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by John William Moore.**

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REMARKS

12

ON THE

CLIMATE OF DUBLIN,

BASED UPON TWENTY YEARS' OBSERVATIONS.

BY

JOHN WILLIAM MOORE,

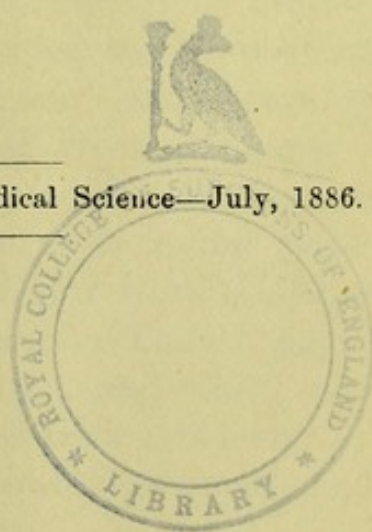
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REMARKS ON THE CLIMATE OF DUBLIN,

BASED UPON TWENTY YEARS' OBSERVATIONS.^a

OBSERVATIONS on the Weather and on the chief climatic elements in Dublin are by no means of modern origin. In the Report on the Tables of Deaths in the first volume of the Census of Ireland for the year 1851 will be found an interesting historical sketch, presumably from the pen of Sir William Wilde, one of the Census Commissioners, of the weather records which had been kept in Ireland, and in Dublin specially, from time to time. At page 648 of *The Philosophical Transactions* for 1676, there is a letter addressed to the Royal Society of London, giving an account of the weather in Dublin in the previous year—1675. The next notices are preserved amongst the records of the Dublin Philosophical Society, established in 1683.^b The MS. Proceedings and Transactions of the Medico-Philosophical Society of Dublin, founded in 1756, afford, down to the year 1784, several useful notices of the weather and diseases, particularly in the metropolis of Ireland. Dr. Rutty's observations were embodied in a monthly diary compiled, no doubt, from daily observations on the temperature, the wind, and the rain; but only a few of his tables have been preserved. The first accurately recorded weather observations in Dublin were those made in 1788 and succeeding years by Mr. Richard Kirwan, President of the Royal Irish Academy. His researches were continued until the year 1808. Medical writers in the early part of the present century, including successive generations of physicians to Cork-street Fever Hospital, depended for their meteorological information on records diligently kept from 1805 to 1841 by Dr. Thomas Herbert Orpen, and which are preserved in MS. in the Library of the Royal Irish Academy.

From 1829 to the present time an admirably systematic and, for

^a Read before the Sub-Section of State Medicine of the Academy of Medicine in Ireland, Wednesday, April 21, 1886.

^b See *The History of Periodic Medical Literature in Ireland*, including Notices of the Medical and Philosophical Societies of Dublin.—*Dubl. Quart. Journal of Med. Science*, Vol. I. February, 1846. This paper was also written by Sir William Wilde, who was at the time editor of this journal.

the most part, scientific series of observations have been made at the Ordnance Survey Office, Mountjoy Barracks, Phoenix Park—a station which, however, by no means represents the climatic conditions under which the population of the city, or even its suburbs, in general live. These observations were commenced by the late Sir Thomas Larcom, and have been continued by the several Royal Engineer officers, who have been subsequently in charge of the department from time to time. At present the Observatory of the Ordnance Survey is in a state of high efficiency under the supervision of Col. Sir Charles W. Wilson, K.C.B., K.C.M.G., R.E., to whose able administration I am gratified to be able to bear this testimony. But city observations were not wanting during this time. The late Rev. Humphrey Lloyd, D.D., Provost of Trinity College, Dublin, based his classical “Notes on the Meteorology of Ireland”^a to a large extent on a many years’ series of observations, taken under his direction, in the magnetic observatory of Trinity College. The Royal College of Surgeons in Ireland, at the instance of Professor Apjohn, also instituted a series of observations, the results of which were for a long time after 1839 published week by week in *The Dublin Medical Press*. The observer appears to have been John Evans, a porter in the employ of the College. Mr. S. Yeates, of Grafton-street, subsequently kept a record of the weather, which was published weekly during many years in *Saunders’s News-Letter*. Within a recent period the Glasnevin records, taken in the Botanic Gardens of the Royal Dublin Society, have been revised and improved.

Although it lies outside the scope of this paper, which has reference to Dublin solely, I would like to mention the admirable weather records kept for many years at Portarlinton by a respected member of the profession, Dr. M. W. Hanlon. That his observations possess scientific value is proved by the fact that his rainfall returns have been made use of by Mr. G. J. Symons, F.R.S., in compiling official tables of the rainfall of the British Islands for the Meteorological Council of the Royal Society.

This brief historical summary would be incomplete, and I would be wanting in filial duty, were I to omit mention of the observations taken by my father, Dr. William Daniel Moore, M.R.I.A., at his residence in South Anne-street, in the very heart of the city. His MS. records are still in my possession, and, with a few interruptions, cover the period between October, 1849, and the same month in

^a Transactions of the Royal Irish Academy. Vol. XXII., page 411 *et seq.* 1854.

