

SYMONS'S METEOROLOGICAL MAGAZINE.

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THE RAINFALL OF AUGUST.

A WET August is a misfortune of very wide incidence. It interferes seriously with harvest operations, and it washes the happiness out of the holidays of multitudes to whom the month brings the one opportunity of the year for healthy open-air enjoyment. From the fact that August is the outdoor month *par excellence*, more attention is perhaps paid to the weather than at other seasons, and unless it proves abnormally dry there is a tendency, which the newspapers are ready to encourage, to consider it abnormally wet. This year the complaints in the Press have been loud and frequent. The facts when collected and compared show that the month as a whole was by no means a bad one taken as a whole, so far as a low rainfall makes good weather.

In the south and east of England, August, 1902, was undoubtedly wet, but not excessively so. In other parts of the country it was dry, and over the greater part of the British Isles it still leaves a considerable deficiency of rainfall compared with the average (itself deficient) of the ten years 1890-99. Looking first at the absolute fall it is natural to expect that in a month the heavy rains of which are due mainly to thunderstorms, dry and wet areas should be frequently found very near each other.

Four small and isolated districts were remarkably dry, having less than two inches of rain for the month, and the holiday-makers who chose those localities had no cause to complain. These were—(1) Cornwall and a strip of North Devon, (2) the central part of the Southern Uplands of Scotland extending from the Firth of Forth to the Tweed, (3) Caithness and the east of Sutherland, and (4) a narrow strip in the middle of the valley of the Shannon.

Rainfall exceeding four inches for the month occurred in the centre of the Lake District, in the centre of North Wales, in the Killarney district, and in the Western Highlands, all places which have a naturally high rainfall, to which the tourist goes taking the risk well knowing that the exquisite beauty of one fine day is worth paying for with several wet ones. But rainfall also exceeded four inches along a broad belt of the south of England from Dorset to Kent, and along another broad strip running from London to

Yarmouth, where such heavy rain is distinctly more than was to be expected; even here the rainfall was very rarely one-third more than the average for the month. At several points in the south the fall exceeded five inches; but taking these also into account, we do not consider that more than the average quantity of rain fell on the British Islands as a whole last month. The deficiency in Ireland and the east of Scotland was more remarkable than the excess in Shropshire, parts of Hereford, and the south-east of England.

This opinion is confirmed by the study of the cumulative table of rainfall for the eight months ending with August 31st, which shows that the country as a whole is still suffering from a deficiency of rainfall. So far as the returns received up to the time of writing this summary enable us to judge, the rainfall this year has only exceeded the average for the period 1890-99 in central England south of the Humber and Mersey, in eastern England from the Humber to the North Downs (where the excess averages about 10 per cent.), in the extreme north-east of Scotland, and in the north-east of Ireland. The deficiency is most marked in the Lake District and the west of Yorkshire, in some parts of which less than two-thirds of the usual amount of rain have fallen. The midland valley of Scotland, between the Forth and Clyde, shows a deficiency of about 20 per cent., while some points in the west of Ireland and the west of Wales have been nearly as dry.

In referring to the table of cumulative rainfall, we take the opportunity of urging on those of our correspondents who are good enough to send observations for it, to do their best to send the returns in on the first day of the following month or as soon afterwards as possible. Although the table may be completed by the insertion of figures received the very day before it is printed, it is impossible to refer in the discussion to any returns but those which have been received early.

Correspondence.

RAINFALL OF AUGUST 16TH AND 18TH.

To the Editor of Symons's Meteorological Magazine.

A severe thunderstorm occurred at 11.15 p.m. on the 16th, up to which hour the day had been dry. The heavy rain measured 1.15 in. at 9 a.m. next day. On the morning of the 18th the measured fall was 0.10 in.; and on the morning of the 19th 1.49 in. was measured.

J. J. S. DRIBERG.

Uckfield Lodge, Crowborough, 19th August, 1902.

At 4.30 p.m. on the afternoon of the 17th thunder was heard in the S.W., and rain began to fall at 5.5, and after a heavy clap of thunder at 5.15 suddenly ceased at 5.20. On emptying the rain

gauge immediately afterwards I found that .45 in. had fallen in fifteen minutes. No other rain fell during the day, and the evening was bright and fine.

WILLIAM HALL.

Swerford, Oxford.

THE RAIN OF AUGUST 29TH AND 30TH.

To the Editor of Symons's Meteorological Magazine.

The rainfall of August 29th and 30th was so exceptional here, as well as local, that I am interested in knowing whether any other place has had a like experience. Friday was a very fine day, and on returning from a country drive at 6 p.m. I noticed that the west and south-west were getting very overcast and thick, at the same time the weather was calm and the barometer only slightly falling. The fall from 9 a.m. 29th to 9 a.m. 30th was 0.065 in., or corrected (sea and 32°) 29.681 in. to 29.616 in. The weather continued fine till 8.15 p.m., when rain began, at first quietly, but soon settled down to a steady pour till 9 a.m. next morning, or for a little over 12 hours. The next day was very gloomy, and also the night following, with occasional rain, but the air was completely saturated, humidity being 99. The amounts of rain registered were—

August 29th	1.25 in.
„ 30th	0.26 „
	<hr/>
	1.51 „

The wind, which had been N.W., veered to N. and then to N.E., later becoming S.E. There was no appearance or sign that there was anything electric about the storm.

I have not seen many records except those published by the Meteorological Office, and these contain no station with special fall. The fall was extremely local. It varied here from 1.56 in. to 1.40 in., but at a station two miles to the south on the other side of a hill, 675 ft. above sea-level, less than half the quantity fell. At Worcester I hear they had a great downpour, but at Bath and Bristol and in South and North Wales it does not appear to have been experienced. It is not uncommon for us to have a heavy fall not generally extending to Swindon from an E.N.E. to N.E. wind, but generally it arises from a well-marked storm coming from S.W., and this time there is no such reason.

H. SOUTHALL.

The Graig, Ross, September 2nd, 1902.

