areas are over 2000 feet above sea level.

CHARACTERISTIC CLIMOGRAPHS ILLUSTRATING IMPORTANT CLIMATIC TYPES.



NOTE.—The shaded figure is the composite white race climograph based on twelve typical cities.

Fig 9

TYPICAL CLIMOGRAPHS FOR AUSTRALIA.

The empirical boundary between arid and moist regions is given. (London and Berlin added for comparison.)

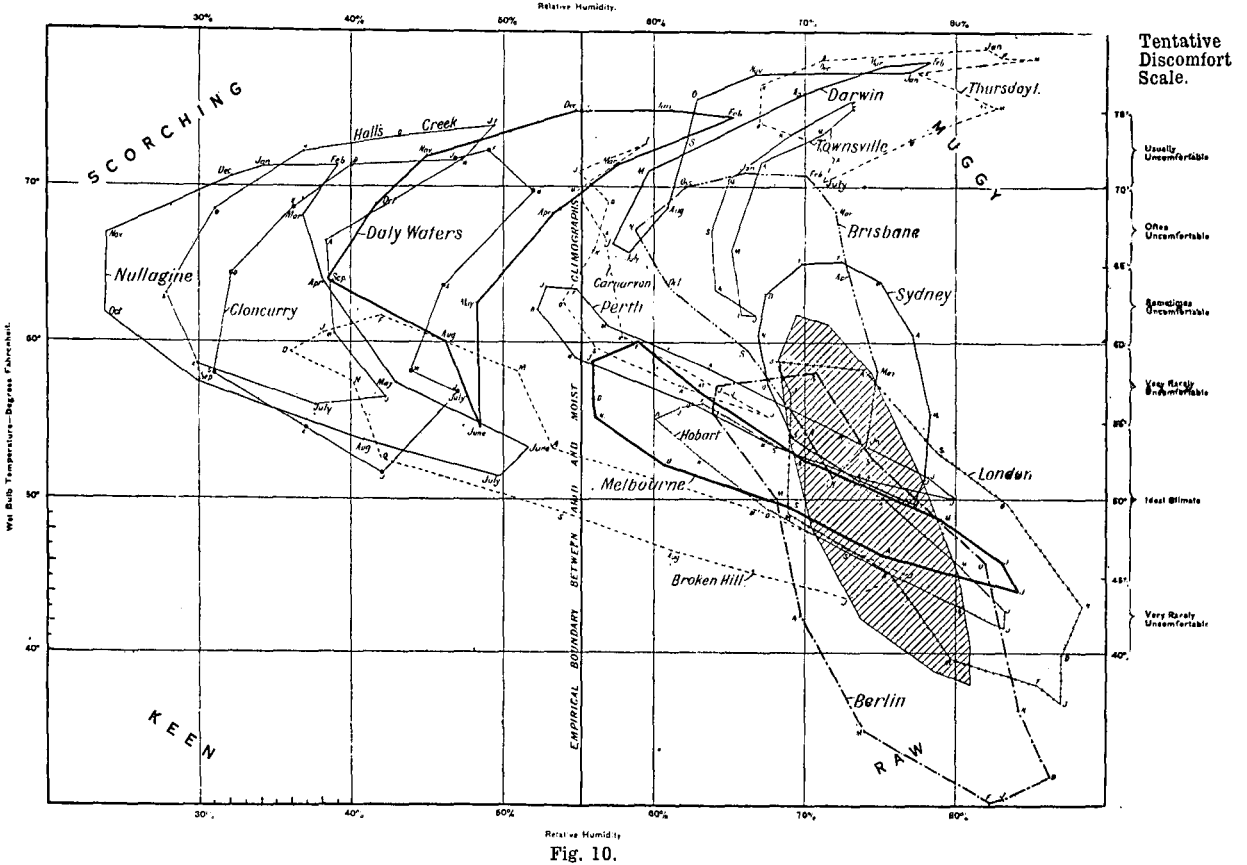


Fig. 10.

NOTE.—The shaded figure is the composite white race climograph based on twelve typical cities.

In the same way the northern rains are largely due to the tropical cyclones which hover over northern Australia when the sun is overhead in the tropics, i.e. in summer. The northern summer rain-controls extend, however, barely as far south as Oodnadatta, South Australia, while the southern winter rain-controls normally extend north approximately to Farina, South Australia. Hence the great arid region of Australia is in the broad belt only occasionally favoured by either of these beneficial controls. This arid area extends from North-west Cape to Broken Hill, and includes thirty-seven per cent. of the area of the continent.