1860, when my own series of observations commenced. These, to the taking of which my father's example first inspired me, have been continued uninterruptedly to the present—thanks to the help from time to time most cheerfully afforded me by various members of my family. At first the observations were of a primitive kind, consisting solely of a daily morning record of the temperature, the atmospherical pressure, and the direction of the wind, with a few notes as to the prevailing weather. Afterwards the maximal and minimal temperatures began to be recorded, as well as the rainfall each twenty-four hours. Then a second daily observation was made, and in March, 1869, the dry and wet bulb thermometers were added to the Observatory in the garden of my present residence, 40 Fitzwilliam-square, West. The instruments in use since that time were nearly all supplied, at my own expense, by the Meteorological Office of the Royal Society, London, and they were duly certificated at Kew Observatory.

The thermometers are hung in a modified Stevenson-stand, with louver-work sides, which faces N.N.E., and is fixed on a raised mound near the southern wall of the garden. The barometer—of the Kew pattern, first designed by Mr. P. Adie, of London—is securely fastened to a bookcase in the Library, the cistern being exactly 60 feet above mean sea level (Ordnance datum) at Liverpool. My “station” is situated in latitude $53^{\circ} 20' N.$, longitude $6^{\circ} 15' W.$, at a height of 51 to 54 feet above mean sea level. It is annually inspected by Mr. Robert H. Scott, F.R.S., the Secretary of the Meteorological Office, who thus comments upon it in the Annual Report of the Meteorological Council to the Royal Society, for the year ending March 31, 1884—“This station (Dublin, Fitzwilliam-square) fully maintains its character, as being as good as is possible for a town situation.” He sums up his remarks on the three Dublin stations, Mountjoy Barracks, Fitzwilliam-square, and Glasnevin Botanic Gardens, with the words—“On the whole, it may be said that Dublin is as well represented, climatologically, as any city in the United Kingdom.” I mention these facts in order to bespeak attention to the results I shall now endeavour to bring out.

From a hygienic point of view, the meteorological factors of greatest importance are — (1) Temperature; (2) Rainfall; (3) Number of Rainy Days; and (4) Relative Humidity. Of somewhat less importance are—(5) Mean Atmospherical Pressure; (6) Amount of Cloud; (7) Direction and Force of the Wind.

In the present paper I will deal chiefly with the former group ; but Table I., reproduced from the "Supplement to the Seventeenth Report of the Registrar-General for Ireland on Marriages, Births, and Deaths," contains an abstract of the complete observations taken during the ten years (1871–80 inclusive). In this Table the average^a "mean atmospherical pressure" has been obtained from daily readings of the barometer at 9 a.m. and 9 p.m., corrected and reduced to 32° Fahrenheit at the mean sea level. The average "mean temperature of the air" given is the arithmetical mean of the readings of the dry bulb thermometer in a Stevenson stand taken daily at 9 a.m. and 9 p.m. The "tension of aqueous vapour" (expressed in terms of inches of mercury), "relative humidity," and "amount of cloud," are the result of observations taken daily at 9 a.m. and 9 p.m. The "rainfall" is that measured at 9 a.m. each day and entered to the preceding day. A "rainy day" is one on which at least one-hundredth ($\cdot 01$) of an inch of rain falls within the twenty-four hours from 9 a.m. to 9 p.m. The number of days of rain, snow, hail, thunderstorms, clear sky, overcast sky, and gales are calculated from observations at 9 a.m. and 9 p.m., and the same applies to the results obtained as to the direction of the wind.

The *average mean height of the barometer* during the ten years embraced in the Table, 1871–80, was 29·898 inches. The annual mean varied from 29·737 inches in 1872, to 29·964 inches in 1875 and 1880—a difference of nearly a quarter of an inch ($\cdot 227$ inch). The monthly average ranged from 29·996 inches in May to 29·847 inches in October. The extreme monthly means were—highest, 30·307 inches in January, 1880; lowest, 29·344 inches in December, 1876. I may state that the absolute extreme readings of the barometer at any time taken by me were—maximum, 30·935 inches, at 10 30 p.m., of January 18, 1882; minimum, 28·150 inches, at 2 15 p.m. of January 26, 1884, on which memorable occasion the probably unprecedented readings of 27·400 inches at Aberdeen, and 27·332 inches at Ochtertyre, near Crieff, in Perthshire, were recorded. No such reduction of pressure had taken place in the British Islands for at least 120 years previously.

The extreme observed range of atmospherical pressure in Dublin within the past quarter of a century or so was, therefore, 2·785 inches—a little more than two inches and three-quarters.

^a Throughout this paper the term "average" is employed to denote *the arithmetical mean of a series of means*; thus, by average atmospherical pressure, we understand, in the present instance, the arithmetical mean of a series of ten years' annual mean pressures.

TABLE I.—*Yearly Abstract of Meteorological Observations taken at 40 Fitzwilliam-square, West, Dublin, during the Ten Years 1871–80, by J. W. MOORE, M.D. Univ. Dub., F.K.Q.C.P., F.R. Met. Soc.*

Long. 6° 15' W.; Lat. 53° 20' N. Height above Mean Sea Level, 51 feet. Thermometers 4 feet above ground. Rain-gauge 3 feet 4 inches above ground.