[So far as we can ascertain the rainfall in the east of Wales and west of England on the two days in question very rarely reached half-an-inch. The aggregate fall for August 29th and 30th at Clifton was .47 in., at Cardiff .39 in., at Llanvihangel Court 1.31 in., at Llanfrechfa Grange .82 in., at Rochford .39 in., and at Stroud .33 in. Further north the fall was much less.—ED. S.M.M.]

THE RAINSTORM OF SEPTEMBER 2ND—3RD, 1902.

SIR JOHN MOORE, M.D., F.R.Met.Soc., of Dublin, reports, under date September 3rd :—

“Last night’s deluge of rain in Dublin was of exceptional violence. It was caused by the rapid transit across Ireland, in a north-north-easterly direction, of the deepest atmospheric depression observed since the 22nd of last April. The centre passed along the east coast throughout. At 7.15 a.m. to-day the barometer in Dublin read as low as 29.14 inches. The rain began with a light S.S.E. wind, and fell persistently through the night. In the early morning the wind veered to W., and freshened to a moderate or fresh gale.

“The following rainfall returns have reached me—the measurements are for the 24 hours ended 9 a.m., Wednesday, Sept. 3rd :—

“Knockdolian, Greystones, co. Wicklow, 2.93 in. ; Kingstown, co. Dublin, 2.83 in. ; Fassaroe, Bray, co. Wicklow, 2.64 in. ; Lynton, Dundrum, co. Dublin, 2.40 in. ; Ordnance Survey Office, Phoenix Park, 1.64 in. ; Leeson Park, Dublin, 2.10 in. ; Fitzwilliam Square, Dublin, 2.07 in. ; Royal Botanic Gardens, Glasnevin, 1.95 in.

“This is only the eighth occasion since 1865—that is, in 37 years—upon which two inches of rain have been measured in Dublin at 9 a.m. as the product of the preceding 24 hours’ precipitation. It is noteworthy that of the eight excessive falls in question, four have occurred within the past four years—on August 4th, 1899, 2.227 in. ; August 2nd, 1900, 2.135 in. ; November 11th, 1901, 2.037 in., and September 2nd–3rd, 1902, 2.075 in.”

Mr. J. Ernest Grubb, of Carrick-on-Suir, informs us that a fall of 3.55 in. was measured by him on the same occasion. The storm caused a somewhat serious flood at Belfast ; and both in North Wales and in Scotland much damage was done by wind as well as by rain, telegraphic communication being interrupted over a considerable part of the country.

A SHORT PERIOD OF SOLAR AND METEOROLOGICAL CHANGES.*

By SIR NORMAN LOCKYER, K.C.B., F.R.S., and WILLIAM J. S. LOCKYER, M.A., PH.D., F.R.A.S.

IT is well known that in India during the summer months (April to September) and during the winter months (October to March) low and high pressures respectively prevail. In the case of the latter, the pressure is found to exhibit very remarkable and definite variations, and is in excess, every $3\frac{1}{2}$ years, on the average, while at these times of excess of high pressure the low pressure during the other 6 months of the year is deficient ; so that every $3\frac{1}{2}$ years or so the high pressure becomes higher and the low pressure is not so low as usual.

* Abstract of a paper read at the Royal Society on June 19th, 1902.

Further, this short-period variation, which appears in the mean variation of pressure over the whole of India, is as well defined in the mean values for individual stations, such as Bombay, Calcutta, Madras, Nagpur, &c.

The view that the variation of pressure in question over India and its neighbourhood is not due to local causes, but is produced by some external or extra-terrestrial action, is considerably strengthened by an examination of the pressure-curve of a very distant station, such as Cordoba. Dealing with the pressure of Cordoba during the high-pressure months, April to September, the curve representing the variation from the mean from year to year, is exactly the *inverse* of the curve representing the Bombay and other Indian pressures for the same months over the same period of time. The cause, therefore, which raises the mean value for the low-pressure months over the Indian area would appear to lower the mean value of high-pressure months at Cordoba simultaneously. In fact, we have a see-saw.

Further investigation shows that not only do the pressures of practically the whole Indian area exhibit variations from year to year, which present very similar features, but that this is the case with other large areas. Thus, for instance, it is found that the yearly mean pressures for Brussels, Bremen, Oxford, Valencia, and Aberdeen (the only pressures that have been at present examined) are all remarkably similar in their variations from year to year, and it might almost be said that one curve, representing the variations from the normal, would approximately define the pressures at all these places. The probable extra-terrestrial origin of these short-period variations led to a detailed examination of the records of the phenomena connected with solar spots and prominences, with a view of seeing whether similar variations, indicating changes in the solar activity, could be detected.

A preliminary reduction of the Italian observations of prominences observed on the sun's limb since 1871 was first undertaken. The result of this inquiry indicates that, in addition to the main epochs of maximum and minimum of prominences, which coincide in time with those of maximum and minimum of the total spotted area, there are prominent subsidiary maxima and minima having a similar short period and also coinciding in time.

A comparison of these solar data with those already referred to relating to terrestrial pressures suggests that these simultaneous outbursts of prominences and changes of the latitudes in which the spots occur about every $3\frac{1}{2}$ years are the true cause of the pressure changes; and that the varying intensity of solar activity during the sunspot period of 11 years produces an effect on the pressure and circulation of our atmosphere, thus affecting the whole globe meteorologically.

The close correspondence between the epochs of these subsidiary pressure variations and those representing prominence frequency, suggests not only their very close relationship, but that the terrestrial

pressure quickly answers to the solar changes, while so far as the work has gone it would appear that rainfall and snowfall are subsequent effects.

It may be remarked that we have already obtained evidence showing that this short-period variation is not the only one acting, but that the 11-year and 35-year periods apparently influence the short-period variations; but even this does not explain some anomalies already met with, and should the solar origin of these short-period pressure changes be subsequently confirmed, some of them not constant in all localities will have to be explained; and it is possible we may obtain in this way some new knowledge on the atmospheric circulation.

The period of time included in this survey begins generally with the establishment of the full records of the Indian Meteorological Department in 1875, and extends to 1895, when the regularity of the widened-line phenomena was broken, as stated in a previous communication.

AN AFRICAN RAINMAKER.

By STANLEY P. HYATT.