The dominating winds in this arid stretch have an easterly component, and, towards the north, merge of course into the permanent South-east Trade Winds. In the interior and in the western lands it is typically a drying wind, but in the east it blows from sea to land, and contributes largely to the heavier eastern rainfall. At the same time there is a special series of tropical storms which swing down the east coast from the north in autumn and winter, and give its definite character to that region.

Hence, speaking generally, there are four major rainfall regions. The summer rain region in the north, the winter rain region in the south, the uniform rain region in the east, and the arid region in the centre and middle west.

The uniform region may be defined as that which receives over one inch per month through eight months in the year. This uniform portion includes all east of a line from Cairns south to Wentworth, and thence west to Adelaide, and Bunbury, Western Australia. This region also includes almost all the timber areas in Australia, which are largely determined by the uniformity of the rain. Along these coasts, moreover, are the only regions where the evaporation is balanced by the rainfall. Hence the heavy tropical rains of the Northern Territory do not produce timber forests, for the six months' drought in winter prevents the growth of true tropical forests.

Fig. 5 shews how the rainfall varies in amount in season, in uniformity, and in reliability. Thus, considering rainfall alone, one can usefully distinguish seven regions, which may be arranged in order of their value for settlement somewhat as in the following table :—

TABLE X.—MAJOR RAINFALL REGIONS.

Class.	Sub-class.	Chief Localities.	Chief Products.
I. Uniform ...	1. With winter maximum	Riverina, Victoria. Tasmania, Albany	Timber, dairies, farming, sheep, wheat, vines.
,, ...	2. With summer maximum	Eastern Queensland, North-east of New South Wales*	Farms, sugar, sheep, cattle; also timber, dairies and sugar on coast.
II. Seasonal, but reliable	3. Moderate winter type	Swanland, W. Australia† ...	Wheat, sheep, vines.
,,	4. Summer type ...	Kimberley, W. Australia and Coastlands, N. Territory	Cattle.
,,	5. Arid winter type ...	Coolgardie to Broken Hill ...	Sheep.
III. Erratic ...	6. Summer only ...	Pilbarra, W. Australia, Macdonnells, N.Territory, Western Queensland	Sheep and Cattle.
,, ...	7. Arid	Central W. Australia and Inland S. Australia	Relatively empty, a few sheep and cattle stations only.‡

* Type 3a (*on* Fig. 5) *is too erratic to be classed with type* 2. † The temperate and well-watered south-west corner of Western Australia. ‡ Mining is ignored.

9. **Climate and Production.**—The control of wheat and of cattle and sheep-raising by rainfall and temperature is considered very fully in Meteorological Bulletin No. 11,* to which the reader is referred. On the maps in that bulletin it is shewn that cattle are chiefly raised in regions having more than twenty inches of rainfall per annum. Temperature has little effect. Sheep are very largely contained between the twenty and thirty-inch isohyets, though they are numerous between the ten and forty-inch isohyets. They do not extend so far north as the cattle; the hinterland of Broome, Western Australia, being the most northern of the important sheep areas. Wheat is grown almost entirely between the ten and twenty-inch isohyet. It is limited by temperature in the north, for very little is grown north of Nanango, in south-east Queensland, which has an average annual temperature of about 70° F.

10. **Potential Production in the Tropics.**—The two chief controls governing crops are, of course, temperature and rainfall, and the rain must stimulate growth at the the proper season of the year. It is comparatively simple to express graphically the climatic conditions which are highly favourable for such crops as cotton, tea, coffee, rubber, etc. Such graphs have been named *hythergraphs*† by the writer of this article, and they are illustrated in Figs. 6 and 7.

For each locality a table of the twelve average monthly temperatures and rainfalls is consulted. These twelve points are plotted on a chart with the proper co-ordinates. Thus, each locality is represented by a twelve-sided polygon—the hythergraph—which accurately represents the march of temperature and rainfall throughout the year. In Fig. 6 are graphs for tropical Australian towns—Wyndham, Darwin, Rockhampton, Longreach, Carnarvon, and Alice Springs. All these fit within a slipper-shaped boundary, which represents the general range of climate in Northern Australia. Herberton, on the elevated Atherton Plateau, is seen to be quite exceptional in its climate.

The application of this graph is seen in Fig. 7. Here are plotted the graphs for such places as Lahore (which is a very important district for summer wheat); Calcutta, a typical rice region; Nagpur, famous for cotton, etc., etc. It will be seen that all these graphs can be closely paralleled on the north coast of Australia (see Fig. 6). No account is taken of soils (which lie outside the writer's province), but it may be assumed that there are many acres of suitable soil near the permanent rivers flowing to the north coast.