YEAR	MEAN PRESSURE	AIR TEMPERATURE										TENSION OF VAPOUR			RELATIVE HUMIDITY		
		9 a.m.	9 p.m.	Mean	Means of		Absolute Min.		Absolute Max.		9 a.m.	9 p.m.	Mean	9 a.m.	9 p.m.	Mean	
					Min.	Max.	Temp.	Date	Temp.	Date							
1871	Ins. 29·886	50·5	49·5	50·0	45·3	55·5	25·9	Dec. 5th	78·3	August 10th	Ins. ·305	Ins. ·306	Ins. ·306	°/° 81·5	°/° 85·0	°/° 83·2	
1872	·737	50·0	48·9	49·5	45·0	55·3	26·0	Jan. 21st	77·3	July 4th	·295	·297	·296	80·8	84·2	82·5	
1873	·930	49·4	48·6	49·0	44·4	55·1	24·0	Feb. 3rd, 4th	79·3	July 20th	·291	·290	·291	80·0	82·0	81·0	
1874	·944	50·0	49·3	49·7	44·8	55·6	25·2	Mar. 11th	77·5	July 18th	·292	·294	·293	80·0	83·0	81·5	
1875	·964	50·3	49·5	49·9	45·1	55·5	26·7	Dec. 9th	74·3	July 29th	·305	·306	·306	81·9	84·4	83·2	
1876	·863	50·2	49·3	49·7	44·9	55·4	25·4	April 13th	87·2	July 16th	·296	·299	·298	80·0	83·4	81·7	
1877	·852	49·7	48·7	49·2	44·3	55·0	27·4	Feb. 28th	72·5	July 30th	·298	·296	·297	81·5	83·8	82·7	
1878	·921	49·4	48·6	49·0	44·5	54·6	14·0	Dec. 24th	75·1	July 17th	·306	·308	·307	82·9	85·8	84·3	
1879	·923	47·2	46·7	47·0	42·4	52·2	21·2	Jan. 12th	73·6	July 28th	·278	·280	·279	82·1	84·5	83·3	
1880	29·964	49·6	49·0	49·3	44·7	54·9	20·1	Jan. 22nd	74·8	Sept. 4th	·303	·306	·305	81·8	83·9	82·9	
Averages and Extremes of Ten Years	Ins. 29·898	° 49·6	° 48·8	° 49·2	° 44·5	° 54·9	° 14·0	Dec. 24th, 1878	° 87·2	July 16th 1876	Ins. ·297	Ins. ·298	Ins. ·298	°/° 81·3	°/° 84·0	°/° 82·6	

TABLE I.—*continued.*

YEAR	AMOUNT OF CLOUD			RAINFALL			WEATHER							WIND											
	9 a.m.	9 p.m.	Mean	Total	Max.	Date	Number of Days of							Number of Observations of											
							Rain	Snow	Hail	Thunder Storms	Clear Sky	Overcast	Gale	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm			
1871	5.8	5.0	5.4	25.368	1.043	Sept. 26th	191	12	24	12	51	75	9	49	42	66	70	83	94	194	90	42			
1872	5.8	5.1	5.5	35.566	1.276	Mar. 21st	238	12	26	7	54	74	9	42	40	52	90	72	97	200	87	52			
1873	6.1	5.4	5.8	23.820	1.181	Sept. 13th	189	17	27	16	104	200	12	47	49	62	43	58	98	224	92	60			
1874	5.9	5.4	5.7	27.186	2.482	Aug. 13th	186	11	30	9	26	85	16	34	36	62	55	51	110	248	87	47			
1875	6.9	6.3	6.6	29.950	1.355	Oct. 26th	205	14	35	9	15	114	13	20	61	100	76	57	84	197	71	64			
1876	6.6	5.7	6.2	32.663	1.828	Dec. 2nd	195	25	34	7	35	96	14	40	39	87	75	71	93	175	93	59			
1877	6.8	5.7	6.2	32.146	1.150	Mar. 24th	229	18	30	8	15	101	13	31	34	62	53	68	110	231	97	44			
1878	6.6	5.8	6.2	28.262	1.220	May 10th	202	26	28	11	28	108	15	43	37	52	69	58	82	212	113	64			
1879	6.9	6.5	6.7	28.858	1.615	Aug. 5th	208	32	48	8	21	132	21	47	50	91	80	46	97	200	76	43			
1880	6.4	5.7	6.1	34.512	2.736	Oct. 27th	188	18	27	15	33	108	17	41	54	95	56	45	99	201	72	69			
TEN YEARS	6.4	5.7	6.0	298.331	2.736	Oct. 27th 1880	2,031	185	309	102	382	1,093	139	394	442	729	667	609	964	2,082	878	544			

Of the 185 snowy days which occurred in the ten years under discussion, 104 were found in the first quarter, 15 in the second, none in the third, and 66 in the fourth. Of the 309 days on which hail was observed, 114 fell in the first quarter, 77 in the second, 23 in the third, and 95 in the fourth.