AMONGST the natives of Rhodesia the rainmaker is a person of great importance, and once a man acquires a reputation as such his future prosperity is assured.

The mightiest rainmaker of modern times was Fupa D'Jena, a petty chieftain living in Eastern Mashonaland; his fame spread from the Limpopo to the Zambesi, from the east coast to the Kalahari desert. Born in the early part of last century, his memory stretched back to the time prior to the Zulu invasion, when the Mashonas were a prosperous nation, and the only indications of the coming storm were vague rumours of the northward march of M'Zilukatzi and his savage horde.

How Fupa D'Jena first acquired his reputation is one of those mysteries which a white man can never hope to penetrate, but the accession of Lobengula found his position firmly established. This savage ruler, though he persecuted the Mashona race with unrelenting hatred, entertained a great respect for the rainmaker, to whom he frequently sent presents of cattle, with the object of inducing him to procure favourable rains for the Matabele nation.

The manipulation of the weather is a jealously guarded secret; but the outward signs of the process are unholy orgies, involving the sacrifice of many cattle and the consumption of much native beer, accompanied by the beating of drums, braying of horns, and shaking of rattles; the result being a hideous uproar, which frequently continues for several days without intermission. The throwing of bones also plays an important part in the ceremony, as by that means the rainmaker can discover the auspicious moment for the planting of certain crops.

Fupa D'Jena maintained his reputation untarnished up to the time of his death, which occurred in September, 1900; but the closing years of his life were clouded through the downfall of his patron Lobengula, and the disfavour with which the new Government regarded his supernatural powers. In old age his personal appearance was not prepossessing, a shrivelled, toothless old savage, clad in a dirty blanket; the only outward sign of his wealth lay in the number of his wives and huts, the latter, however, were in no way superior to those of his neighbours, being wattle-and-dab hovels, which the human inhabitants shared with numerous goats, fowls, and dogs. Although he breathed his last in September, the fact was not officially announced till the following April, when a deputation waited on the Native Commissioner, and presenting him with a fat sheep, requested that he would nominate a successor to the temporal power of the late magician. The reason for the delay was that the wake of so important a personage could not, with propriety, be held until the next harvest was over. By the end of May the crops were all gathered, and after much throwing of bones and earnest consultation with the local ghosts, an auspicious day was discovered, and messengers despatched to summon the natives of the surrounding country to attend the funeral rites. From every direction the warriors of the tribe poured into the squalid little village hidden amongst the kopjes, which for many years had been the residence of the dead man. The scene on the footpaths leading thither was truly extraordinary, a continuous file of naked savages passed along, decked with ostrich feathers and armed with antiquated guns, assegais, and bows; on the backs of many were strapped drums, which those following behind beat incessantly with their hands, and all carried horns or rattles.

At the village itself an immense quantity of native beer was prepared, and when the tale of visitors was complete, six bulls were slaughtered as a sacrifice to the spirit of Fupa D'Jena; but as the Mashona is of a practical turn of mind these sacrifices are always eaten by the mourners instead of being burnt.

The funeral rites consisted chiefly of a wild dance, accompanied by the beating of innumerable drums; beer was served out freely, and the ceremony rapidly became a hideous saturnalia, which lasted till exhaustion and hunger forced the mourners to return to their kraals. Since the first wake more cattle have been sacrificed to pacify the uneasy spirit of Fupa D'Jena, which probably will refuse to depart permanently till all the available bulls have been eaten, and no more grain can be spared for the manufacture of beer.

Hervé Faye.

3RD OCTOBER, 1814—JULY, 1902.

M. HERVÉ FAYE, who has recently died at the great age of 88, entered the Paris Observatory as a pupil of Arago, in 1836, and continued for more than 60 years to take a leading part in astronomical and meteorological work. On the death of Le Verrier, who had for many years been the Director of the combined astronomical and meteorological work of the Observatory, M. Faye was generally considered as his most probable successor, but the French government resolved to separate the two establishments, and offered M. Faye the directorship of the astronomical branch; this incomplete appointment he declined to accept.

M. Faye brought a philosophical spirit to bear on his scientific work; but, perhaps misled by fancied resemblances between the dynamical conditions of nebulae and of the Earth's atmosphere, he enunciated his famous theory of the origin of cyclones by descending currents, a theory which has failed to commend itself to other meteorologists, and is indeed disproved by observed facts. M. Faye was great as a teacher, both as a professor in the *Ecole Polytechnique* and through his writings.

REVIEWS.

Die Schwankungen der Niederschlagsmengen in grösseren Zeiträumen.

[The variations of the amount of precipitation in long periods.]

Von J. HANN. (From Sitzungsberichten der k. Akad. der Wissenschaften in Wien. Mathem.-naturw. Classe. Bd. cxi. Abth. IIa. Februar, 1902.) Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 120.

PROFESSOR HANN discusses three of the longest continuous records of rainfall in existence, those at Padua for the 176 years 1725–1900, at Milan for the 137 years 1764–1900, and at Klagenfurt for the 88 years 1813–1900. These records are familiar to English readers from the use made of portions of them by Sir A. R. Binnie in his well-known paper on “Mean or average Rainfall.” In addition to publishing the yearly values (in millimetres) for each of the three stations the author gives in detail the monthly values for each of the 176 years at Padua, the difference of each month from the mean in percentages, the seasonal totals and the totals for the meteorological year, *i.e.*, December to November. The tables embodying all these data occupy about 85 pp.

The homogeneity of the Padua record is considered carefully and pronounced on the whole satisfactory. Since 1838 the receiving surface of the rain gauge has been the hollow metal roof of the meridian pillar, which has a total catchment area of 295 square feet, nearly seven times as large as the great Rothamsted gauge, the surface of which measures one-thousandth of an acre.

We have only space for a few of the general conclusions. The

following table shows the extremes of annual rainfall expressed as a percentage of the mean at the three stations :—

	Period. Years.	Driest year. Per cent.	Wettest year. Per cent.	Ratio of wettest to driest.
Padua	176	56	181	3·25 to 1
Padua	100	58	152	2·6 „
Klagenfurt ...	88	42	151	3·6 „
Milan	137	62	152	2·5 „

The second period given for Padua is the century 1801–1900, and the extremes for Milan occur within the same century. As to the frequency of dry and wet years the average of the three stations shows that in 100 years there may be expected 8 very dry (with 51 to 70 per cent. of the normal fall), 26 dry (71 to 90 per cent.), 37 nearly normal (91 to 110 per cent.), 22 wet (111 to 130 per cent.), 6 very wet (131 to 150 per cent.), and 1 excessively, wet with over 150 per cent.