Such crops as tea and coffee need cooler regions, and there are few such in the tropics. It will be seen that the hythergraph for Herberton indicates that the wetter portion of the Atherton Plateau is very suitable for these crops. Many experimental plots have, of course, been devoted to new products on various research farms in Australia. This climatological study will, however, support their introduction on a larger scale.

11. **Wet Bulb Temperatures and Comfort.**—It is generally accepted by physiologists that the best available instrument for testing the suitability of a region as regards habitability is the wet bulb thermometer. Professor J. W. Gregory quotes 78° F. wet bulb as a limit—"above which continuous hard work becomes impracticable." Unfortunately for Australia 78° F. wet bulb is quite common in summer along our northern coast, but this statement (by a strong supporter of tropical white settlement) will free the following deductions from a charge of exaggeration.

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* "The Climatic Control of Production," by Griffith Taylor, 1913.

† *Hyetos*, rain; and *therme*, heat. See "The Australian Environment."

For reasons which are elaborated in Meteorological Bulletin No. 14,* 70° F (wet bulb) has been adopted as the limit of comfort for our race. This means that when the average wet bulb remains above 70° F. day after day for a long period, conditions are not favourable for close white settlement. An open-air active occupation such as stock-riding has little to fear; but strenuous field labour, sedentary indoor life, and especially domestic work and the care of young children, cannot be carried on under favourable conditions at present with high wet bulb temperatures of this order.

It is well known that February is usually the most oppressive month both in Sydney and Melbourne. The average wet bulb temperatures for this month are, however, only 65° F. and 60° F. respectively, while at Melbourne the extreme reading for any day in the year rarely exceeds 75° F.

Brisbane has two months with an average wet bulb over 70° F., and conditions become continuously less attractive as one journeys up the coast. At Mackay such high wet bulbs obtain for six months in the year; at Cooktown for ten, and at Thursday Island all the year round. These isopleths are plotted on Fig. 8. It will be noticed that it is precisely the low-lying river alluvials of the north which are adversely affected. Here irrigation may ultimately be possible, for there are many fine rivers running into the northern seas. But it is doubtful if a white farming community will settle in these agricultural areas for very many years.†

12. **Comparative Climatology and the Climograph.**—Just as heat and moisture determine the well-being of plant life, so do they control the comfort of the human race. But in place of the dry bulb and rainfall, the wet bulb and humidity indicate more directly the effect on man's feelings. Indeed wet bulb temperatures have been termed "sensible" temperatures for this reason. Humidity is a better factor than rainfall—for the average rainfall at a place often remains at zero for many months of the year, while the humidity rarely falls below 40 per cent., and shews the sequence of climatic changes much more clearly.

A graphical representation, akin to the hythergraph for crops, can therefore be drawn from the twelve monthly means of humidity and wet bulb at the required locality. This the writer has named the *climograph*, and it is being accepted generally as giving a clear picture of the climatic changes. (See Bulletin 14.)

In Fig. 9 are shown types of all the chief climates of the world, while at the side is a tentative scale of discomfort depending on the wet bulb readings alone.

As a criterion enabling one to judge if a locality is well suited for close white settlement, a composite climograph is given, based on averages from twelve centres of Anglo-Saxon settlement. This is the cigar-shaped climograph which is shaded in Fig. 9.

Unhealthy regions near the Equator with a uniformly muggy climate are represented by Madras and Batavia. Scorching dry regions—with, however, monsoonal rains in midsummer—are illustrated by Jhansi in Central India. Simla shows one of the keen winter types, though it is also affected by the monsoons in summer. London (see Fig. 9) agrees almost exactly with the type white climograph. Seattle, United States of America, is similar, but wetter. Bronno, near Trondhjem, and Prince Rupert, British Columbia, illustrate raw conditions. Winnipeg and Ross Island, Antarctica, extend far below the temperatures of normal white settlement.

Australian localities have a fairly wide range, as will have been gathered from the first section of this article. There are no "keen" or "raw" climates, but "scorching" and "muggy" types are but too well represented. The more important places are all given

* "The Control of Settlement by Humidity and Temperature," by Griffith Taylor, Melbourne. 1916. † *Vide* "Settlement in the Tropics," by Griffith Taylor. Royal Geographical Society of Queensland, 1918.

on Fig. 10. The cluster of climographs covers an area curiously resembling an arrow-head, and this outline is inserted on the general chart, Fig. 9. (For other continents the climographs would cover a much larger area of the chart.)