As regards the *direction of the wind*, 7,309 observations were made with this result—N., 394; N.E., 442; E., 729; S.E., 667; S., 609; S.W., 964; W., 2,082; N.W., 878; calm, 544. The preponderance of westerly (S.W. to N.W.) over easterly (N.E. to S.E.) winds is very striking—the figures are, 3,924 and 1,838 respectively, more than 2 to 1 in favour of westerly winds. But the great excess of due W. winds is still more remarkable. They number 2,082, or more than double the number of S.W. winds, 964. Partial deflection of S.W. winds by a range of mountains, with summits of 2,000 feet and upwards, to the southward of the city, in some measure accounts for this, and a further explanation is to be found in the frequent occurrence of light westerly land breezes during calm, cold weather. Correlated to this class of westerly winds are the light easterly and south-easterly sea breezes of the daytime, which so materially modify the heats of summer in Dublin, and go so far to swell the number of E. and S.E. winds included in the Table.

Gales were recorded on 139 occasions at 9 a.m. or 9 p.m., of which 59, or considerably more than one-third, happened within the first quarter, only 10 in the second, 19 in the third, and 51 in the fourth. January (with 30 gales) was the stormiest month. There was only one gale in June.

Thunderstorms occurred on 102 days, of which 9 were in the first quarter, 37 in the second, 42 in the third, and 14 in the fourth. June (with 22 storms) and July (with 31) were the months in which electrical disturbances most frequently took place. Not a single thunderstorm happened in December.

The *amount of cloud* varied from 64 per cent. at 9 a.m. to 57 per cent. at 9 p.m., the average being 60 per cent. February is the most cloudy month (66 per cent.), May is the least so (55 per cent.). On 382 occasions the sky was clear, or the amount of cloud was under 20 per cent.; on 1,093 occasions it was overcast—that is, the amount of cloud exceeded 80 per cent. The first quarter was the cloudiest (325 overcast skies), the second quarter was the clearest (109 clear skies).

The *mean relative humidity* was 82·6 per cent. (81·3 per cent. at

9 a.m., but 84·0 per cent. at 9 p.m.; it was highest in December (87·2 per cent.), and lowest in May (75·8 per cent.)—this latter being the month when temperature is rising most quickly, and when, therefore, the capacity of the air for vapour is at a maximum.

In Tables II., III., and IV. are embodied the results of twenty years' observations on three of the more important meteorological factors—mean temperature, rainfall, and number of days of rainfall. As the dry and wet bulb temperatures were not observed until March, 1869, I am unable to add a twenty years' table of the relative humidity, and so I must be content with the ten years' results already given in Table I.

Temperature.—Table II. gives the arithmetical means of the daily maximal and minimal temperatures for each month and year from 1865 to 1884 inclusive. The average annual temperature is 49·9°; it varied from 51·6° in 1868 (a very dry, warm year) to 47·3° in 1879 (a phenomenally cold year, which almost produced a famine in Ireland). The coldest months are December (M. T.=41·3°) and January (M. T.=41·4°). The warmest month is July (M. T.=60·7°). The stationary temperature in March (43·5° compared with 43·2° in February) is interesting. The warmest month in the twenty years was July, 1868 (M. T.=63·5°), but the same month was nearly as warm in the two following years (M. T.=63·2° and 63·3° respectively). The coldest month was December, 1878, when the M. T. was within one degree of freezing point (32·8°); but January, 1881, was nearly as cold (M. T.=33·2°). March was unusually cold in 1867 (M. T.=39·0°), and in 1883 (M. T.=39·0°); so were April in 1879 (M. T.=44·5°), October in 1880 (M. T.=45·4°), and November in 1878 (M. T.=38·2°). The last-named month was singularly warm in 1881, when there was actually an increase of temperature from 48·1° in October to 50·3°. Something like this occurred again last year (1885), when the M. T. in October was very low (45·5°), while that in November was 45·9°, or 0·4° higher.

In an Appendix to the Table, I have grouped together four quinquennial periods. This brings out the curious result that the latter half of the twenty years was decidedly colder than the former half.

TABLE II.—*Monthly and Yearly Mean Temperature of the Air in Dublin, and the Average Mean Temperature for the Twenty Years, 1865–84, inclusive.*