The average departure of the mean rainfall of short periods from the mean for 100 years, which can be taken as the true mean, was found to be as follows :—

	5 years. Per cent.	10 years. Per cent.	20 years. Per cent.	30 years. Per cent.	40 years. Per cent.
Padua	9·6	8·4	6·6	2·5	2·39
Klagenfurt	9·5	8·1	5·2	2·6	2·55
Milan	7·0	5·9	3·9	2·7	1·96

The most interesting fact brought out here is that a 30 years' mean is practically as good as a 40 years' mean, while it is enormously better than a 20 years' mean. In fact, the table shows that a 30 or a 40 years' mean is not likely to differ from a true mean by more than $2\frac{1}{2}$ per cent., while a 20 years' mean may be expected to differ from the true mean by as much as $5\frac{1}{4}$ per cent.

Professor Hann investigated the amount of rainfall with reference to sunspot frequency during nine sunspot cycles, and came to the conclusion that no distinct relationship could be made out. He recognised, however, a very clear periodicity corresponding to Brückner's 35-year cycle.

A similar discussion of monthly falls completes this most valuable contribution to the literature of rainfall.

Clouds and Weather Signs by COMMANDER D. WILSON-BARKER, R.N.R. Reprinted from *Knowledge*. London: 1902. Size $8\frac{1}{2} \times 5\frac{1}{2}$. Pp. 32. Plates. Price 1s.

CAPTAIN WILSON-BARKER presents his readers with a series of the most beautiful photographs of clouds that we have ever seen, a series rendered as valuable as they are beautiful by the care with which the types of cloud have been selected from the author's large collection of negatives. We heartily endorse his appeal for greater attention to be bestowed on the signs of weather change presented by the clouds.

Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus. Herausgegeben von PROFESSOR DR. G. HELLMANN. No. 14 *Meteorologische Optik*, 1000–1836. Theodoricus Teutonicus, R. Descartes, I. Newton, G. B. Airy, A. de Ulloa, P. Bouguer, J. Hevel, T. Lowitz, J. Fraunhofer, G. Monge, W. Scoresby, Alhazen, J. de Mairan. Berlin, A. Asher & Co., 1902. Size $10 \times 7\frac{1}{2}$. Pp. (12)+108. Price 11 marks.

PROFESSOR HELLMANN in this new volume of his invaluable series of reprints of meteorological classics, reproduces thirteen of the earliest or most important contributions to meteorological optics. Each memoir is reprinted from the original, now often very difficult of access, and is a verbatim copy in the original words of the author. Professor Hellmann explains in a brief preface the special circumstances which led him to choose the contents of the fascicle. The first four articles are on the rainbow, the oldest by the German monk Theodoricus Teutonicus, in Latin, and dated 1311, the others by Descartes in French (1637), by Sir Isaac Newton (1704) and Sir George Airy (1836) in English. Then follows the first account of the phenomenon known as the Brocken spectre, by Ulloa, who observed it in the Andes in 1748, in Spanish. Three chapters follow on halos, by Hevel, in Latin (1662), Lowitz, 1794, and Fraunhofer in 1826. Finally come three papers on exceptional refraction phenomena. One of these is an account of mirages on the coast of Greenland in 1820 by William Scoresby, the Whitby whaling captain, who qualified himself for studying Arctic phenomena by a university course, and subsequently became a Fellow of the Royal Society and a clergyman. The gem of the collection is undoubtedly the Latin translation of Alhazen's work on twilight, which was written in Arabic in the year 1000. On account of the rarity of this work Professor Hellmann has had it reproduced in facsimile from the first printed edition of 1542.

By making the labours of the pioneer meteorologists available in this way, Professor Hellmann lays his brethren in atmospheric studies under an obligation which it would not be easy to exaggerate.

METEOROLOGICAL NEWS AND NOTES.

MR. W. H. DINES has completed his series of kite-experiments at Crinan, N.B., and obtained a large number of records. His report was presented to the British Association meeting at Belfast on September 15th.

"WRAGGE" is the title of a new meteorological publication edited by Mr. Clement L. Wragge, whose post as Government Meteorologist of Queensland was abolished by the Federal Government of Australia. In the first number Mr. Wragge announces that he is to undertake himself, with government subsidies amounting

to £1000 per annum, the functions of a Central Weather Bureau for Australia. No one can help admiring the enthusiasm of a man who takes so prodigious a task on his shoulders; but we feel that it is wrong for Australia and a discredit to the British Empire that so important a department of the public service should be left to an individual, even if the heads of the weather services of the different States were co-operating with him, and as to this nothing is said. Next to India, we doubt if any country is so dependent as Australia on a scientific knowledge of its climate, and the neglect of the opportunity afforded by confederation to institute a central weather service, is much to be deplored. The example of Canada, and the efforts in Cape Colony, to keep its meteorological system at work during the war, ought in these days of imperial fraternity to have impressed the Australian Government with a sense of their duty to the community.

RAIN HAS FALLEN IN INDIA during the last week of August and the first part of September in sufficient quantity to dispel the fear of famine, and thanks to the excellent records of past seasons of deferred rains there is ground to hope that as in 1884 the monsoon though late may be a good one.

CO-OPERATION BETWEEN SCIENTIFIC BODIES to enable the results of their researches to be applied to practical matters is often difficult to bring about, and Lord Curzon, the Viceroy of India, is to be congratulated on employing his large executive powers to secure an efficient advisory committee to assist his government on economic questions. He has created a Board of Economic Enquiry, composed of the heads of the Meteorological, Geological, Land Survey, Botanical, Forest, Agricultural and Veterinary Departments of India, which will meet twice annually. It is encouraging to men of science to meet with an administrator like Lord Curzon who realizes the value of their services, and is determined to utilize them for the public good.