The cooler localities in Fig. 10 have the major axes of their climographs running north-west—which means dry summers and wet winters. The hotter localities have the major axis running north-east—which means they are in the monsoon region, with wet summers. The inland localities have low humidity, and so appear at the left of the chart, usually as crescents, which fact indicates that they have a little winter rain and a little summer rain. The climographs for east coast localities (Sydney, Brisbane, etc.) are much less elongated, which implies that spring differs from autumn more than in the other portions of Australia; in fact, the special autumn rainfall is indicated by the high humidity, as we should expect.

The Tentative Scale of Discomfort at the side of the chart will enable the reader to see the conditions in any month at any of the localities at a glance. He can also compare the localities *inter se*; and by reference to the original memoir (Bulletin 14, where seventy climographs are charted) with most other regions of the world.

13. **Settlement in the Tropics.**—The chief object of this article is to focus attention on the climatic difficulties which hinder settlement in the unoccupied regions of Australia. Space does not permit of the insertion of further illustrative climographs, but the following table seems to indicate that our northern lands are not well suited for *close* white settlement. In the table the foreign homoclime (similar region) appears in each case at the right of the Australian locality. (See also Fig. 1.)

TABLE XI.—TROPICAL AUSTRALIAN HOMOCLIMES.

AUSTRALIAN LOCALITY AND A FOREIGN HOMOCLIME.													
Locality.	Temperature.			Rainfall.			Locality.	Temperature.			Rainfall.		
	Average.	Hottest Month.	Coldest Month.	Average.	Wettest Month.	Driest Month.		Average.	Hottest Month.	Coldest Month.	Average.	Wettest Month.	Driest Month.
	°F.	°F.	°F.	Inch.	Inch.	Inch.		°F.	°F.	°F.	Inch.	Inch.	Inch.
Broome ...	79.8	85.9	70.3	23	6	0	Banana, R. Congo	77.9	81.5	72.5	29	6	0
Nullagine	79.8	85.9	70.3	23	3	0	Colima, S.W.Mexico	76.1	80.0	69.6	34	7	0
Carnarvon	71.0	80.0	60.0	9	3	0	Olukonda, S.W. Africa	72.0	77.0	51.0	19	5	0
Wiluna ...	70.0	85.0	52.0	10	2	0	Windhoek, S.W. Africa	67.0	74.0	56.0	15	4	0
Darwin ...	83.0	84.0	77.0	62	15	0	Cuttack, E. of India	80.0	87.0	70.0	55	12	0
Daly Waters	80.0	87.0	69.0	27	6	0	Quixeramobim, Brazil	81.0	83.0	79.0	27	6	0
Alice Springs	70.0	84.0	53.0	11	2	0	Biskra, Algeria	69.0	89.0	51.0	10	1	0
Townsville	78.0	82.0	66.0	49	11	0	Calcutta	78.0	82.0	65.0	60	12	0
Wyndham	84.5	88.3	76.2	27	8	0	Tinnevelly	84.3	89.5	78.5	28	9	0

Assuming that these and similar parallels are correct, it will be seen that the analogous regions (homoclimes) for Darwin are settled by Siamese, Indians and Bantu Blacks, and in Northern Brazil by half-caste Portuguese. Wyndham (as stated earlier) has for homoclime only the extreme tip of India. Broome's homoclime is inhabited by Bantu, and Townsville's (Rio de Janeiro) settled by the Portuguese.

Only in the inland country like that around Wiluna or Daly Waters, is there a h omoclime even sparsely settled by North Europeans. This is the recently conquered German territory of South-west Africa.

In Eastern Brazil is a most interesting series of settlements; but the Germans have settled in the homoclime of Grafton; the Italians in Brazilian "Brisbane," and only the Spanish immigrants touch even the cooler tropical regions.

This brief but comprehensive climatological study shews that Australia is ahead in tropical settlement. Her white sugar-growers around Cairns and Mourilyan are the advance guard of the white farmer in the tropics.

Limitations of space permit merely an allusion to one great asset in Australian northern lands—their freedom from yellow fever, and comparative immunity from beri-beri and malaria. There seems good reason to hope that the two latter will eventually disappear.

What then is indicated as regards the immediate future of the empty northern lands of Australia? The country is essentially a pastoral one—it is not an agricultural region. Apart from questions of labour and market, the lowlands west of Cooktown do not appear to be suitable for white farming at present.

A consideration of progress in Algeria and similar regions indicates that conditions in the Australian tropics may become more acceptable to white settlers in the future. In four or five generations it is possible that the native-born may become thoroughly acclimatised in the sub-tropical areas, and will then gradually spread in considerable numbers into the hotter and more humid zones to the north.