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1865	37.8	41.1	41.2	50.4	53.6	61.0	62.0	59.6	61.4	50.7	45.1	46.2	50.8
1866	43.8	40.3	42.0	47.9	50.1	57.8	61.0	58.3	53.0	51.3	46.1	45.1	49.7
1867	35.7	45.7	39.0	49.9	52.0	58.8	58.6	61.3	56.4	50.3	43.2	42.0	49.4
1868	41.9	44.8	47.3	50.1	55.8	60.5	63.5	60.8	57.9	48.0	43.3	44.7	51.6
1869	44.1	46.7	41.2	50.0	48.2	56.0	63.2	59.4	57.1	51.8	45.0	39.8	50.2
1870	41.3	40.5	43.5	49.8	53.9	59.6	63.3	60.5	57.2	50.3	42.2	37.3	50.0
1871	37.9	46.1	46.6	49.6	53.9	57.1	60.4	62.0	54.6	51.6	43.2	42.1	50.4
1872	42.3	45.9	45.9	48.4	50.4	56.2	62.4	60.0	55.7	47.6	44.4	42.1	50.1
1873	43.0	37.9	42.9	47.3	51.9	59.1	61.5	60.2	54.1	48.2	45.7	45.5	49.8
1874	43.6	42.5	46.7	50.4	50.8	57.9	61.8	59.1	55.8	50.4	46.5	36.8	50.2
1875	46.3	41.0	43.9	48.0	54.9	56.5	58.2	61.1	58.2	50.1	44.6	41.2	50.3
1876	43.1	42.4	41.1	47.1	50.5	57.1	62.1	60.1	54.9	53.1	44.4	44.6	50.0
1877	43.7	44.7	42.5	46.1	49.7	58.5	58.9	58.6	53.4	51.2	45.9	42.3	49.6
1878	43.2	44.6	44.5	48.9	53.5	58.2	62.1	60.7	56.7	51.6	38.2	32.8	49.6
1879	35.3	40.1	42.5	44.5	48.8	55.9	57.2	57.7	54.3	49.7	43.9	37.9	47.3
1880	39.7	45.0	45.4	47.8	52.1	57.1	58.9	61.5	58.6	45.4	44.3	42.4	49.9
1881	33.2	40.6	43.2	45.6	53.5	56.4	61.0	57.0	54.6	48.1	50.3	40.7	48.7
1882	44.7	46.2	46.9	47.1	53.2	55.8	59.5	59.2	53.0	50.1	43.6	38.2	49.8
1883	43.2	43.6	39.0	46.7	51.7	56.4	57.9	59.4	55.3	50.0	44.4	42.6	49.2
1884	45.2	43.4	45.4	46.4	52.6	57.9	60.8	61.5	58.0	50.3	43.9	41.6	50.6
Twenty years	41.4	43.2	43.5	48.1	52.1	57.7	60.7	59.9	56.0	50.0	44.4	41.3	49.9
1885	41.5	43.6	41.8	46.7	48.7	56.2	60.8	57.1	54.4	45.5	45.9	42.0	48.7

N.B.—The temperature values given above are the arithmetical means of the daily readings of the maximal and minimal thermometers.

TABLE II. (Appendix).—*The same arranged in Four Quinquennial Periods.*

1865-69	40.7	43.7	42.1	49.7	51.9	58.8	61.7	59.9	57.2	50.4	44.6	43.6	50.3
1870-74	41.6	42.6	45.1	49.1	52.2	58.0	61.9	60.4	55.5	49.6	44.4	40.8	50.1
1875-79	42.3	42.6	42.9	46.9	51.5	57.2	59.7	59.6	55.5	51.1	43.4	39.8	49.4
1880-84	41.2	43.8	44.0	46.7	52.6	56.7	59.6	59.7	55.9	48.8	45.3	41.1	49.6
Twenty years	41.4	43.2	43.5	48.1	52.1	57.7	60.7	59.9	56.0	50.0	44.4	41.3	49.9

I may mention that in the original draft of this Table the mean temperatures were deduced from the maximal and minimal readings of the self-registering thermometer by Kaemtz's Formula^a—viz. :— $\text{Min.} + [\text{Max.} - \text{Min.} \times .41] = \text{M. T.}$ This formula reduces the mean temperature values in winter by half a degree, and those in summer by somewhat more than one degree Fahrenheit.

The *extreme* temperatures in the shade recorded in the twenty years were 87.2° on July 15, 1876, and 13.3° on December 14, 1882—a range of 73.9° Fahr. But these values are very exceptional. As the Table shows, the average annual range of temperature is not quite 20°—namely, 19.4°.

The year 1868 may be cited as an example of an unusually *warm year*. There was an almost complete absence of frost, and during ten out of the twelve months the mean temperature was above the average—the excess varying from 0.5° in January to 3.8° in March—the warmest March within the twenty years now under discussion. October and November were cold—the deficit of temperature amounting to 2.0° and 1.1° respectively. Notwithstanding this, the M. T. of the whole year was 51.6°, compared with an average of 49.8° (excess=1.8°). A remarkable drought prevailed from the last week in April to the 10th of August, when a tropical rainfall occurred. During this period of nearly three and a half months, only 2.797 inches of rain fell in the city. On six occasions during the summer of this year the thermometer rose to 80° in the shade in Dublin—the highest readings of all being 86° on July 15th and 85° on July 21st. On August 1st the maximum was 82°, and even as late as September 6th the high reading of 77° was noted.

^a Trans. R. I. A. Vol. XXII., page 422. 1854.

In marked contrast to 1868, and as an instance of a *cold year*, 1879 stands out in bold relief. The annual mean temperature was only 47.3° —that is, 2.5° below the average (49.8°). *Every* month was colder than usual—the deficit of mean temperature ranging from 6.1° in January, 3.6° in April, 3.5° in July, and 3.4° in December, to 0.3° in October and 0.5° in November. Curiously enough, these last-named months were relatively the coldest in the warm year, 1868. There was a singular absence of summer heat in July and August; in each of these months the shade temperature exceeded 70° on one day only in Dublin, and on nine days in July it did not reach 60° . The low temperature was accompanied with—to some extent depended upon—a continuous rather than a heavy rainfall. During the six months ending September 30, rain fell on 125 out of 183 days—that is to say, on two out of every three days. The amount of cloud during this cold, damp, sunless year, was 7.5 per cent. over the average. The cold weather, which persisted almost throughout 1879, set in first on October 21, 1878. This period of low temperature had probably not been paralleled for intensity and duration within the present century. The deficiency of mean temperature of the last 11 days of October, 1878, amounted to some 6° , being the coldest weather experienced in that month since 1873. The succeeding November appears to have been the coldest observed in Dublin since 1807—the M. T. was 38.2° , or 6.2° below the average. December, 1878, was also a most inclement month. Snow lay on the ground in the city from the 8th to the 27th, and the M. T. was only 32.8° , or 8.5° below the average, and this notwithstanding a spell of really warm weather on the 30th and 31st.