A WATERSPOUT of a somewhat interesting kind was seen in the south of Cornwall, on August 27th. It seems to have been first observed in a cornfield, near Trevilly, a mile from Land's End, about 2 p.m., when it took the shape of a small whirlwind, raising up and whirling about the sheaves, and then passing in a north-easterly direction over the sea, where the water was whirled and raised in the same way, forming, as far as we can judge from the descriptions sent to us, a typical waterspout. Waterspouts were reported on the same afternoon from the Lizard, and in the Scilly Isles; but the particulars are not precise enough to show whether it was the same whirl, or a succession of whirls due to similar atmospheric conditions.

AUGUST, 1902.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.				Days on which fall or more fell.	TEMPERATURE.				No. of Nights below 32°		
		Total Fall.	Difference from average 1890-9.	Greatest Fall in 24 hours.			Max.		Min.				
				Dpth	Date		Deg.	Date	Deg.	Date			
		inches.	inches.	in.								In shade.	On grass.
I.	London (Camden Square) ...	3·69	+ 1·59	·96	18	18	79·9	29	44·0	11	0	0	0
II.	Tenterden	4·03	+ 1·59	·93	16	17	79·0	16	42·5	11	0	0	0
III.	Hartley Wintney	3·40	+ 1·05	·59	18	23	80·0	30	42·0	2	0	0	0
IV.	Hitchin	4·02	+ 1·39	·83	6	19	75·0	29	44·0	10	0	0	0
V.	Winslow (Addington)	2·63	+ ·50	·65	7	21	77·0	16	40·0	11	0	0	0
VI.	Bury St. Edmunds (Westley) ..	3·83	+ 1·43	·71	23	18	78·5	29	41·5	2	0	0	0
VII.	Norwich (Brundall)	3·37	+ 1·00	·68	7	18	77·8	29	39·8	2	0	0	0
VIII.	Winterborne Steepleton	4·39	...	·89	16	20	76·9	29	39·5	27	0	0	0
IX.	Torquay	2·44	...	·75	16	15	71·8	8	48·3	2	0	0	0
X.	Polapit Tamar [Launceston]..	1·66	— 1·68	·31	17	22	74·9	29	38·9	26	0	0	0
XI.	Stroud (Upfield)	3·17	+ ·63	·31	18	23	78·0	14	44·0	10	0	0	0
XII.	Church Stretton (Woolstaston) ..	6·13	+ 3·29	1·66	7	24	70·0	16	43·0	11	0	0	0
XIII.	Worcester (Diglis Lock)	3·62	+ 1·47	·84	29	25	...	...	...	...	...	...	...
XIV.	Boston	4·38	+ 2·43	1·84	6	16	77·0	27	43·0	11	0	0	0
XV.	Hesley Hall [Tickhill]	3·58	+ 1·37	·80	17	17	73·0	26 ^a	40·0	11	0	0	0
XVI.	Derby (Midland Railway)	3·22	+ 1·10	·90	7	18	74·0	26	42·0	11 ^d	0	0	0
XVII.	Manchester (Plymouth Grove) ..	2·78	— ·63	·65	18	20	...	...	...	...	...	...	...
XVIII.	Wetherby (Ribston Hall) ...	2·92	+ ·65	·82	17	17	...	...	...	...	...	...	...
XIX.	Skipton (Arncliffe)	2·96	— 2·53	·61	17	19	...	...	...	...	...	...	...
XX.	Hull (Pearson Park)	2·18	— ·44	·57	17	19	75·0	16	39·0	11 ^e	0	0	0
XXI.	Newcastle (Town Moor)	2·58	— ·33	·50	4	16	...	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite)	7·23	— 4·17	2·96	22	16	71·5	16	41·2	30	0	0	0
XXIII.	Cardiff (Ely)	3·95	— ·22	·82	18	23	...	...	...	...	...	...	...
XXIV.	Haverfordwest	3·02	— ·64	·90	5	15	74·3	16	40·4	27	0	0	0
XXV.	Aberystwith (Gogerddan) ...	2·97	— ·98	·85	7	13	77·0	16	31·0	4	1	...	...
XXVI.	Llandudno	1·96	— ·84	·48	5	18	70·0	18	43·5	5	0	0	0
XXVII.	Cargen [Dumfries]	2·88	— 1·26	·68	17	15	71·0	16	35·0	11	0	0	0
XXVIII.	Edinburgh (Royal Observatory) ..	1·30	...	·40	18	11	69·8	15	40·3	11	0	0	0
XXIX.	Colmonell	2·91	— 1·08	·64	17	15	76·0	16	37·0	29	0	0	0
XXX.	Tighnabruaich	3·88	...	·70	21	14	65·0	15	41·0	20	0	0	0
XXXI.	Mull (Quinish)	4·54	— ·58	·85	1	22	...	...	...	...	...	...	...
XXXII.	Loch Leven Sluices	3·73	+ ·07	1·42	4	14	...	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis) ..	3·00	+ ·19	·85	18	19	74·5	15	38·0	21	0	0	0
XXXIV.	Braemar	2·73	— ·94	·45	17	22	66·1	15	33·8	30	0	4	0
XXXV.	Aberdeen (Cranford) ...	2·61	— ·69	·47	3	24	68·0	9 ^b	43·0	20 ^c	0	0	0
XXXVI.	Cawdor (Budgate)	3·31	+ ·16	·60	17	16	...	...	...	...	...	...	...
XXXVII.	Strathconan [Beaul]	2·58	— 1·82	·48	11	11	...	...	...	...	...	...	...
XXXVIII.	Glencarron Lodge	5·62	— 2·92	·77	22	22	65·7	22	40·0	1	0	0	0
XXXIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...	...
XL.	S. Ronaldshay (Roeberry) ...	2·43	— ·59	·44	28	15	64·0	24	41·0	13	0	0	0
XLI.	Darrynane Abbey	3·97	— ·52	·85	5	20	...	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	2·45	— 1·48	·60	5	14	72·0	14	41·0	30	0	0	0
XLIII.	Broadford (Hurdlestown) ...	1·61	— 1·97	·37	22	21	70·0	4	44·0	29	0	0	0
XLIV.	Carlow (Browne's Hill)	2·76	— ·67	·86	6	15	...	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square) ..	2·95	— ·01	·92	6	18	71·2	18	44·8	4, 11	0	0	0
XLVI.	Ballinasloe	2·01	— 1·92	·49	5	16	70·5	14 ^e	38·0	4	0	0	0
XLVII.	Clifden (Kylemore)	3·40	— 4·50	·92	21	13	...	...	...	...	...	...	...
XLVIII.	Seaforde	2·75	— ·55	·52	6	18	...	...	...	...	...	...	...
XLIX.	Londonderry (Creggan Res.) ..	3·62	— ·80	·55	28	23	...	...	...	...	...	...	...
L.	Omagh (Edenfel)	2·65	— 1·59	·76	17	18	70·0	16	37·0	29	0	0	0

+ Shows that the fall was above the average ; — that it was below it.

a—and 27. b—and 15, 24, 26. c—and 25. d—and 26. e—and 15.

SUPPLEMENTARY TABLE OF RAINFALL,
 AUGUST, 1902.

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	5.22	XI.	Castle Malgwyn	2.42
II.	Dorking, Abinger Hall .	2.90	„	Builth, Abergwesyn Vic. ...	...
„	Sheppey, Leysdown	4.20	„	Rhayader, Nantgwillt ...	5.27
„	Hailsham	4.48	„	Lake Vyrnwy	5.16
„	Crowborough	5.38	„	Ruthin, Plâs Drâw	2.47
„	Ryde, Beldornie Tower..	4.38	„	Criccieth, Talarvor	2.97
„	Emsworth, Redlands ...	4.53	„	I. of Anglesey, Lligwy..	2.16
„	Alton, Ashdell	3.33	„	Douglas, Woodville.....	3.28
„	Newbury, Welford Park	3.39	XII.	Stoneykirk, Ardwell Ho.	4.15
III.	Oxford, Magdalen Coll..	2.50	„	Dalry, Old Garroch	3.02
„	Banbury, Bloxham	2.60	„	Moniaive, Maxwelton Ho.	2.88
„	Pitsford, Sedgebrook ...	3.21	„	Lilliesleaf, Riddell	2.69
„	Huntingdon, Bampton.	1.93	XIII.	N. Esk Res. [Penicuik]	1.50
„	Wisbech, Bank House...	3.14	XIV.	Glasgow, Queen's Park..	2.71
IV.	Southend	2.58	XV.	Inveraray, Newtown ...	4.69
„	Colchester, Lexden	2.79	„	Ballachulish, Ardsheal...	5.57
„	Saffron Waldon, Newport	3.26	„	Islay, Eallabus.....	2.34
„	Rendlesham Hall	3.51	XVI.	Dollar	3.03
„	Swaffham	2.17	„	Balquhider, Stronvar...	3.47
V.	Salisbury, Alderbury ...	3.10	„	Coupar Angus Station...	3.43
„	Bishop's Cannings	3.43	„	Blair Atholl	2.24
„	Blandford, Whatcombe .	...	„	Montrose, Sunnyside ...	3.01
„	Ashburton, Druid House	3.40	XVII.	Keith H.R.S.....	3.03
„	Okehampton, Oaklands.	1.69	XVIII.	Fearn, Lower Pitkerrie..	1.15
„	Hartland Abbey	2.62	„	S. Uist, Askernish	2.36
„	Lynmouth, Rock House	1.88	„	Invergarry	3.16
„	Probus, Lamellyn	1.65	„	Aviemore, Alvie Manse.	3.26
„	Wellington, The Avenue	3.69	„	Loch Ness, Drumnadrochit	2.47
„	North Cadbury Rectory	4.17	XIX.	Invershin	1.75
VI.	Clifton, Pembroke Road	4.16	„	Bettyhill	1.60
„	Ross, The Graig	3.73	„	Watten H.R.S.....	1.85
„	Shifnal, Hatton Grange	6.06	XX.	Dunmanway, Coolkelure	4.89
„	Wem, Clive Vicarage ...	3.16	„	Cork, Wellesley Terrace	2.89
„	Cheadle, The Heath Ho.	3.29	„	Killarney, District Asyl.	4.95
„	Coventry, Priory Row ..	3.86	„	Caher, Duneske .....	...
VII.	Market Overton	3.24	„	Ballingarry, Hazelfort...	3.10
„	Grantham, Stainby	3.28	„	Miltown Malbay	3.27
„	Horncastle, Bucknall ...	3.06	XXI.	Gorey, Courtown House	2.75
„	Workop, Hodsck Priory	3.94	„	Moynalty, Westland ...	3.64
VIII.	Neston, Hinderton	3.44	„	Athlone, Twyford	2.21
„	Southport, Hesketh Park	2.07	„	Mullingar, Belyedere ...	1.78
„	Chatburn, Middlewood.	2.89	XXII.	Woodlawn	2.63
„	Duddon Val., Seathwaite Vic.	5.76	„	Westport, Murrisk Abbey	1.88
IX.	Baldersby	2.43	„	Crossmolina, Enniscoe ..	2.33
„	Scalby, Silverdale	3.42	„	Collooney, Markree Obs.	2.55
„	Ingleby Greenhow Vic..	2.61	XXIII.	Enniskillen, Model Sch.	...
„	Middleton, Mickleton ...	2.39	„	Warrenpoint.....	3.42
X.	Beltingham .....	...	„	Banbridge, Milltown ...	2.43
„	Bamburgh .....	...	„	Belfast, Springfield .....	...
„	Keswick, The Bank	1.65	„	Bushmills, Dundarave..	2.48
XI.	Llanfrechfa Grange	4.18	„	Stewartstown	3.72
„	Treherbert, Tyn-y-waun	...	„	Killybegs	2.23
„	Llandovery	2.56	„	Horn Head	2.24

METEOROLOGICAL NOTES ON AUGUST, 1902.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

LONDON, CAMDEN SQUARE.—Wet and gloomy, with absence of sunshine, but many fine evenings. The greatest rainfall since 1881. Mean temp. $61^{\circ} \cdot 3$, or $0^{\circ} \cdot 8$ below the average.