Rainfall, and Rainy Days.—The average annual rainfall during the twenty years, 1865–84, was 28.015 inches, and the average annual number of rainy days—or days on which at least one-hundredth ($.01$) of an inch of rain was measured—was 194.6.

The year of the *least* rainfall was the last of the series—1884, in which only 20.467 inches were registered on 187 days. In 1870 only 20.859 inches fell, and that was really a drier year than 1884, for in it there were but 145 rainy days. In 1884 there were as many as 187 rainy days, compared with an average number of 194.6 in the twenty years, 1865–84 inclusive. Contrary to what usually occurs, more than half the rainfall fell within the first six months—11.872 inches having been registered up to June 30 on 92 days. In fact, the most striking feature in the distribution of

the rainfall was the scanty downpour observed in August ($\cdot777$ inch) and October ($\cdot834$ inch), usually two of the wettest months in the year, the averages being $2\cdot877$ inches and $3\cdot025$ inches respectively. On no one day did one inch of rain fall—the heaviest daily rainfalls were $\cdot863$ inch on April 4, and $\cdot700$ inch on February 20. It will be observed that on April 4 more rain fell than during the whole month of October, and that on February 20 the downpour nearly equalled the rainfall of August.

The next driest years were 1873 ($23\cdot820$ inches, on 189 days) and 1868—the “warm year”—($24\cdot935$ inches, on 160 days).

The year of the *greatest* rainfall was 1872, in which no less than $35\cdot566$ inches of rain were measured on 238 days. In 1880 the precipitation measured $34\cdot512$ inches, but was distributed over only 188 days—exceptional downpours, amounting to 39 per cent. of the entire precipitation for the year, took place in July ($6\cdot087$ inches, on 24 days) and October ($7\cdot358$ inches, on 15 days), and caused the excess.

The years 1876, 1877, and 1882, were also very wet—the rainfalls being $32\cdot663$, on 195 days in 1876; $32\cdot146$ inches, on 229 days in 1877, and $31\cdot184$ inches, on 227 days in 1882. Had it not been for a dry autumn and winter in 1879—the “cold year”—that year would probably have been the wettest of all, as it was the coldest, for $25\cdot275$ inches of rain fell on 174 days in the nine months ending September 30.

Tables III. and IV. show that May^a and June are the months in which least precipitation takes place in Dublin, the averages being $1\cdot938$ inches on 15·1 days in May, and $1\cdot962$ inches on 14·7 days in June. Summer showers and thunderstorms raise the averages for July and August to $2\cdot499$ inches on 17·6 days and $2\cdot877$ inches on 15·5 days respectively. September is a dry month ($2\cdot289$ inches, on only 14·5 days, thus having a fewer number of rainy days than any other month). It is followed by October—the month of the heaviest rainfall ($3\cdot025$ inches on 17·2 days). The monthly precipitation then remains about two and a quarter inches on some 17 days each month until March, when it sinks to 2 inches, remaining low until July.

^a A notable exception to the rule that May is a dry month occurred in the present year, 1886, when no less than $5\cdot472$ inches of rain were measured on as many as 21 days. More than an inch of rain fell on two consecutive days—viz., $1\cdot151$ inches on the 11th and $1\cdot266$ inches on the 12th.

TABLE III.—*Monthly and Yearly Rainfall at Dublin during the Twenty Years 1865 to 1884, inclusive ; and in 1885.*

Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Yearly Rainfall
	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
1865	1.893	2.321	1.476	1.301	3.412	.727	3.633	3.395	*.056	3.056	3.329	2.863	27.462
1866	1.889	2.063	3.629	2.119	1.810	3.568	1.013	2.172	2.734	1.733	1.489	1.660	25.879
1867	3.086	1.809	4.972	2.181	2.804	1.118	3.443	1.775	1.176	2.848	1.258	.771	27.241
1868	2.638	1.232	1.646	1.930	.891	.677	.741	4.745	2.684	.856	2.146	4.749	24.935
1869	4.258	1.272	2.422	1.490	5.414	.791	.739	1.559	3.957	1.074	1.989	2.594	27.559
1870	2.347	1.440	1.789	.838	1.157	.796	.539	1.514	1.634	5.194	1.218	2.393	20.859
1871	2.624	1.648	.815	3.162	.378	2.265	†4.391	1.065	4.048	2.917	1.258	.797	25.368
1872	2.864	2.557	2.419	2.655	2.164	3.276	1.098	4.302	2.464	3.421	3.414	4.932	35.566
1873	2.650	.925	2.391	.498	.907	.939	3.408	3.944	2.368	3.089	2.009	.692	23.820
1874	2.019	2.683	.953	1.315	1.747	.405	2.515	4.946	1.709	2.508	3.179	3.207	27.186
1875	2.141	2.477	1.040	1.008	1.071	2.989	2.751	1.883	3.180	7.049	3.051	1.310	29.950
1876	.406	3.012	2.158	2.601	.798	1.260	1.337	2.260	3.146	4.505	3.614	+7.566	32.663
1877	4.322	1.560	2.741	4.707	2.343	.921	3.300	3.536	1.795	2.153	2.438	2.330	32.146
1878	1.557	1.576	1.157	2.350	4.540	5.058	.650	4.641	1.684	2.095	1.338	1.616	28.262
1879	1.714	3.706	1.827	1.997	2.048	4.046	4.187	3.704	2.046	1.320	1.251	1.012	28.858
1880	.563	2.581	3.129	1.832	.847	2.156	6.087	1.401	2.061	§7.358	3.235	3.252	34.512
1881	1.369	2.879	1.885	1.329	1.532	2.666	1.863	4.739	1.599	3.470	2.173	1.529	27.033
1882	1.476	1.862	2.260	3.526	1.533	2.334	3.722	1.872	2.619	2.804	3.344	3.782	31.184
1883	2.679	3.752	1.056	2.207	2.023	1.932	2.222	3.307	3.637	2.205	3.074	1.257	29.351
1884	2.358	3.518	1.858	1.532	1.358	1.248	2.350	.777	1.214	.834	1.412	2.008	20.467
Means	2.243	2.244	2.081	2.029	1.938	1.962	2.499	2.877	2.289	3.025	2.312	2.516	28.015
1885	1.617	2.812	1.530	2.911	2.532	1.506	1.154	3.050	2.862	3.500	2.398	.742	26.614

* September, 1865, was the *driest* month of the twenty years.

† December, 1876, was the month of the heaviest rainfall.

‡ July, 1871, was the *wettest* month of the twenty years.

§ Heaviest rainfall in 24 hours—2.736 inches, on October 27th 1880.

TABLE IV.—*Monthly and Yearly Number of Rainy Days* at Dublin during the Twenty Years 1865 to 1884, inclusive ; and in 1885.*

Year	Jan.	Feb	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Rainy Days
1865	13	20	14	9	19	5	17	19	‡ 3	17	18	15	169
1866	22	22	21	18	13	17	13	20	22	13	15	19	215
1867	17	18	22	25	12	6	17	16	13	20	8	13	187
1868	17	14	11	12	10	6	5	13	11	15	19	27	160
1869	18	18	17	14	19	11	9	10	21	11	17	20	185
1870	14	18	11	8	14	9	8	7	11	18	11	16	145
1871	20	16	12	20	9	16	+ 28	12	13	16	14	15	191
1872	23	20	21	12	22	19	12	17	22	22	24	24	238
1873	21	8	22	8	17	13	25	23	13	18	14	7	189
1874	14	12	12	16	14	9	19	18	13	22	19	18	186
1875	23	17	14	12	15	20	18	14	14	26	19	13	205
1876	9	23	23	17	6	14	10	14	17	20	20	§ 22	195
1877	25	19	20	21	18	12	25	24	10	16	22	17	229
1878	20	14	17	16	23	19	9	22	16	16	11	19	202
1879	10	23	16	17	23	24	24	19	18	14	10	10	208
1880	8	17	16	20	9	18	24	10	15	15	20	16	188
1881	14	18	17	13	15	21	15	21	12	18	18	16	198
1882	17	16	17	20	16	25	25	11	15	20	24	21	227
1883	20	17	12	10	13	18	22	14	14	16	19	13	188
1884	18	20	17	11	16	10	25	8	14	14	14	20	187
Means	17·1	17·6	16·5	15·0	15·1	14·7	17·6	15·5	14·5	17·2	16·8	17·0	194·6
* <i>I.e.</i>, days on which ·01 inch, or upwards, of rain fell within the 24 hour † <i>Wettest</i> month of the twenty years. Rainfall = 4·391 inches. ‡ <i>Driest</i> month of the 20 years. Rainfall = ·056 inches. § Month of the heaviest rainfall = 7·566 inches.													
1885	23	19	13	16	23	8	10	14	23	22	17	10	198

Borrowing the language of the agriculturist, we may roughly regard the first quarter of the year (January—March) as “Seed-time,” the second quarter (April—June) as “Growing-time,” the third quarter (July—September) as “Ripening and Harvest-time,” and the fourth quarter (October—December) as “Fallow-time.” We find then that the average precipitation in “Seed-time” amounts to 6·568 inches, and is distributed over 51·2 days; that in “Growing-time” is 5·929 inches on 44·8 days; that in “Ripening and Harvest-time” is 7·665 inches on 47·6 days; and that in “Fallow-time” is 7·853 inches on 51·0 days.

September, 1865—the mean temperature of which month was 61·4°, or 5·4° above the average (56·0°)—was the month of the *least* rainfall in the twenty years, rain having been measured in appreciable quantity (·01 inch or upwards) on only 3 out of 30 days to the remarkably small amount of ·056 inches. This month was, therefore, not only a phenomenally warm one but also the *driest* experienced in the twenty years.