TENTERDEN.—The long dry period came to an end on 16th, and instead of dull weather with occasional showers, there were heavy rains, bad for the harvest, but giving grass a good start. In 60 days ending August 15th, 1.92 in. of R fell; in 16 days ending 31st, 3.61 in. Duration of sunshine 154 hours.

CROWBOROUGH.—Most unseasonable, with very heavy R. TSS on 8th and 16th.

PITSFORD, SEDGEBROOK.—Cold, cloudy, and ungenial. R $1 \cdot 34$ in. above the average.

BURY ST. EDMUNDS, WESTLEY.—R over the average; most disastrous for agriculture. Very little wind or sun, making it impossible to dry the corn.

WINTERBOURNE STEEPLTON.—Colder and wetter than any August for ten years. Mean temp. $57 \cdot 8$, or $1^{\circ} \cdot 7$ below the average.

TORQUAY, CARY GREEN.—R 21 in. below the average. Mean temp. $0^{\circ} \cdot 4$ below the average. Duration of sunshine 177.1 hours, or 31.3 hours below the average. Mean amount of ozone 3.7.

POLAPIT, TAMAR.—Rather cold, and certainly unseasonable. Although the R was below the average it was generally damp, owing to the number of days on which small quantities fell.

OKEHAMPTON, OAKLANDS.—Wet on the whole, and colder than usual. Late harvest.

WELLINGTON, THE AVENUE.—One of the wettest and coolest Augusts for several years. The temp. only rose to 70° on eight days, and the sky was often cloudy when there was not R. Total about an inch above the normal.

NORTH CADBURY RECTORY.—By far the coolest, cloudiest, and most humid August in six years. The ground remained moist all the time. The last week was by far the best and warmest. Disastrous for hay, corn, and potatoes.

CLIFTON, PEMBROKE ROAD.—R nearly every day till 23rd, with low temp. and little sunshine. On 17th 25 in. of R fell in 15 minutes at 3 p.m.

ROSS, THE GRAIG.—Till the 29th, although unsettled and showery, there was less R than usual. A sudden change, however, brought on a great down-pour, extending over quite a limited area.

COVENTRY, PRIORY ROW.—Cool, rainy and sunless, and very bad for harvest operations. The latter part was especially depressing.

WALES AND THE ISLANDS.

HAVERFORDWEST.—One of the coolest Augusts on record. Much bright sunshine and moderate R. The appearance of the country was magnificent, and it was a most productive month. No TSS. Duration of sunshine 138.3 hours.

DOUGLAS, WOODVILLE.—The first three weeks showed no improvement on the previous three months. Temp. again low. The harsh N. winds, which prevailed without a break since the middle of July, continued to the 11th, and R was frequent till 22nd. From 12th to 15th was fine and warmer, and from 18th to 21st fine but cold. The last nine days were brilliantly fine and dry, with very cold nights.

SCOTLAND.

LILLIESLEAF, RIDDELL.—Remarkable for uniformity of pressure and temp. An excessive number of very heavy "silent" TSS, and one very noisy one on 27th, when 90 in. of R fell, nearly all between 3 and 4.30 p.m. Vegetation was most luxuriant, there was not a brown spot in the whole landscape. Crops heavy and good.

MULL, QUINISH.—The first half was generally very fine, the second wet and unsettled. A curious absence of strong winds.

COUPAR ANGUS.—R about normal, but excess of rainy days. Low temp. and cloudy days, and a harvest just beginning which should have been finished. Mean temp. $54^{\circ}4$.

DRUMNADROCHIT.—The wind, particularly in the early part, was cold and mostly N. and E. Green crops a full month behind, and badly laid. R $\cdot 46$ in. below the average of 16 years.

BETTYHILL.—Generally fine and dry, with an occasional shower.

WATTEN, H.R.S.—Cloudy and overcast, with some fine days, but often cold. Occasional slight frost.

S. RONALDSHAY, ROBBERRY.—Cold and changeable. Mean temp. $50^{\circ}5$, being $4^{\circ}1$ below the average, and the lowest in 12 years.

IRELAND.

CORK, WELLESLEY TERRACE.—R $\cdot 68$ in. less than the average. The coldest August for 20 years, the mean temp. being $3^{\circ}3$ below the average. No T or L.

DARRYNANE ABBEY.—Cold, with a few very fine days.

BROADFORD, HURDLESTOWN.—The driest August on record. Water was much wanted in many places, and many mountain streams were quite dry.

MILTOWN MALBAY.—Very fine, temp. not too high. The R, except on four days, was scarcely appreciable, none of it reaching the springs, which nearly all ran dry. The potato and oat crops were splendid.

DUBLIN, FITZWILLIAM SQUARE.—Changeable and cool, with a continued prevalence of polar winds. Mean temp. $58^{\circ}4$, or $1^{\circ}3$ in. below the average. High winds on four days, never reaching the force of a gale. Duration of sunshine 162.7 hours, or exactly the average.

OMAGH, EDENFEL.—With a bar. that fluctuated only $\cdot 5$ in. during the month, a R considerably below the average, temp. almost exactly the average, and wind largely from N. and E., one might suppose we could look back on a brilliant and summer-like month; but it was not so. Except on a few bright days, so persistent was the cloud, and so moist the atmosphere, that it was essentially dull and damp. Crops depending on sunshine were a failure, and much fear was expressed for cereals generally.

THE EIGHT MONTHS' RAINFALL OF 1902.

Aggregate Rainfall for January—August, 1902.