On the other hand, December, 1876, was the month of the *largest* rainfall—7·566 inches having been registered on 22 days. In October, 1880, also, 7·358 inches of rain fell, but on only 15 days—the precipitation on the 27th alone was nearly *two and three-quarter* inches (2·736). In July of the same year—as already stated—6·087 inches fell on 24 days. The *wettest* month—that is, the month in which there were most rainy days—was July, 1871, when 4·391 inches fell on no less than 28 days. In December, 1868—the otherwise “dry and warm” year—rain fell on 27 days to the amount of 4·749 inches.

An inch of rain—equivalent to a downpour of 105 tons of water on every statute acre—seldom falls within 24 hours in Dublin. On October 27, 1880, however, as many as 2·736 inches were measured, and on August 13, 1874, also 2·482 inches of rain were registered. I may add that a tropical downpour, amounting to 1·719 inches, occurred in Dublin and its immediate vicinity on the 4th of August, 1885. The local character of this torrential rain was remarkable—even at Greystones, Co. Wicklow, distant 17 miles, the fall amounted to only ·170 inch, or less than one-tenth of the measurement in Dublin.

In a series of exhaustive papers on the “Climate of the British Islands,”^a Mr. Alexander Buchan, F.R.S.E., Secretary to the

^a Journal of the Scottish Meteorological Society. Third Series. William Blackwood and Sons, Edinburgh and London.

Scottish Meteorological Society, observes—"The only part of Ireland where the rainfall falls short of 30 inches, and even there it does not fall below 29 (? 28) inches, is a small district around Dublin." He offers no explanation of this, but it clearly depends on the geographical surroundings of Dublin—its situation in the east of the island, and the grouping of high lands to the S.E., S., and S.W. of the city, whereby the rainbearing winds are drained of their superabundant moisture before they reach the valley of the Liffey and the plains lying north of that river.

The climate of Dublin is, in the fullest sense, an *insular* one, free from extremes of heat and cold—except on very rare occasions—and characterised by a moderate rainfall (about 28 inches) annually, which is distributed, however, over a large number of days (about 195 in each year). Clouded skies, a high degree of humidity, and a prevalence of brisk winds—chiefly from westerly points of the compass—make up the climatology of the Irish capital.

In common with the rest of the British Islands, Dublin owes its mild equable climate to the proximity of the North Atlantic Ocean and its surface current of warm water—usually called "The Gulf Stream," because its head-springs arise in the Gulf of Mexico. This sets in a northeasterly direction, laving in its course the western shores of Europe, and carries even into the Arctic Regions north of Scandinavia temperatures from 20° to 30° above those due to the latitude alone. But local natural advantages as regards situation exercise a further beneficial effect on the climate of Dublin. A few miles S. of the city lies a range of mountains, with summits varying in height from 1,000 to more than 2,500 feet. This mountain chain intercepts the vapour-laden winds at all points between S.S.E. and S.W., and so the rainfall is diminished and the sky is comparatively cleared during the continuance of the southerly and southwesterly winds which so frequently prevail. The absence of any very high ground to the northward of the city—with the exception of the Hill of Howth, which rises, however, only to 563 feet—also prevents excessive precipitation with S.W. winds. It is true that with easterly (S.E. to N.E. or N.) winds the precipitation (often in the form of hail, and in winter of sleet or snow) in and about Dublin exceeds that which occurs at such a time inland or on the Atlantic coasts. Were it not for this "lee-shore" condensation the Dublin rainfall would be considerably smaller even than it is.

The second local feature which ameliorates the climate of the

capital, is the proximity of the sea to the eastward of the city. The keen, dry, searching easterly winds of winter and spring are much softened in their passage across the Irish Sea, so that during their prevalence the thermometer occasionally stands some 5° or upwards higher in Dublin than it does at Holyhead, although this latter place is actually on the sea. It is true that the converse holds good during westerly and north-westerly winds, when severe frost sometimes occurs in winter in Dublin, while the thermometer remains decidedly above the freezing point at Holyhead. Yet these latter winds are never so piercingly cold and parching as those from easterly points. Nor is it in winter merely that the Irish Sea confers a benefit upon Dublin. In calm, clear weather in summer-time, no sooner has the sun mounted high in the heavens than a cool, refreshing sea-breeze—a typical “inbat,”^a as the modern Greeks call it—sets in towards the land, so that consequently extreme or oppressive heat is rarely experienced. Indeed, an oppressive atmosphere happens only when a damp, warm S.W. wind is blowing, with a more or less clouded sky. Temperatures above 80° in the screen in Dublin nearly always coincide with winds off the land, from some point between S. and W., and a clear or only slightly clouded sky.

Among climatic epiphenomena, the infrequency of thunderstorms and the relative frequency of hail-showers in Dublin, are worthy of note. In winter fog and frost often prevail in the city, when a northerly breeze is blowing along the coast, accompanied with a higher temperature and perhaps showers of rain. Lastly, in summer, with a westerly wind, heavy planetary showers fall at times in the valley of the Liffey, while the neighbouring higher lands enjoy dry weather.

^a Evidently a derivative from *ἐμβάινω*.