Stations.	Diff. from Aver.	Per cent. of Aver.	Stations.	Diff. from Aver.	Per cent. of Aver.	Station.	Diff. from Aver.	Per cent. of Aver.
	in.			in.			in.	
London	+1.10	108	Arnccliffe	-13.26	64	Aberdeen	+1.16	106
Tenterden	-3.12	81	Hull	-1.10	93	Cawdor	- .41	98
Hartley Wintney	- .02	100	Newcastle.....	-1.47	91	Strathconan ...	-3.90	88
Hitchin	+1.10	108	Seathwaite ..	-25.53	68	Glencarron	-7.09	87
Winslow	-2.62	82	Cardiff	-3.00	87	Dunrobin .....	...	...
Westley	+1.12	107	Haverfordwest	-2.90	88	Darrynane ...	-5.54	81
Brundall	+1.16	108	Gogerddan ...	-4.21	84	Waterford ...	-1.47	94
Blandford .....	...	...	Llandudno ...	- .99	94	Broadford ...	-2.97	86
Polapit Tamar ...	-2.51	88	Dumfries	-6.18	77	Carlow	- .80	96
Stroud	- .90	95	Lilliesleaf	-1.39	93	Dublin	+1.21	107
Woolstaston	+2.96	117	Colmonell	-2.75	89	Mullingar	-3.82	84
Worcester	+2.66	120	Glasgow	-4.24	81	Ballinasloe ...	-3.73	84
Boston	+3.01	124	Islay	-2.04	92	Clifden ..	-12.22	75
Hesley Hall	+1.19	109	Mull	-4.01	88	Crossmolina ...	-3.14	90
Derby	+1.56	111	Loch Leven ...	-5.13	77	Seaforde	+2.56	111
Manchester .....	...	...	Dundee	-2.54	85	Londonderry..	-2.82	89
Wetherby	-1.00	93	Braemar	-2.58	88	Omagh	+1.27	105

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1902.

STATIONS. (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	62·2	31	29·5	7	52·9	38·2	39·8	82	108·4	26·1	1·87	11	6·6
Malta.....	72·5	2	45·0	17	62·9	51·7	48·8	78	123·4	38·4	·76	8	4·1
Lagos, W. Africa .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape Town	98·9	20	51·7	1	80·2	62·1	58·7	66	...	...	·90	4	3·3
Durban, Natal	93·8	2	59·2	23	84·1	66·7	...	...	151·3	...	10·23	20	5·8
Mauritius.....	85·5	14	67·7	14	83·0	71·2	69·1	78	159·2	61·7	5·20	20	6·4
Calcutta.....	99·7	28	65·8	15	92·8	71·5	66·4	63	150·8	61·7	1·49	2	2·2
Bombay.....	92·2	25	71·3	1	88·2	75·7	72·6	74	133·5	63·5	·00	0	0·4
Madras	94·3	18	65·9	3	90·3	72·7	71·8	76	147·9	62·2	·00	0	1·6
Kodaikanal	75·2	23	45·3	6	68·3	50·9	42·3	55	143·8	32·1	3·43	13	3·0
Colombo, Ceylon.....	93·4	5	72·2	6	90·7	75·0	73·0	77	153·3	69·0	6·85	12	3·8
Hongkong.....	79·5	17	53·7	5	72·9	64·5	62·4	81	134·9	...	·48	6	7·8
Melbourne.....	95·1	7	40·3	21	70·9	53·5	50·3	68	150·1	29·0	5·44	9	5·5
Adelaide	97·8	1	46·7	30	78·2	55·7	48·5	53	156·0	38·2	·99	5	2·7
Coolgardie	102·9	5	47·5	26	89·6	61·5	56·4	45	166·1	42·6	·00	0	2·6
Sydney	97·0	26	54·4	23	74·8	61·8	56·0	69	141·2	45·1	2·38	17	5·2
Wellington	77·0	4	43·0	19	67·9	54·7	51·7	72	117·0	34·0	3·10	10	5·0
Auckland	79·5	1	53·0	15	70·3	58·8	53·3	67	143·0	50·0	3·34	10	4·5
Jamaica, Negril Point..	86·9	9	64·9	20	84·0	70·8	70·2	78	...	...	4·48	11	...
Trinidad	92·0	24a	64·0	10b	98·1	67·1	69·8	77	160·0	58·0	1·18	8	...
Grenada	88·4	28	71·4	3c	83·5	72·7	68·0	72	156·0	...	1·33	11	2·3
Toronto	57·0	23	13·0	19	44·6	30·2	30·7	75	81·2	5·5	2·53	14	6·3
Fredericton, N.B.	56·8	22	— 5·6	9	44·7	25·5	25·5	64	...	...	7·58	19	7·4
Winnipeg	53·5	12	— 22·5	17	35·6	16·9	...	...	...	...	2·88	9	7·3
Victoria, B.C.	59·0	31	30·2	15	48·1	38·8	...	...	...	...	2·27	19	7·1
Dawson, Yukon .....	...	...	...	...	...	...	...	...	...	...	...	...	...

a—and 25, 27. b—and 27. c—and 16, 17.

REMARKS.

MALTA.—Mean temp. of air 56°·3, or 0°·4 above the average. Mean hourly velocity of wind 13·4 miles, or 2·4 above the average. Mean temp. of sea 61°·0. J. F. DOBSON.

MAURITIUS.—Mean temp. of air 0°·9, dew point 1°·3, and rainfall 3·03 in. below their respective averages. Mean hourly velocity of wind 8·9 miles, or 0·9 miles below average; prevailing direction E. to E.S.E. T. F. CLAXTON.

MADRAS.—Mean temp. below normal for first week and above for rest of the month. Sunshine 234·2 hours, or 62·9 per cent. of possible. Evaporation 5·92 in. A. MOFFAT.

COLOMBO, CEYLON.—Mean temp. of air 82°·4, or 0°·5 above, and R 2·09 in. above, their respective averages. Mean hourly velocity of wind 4·9 miles; prevailing direction S.W. H. O. BARNARD.

HONGKONG.—Mean temp. 68°·1, or 5°·9 above average. Sunshine 79·3 hours. R 2·76 in., below average of 39 years. Mean hourly velocity of wind 12·5 miles; prevailing direction E. F. G. FIGG.

ADELAIDE.—Mean temp. 67°·0, or 3°·3 below average; coldest March (except 1885, 66°·0) in 45 years. Good rain over Central and South parts of State. C. TODD, F.R.S.

SYDNEY.—Mean temp. of air 0°·9 below, R 2·74 in. below, humidity 6·3 below, their respective averages. H. C. RUSSELL, F.R.S.

WELLINGTON.—Mean temp. 0°·8, and R ·44 in., below the average. R. B. GORE.