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## ITALIAN CLOUD ATLAS.\*

By L. C. W. BONACINA.

THE beauty of the clouds in regard to form, colour and grouping is of a high order, and has been extensively portrayed in writing, painting and photography. Until the last few years, however, our scientific knowledge of them was rather meagre, and this for the very good reason that we had practically no means of reaching the shifting masses of condensed or frozen vapour that form in the free air. The rapid development of aviation which the war stimulated has, however, resulted in the acquisition of valuable knowledge regarding the various kinds of cloud and the process of condensation; and in this connection I would particularly draw attention to the valuable flying observations of Lieut. C. K. M. Douglas, who has shown, for example, that the dazzling white summits of cumulonimbus or thunder clouds are not frozen but consist of super-cooled droplets until the false cirrus stage arrives when the whole mass turns bodily into snow. But apart from such purely scientific ends it is clear that the aeronaut has much practical concern with all that appertains to cloud formation. An airman might not, indeed, contemplate a massive thunder pile with the same dread with which the navigator would an iceberg; but he, nevertheless, finds it advisable to avoid formations of that character for not only are such clouds highly charged with electricity, but constituting the visible heads of powerful ascending currents they indicate the seat of violent turbulence with sudden changes of wind velocity. Modern engineering, in fact, has imparted an enhanced realism to the region of the clouds with the inevitable result that every new work on clouds, as on meteorology is general, is sure to attract more

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\*R. Ufficio, Centrale di Meteorologia e Geodinamica, Roma. Luigi Taffara. *Le Nubi. Parte I.: Testo. Parte II.: Atlante.* Rome, 1917. Size 10 x 14, pp. 67, pl. xxvi. *Illustrations in text.*

notice than was formerly the case. Hence it becomes an added pleasure to draw the attention of readers to the handsome cloud atlas which has been compiled by the Italian Meteorological Office. The reproductions from photographs in this collection are good, on the whole decidedly more impressive than those in the International Cloud Atlas (1910) or the Belgian Atlas (1907), upon which the Italian atlas, in regard to the system of cloud nomenclature used, is modelled. There is a good example of those exquisitely delicate fleecy flakes of upper cloud which we in England are accustomed to call Cirro-Cumulus rather than Alto-Cumulus, but is here designated Alto-Cumulus Granosus in accordance with the peculiar system of nomenclature adopted—an illustration, surely, of the folly of detailed cloud classification. Very striking, indeed, are two photographs of the lower cumuloform thunder clouds taken in Rome on July 31st, 1913, and named Cumulus Compositus. One may study the clouds as physical phenomena, on the one hand, which relegates them to the domain of pure meteorology; or as expressions of climate, on the other hand, which immediately connects them with geography. In the present atlas the climatic aspect of the subject is happily not overlooked inasmuch as the place and date of occurrence are given for each of the cloud specimens illustrated in the twenty-six plates, which refer mainly to Rome, Paris and Catania, in Sicily, but represent a few other places as well. The International Atlas, on the other hand, has the serious defect of affording no indication whatever of times and places, which means that as a *climatological* study and as a contribution to geography, whose distinctive function is to treat of what concerns *regions*, it is quite a failure. So inadequate, however, is the geographical representation in the Italian work that it would have been, climatically speaking, more consistent if the author had confined his collection solely to clouds seen in Italy, just as the Belgian atlas comprises only Belgian clouds, and as a cheap little atlas recently published by our own Meteorological Office exhibits only clouds observed at Aberdeen. In this connection I would observe that it would be a valuable contribution to climatology and meteorology alike were each country to bring out from time to time a pictorial selection of its own cloud occurrences. Although the several cloud types in their broad outlines are common to the whole world it is equally true that in their minor features the clouds are closely dependent upon geographical conditions, and it is accordingly a great pity that this most interesting question has received so little systematic study. There is a passage in Ruskin's "Modern Painters" (Vol. V., ch. 3) to the effect that "the true high cirri never cross a mountain in Europe" and that "the true cumulus is never seen in a great mountain region, at least in association with hills" being "always broken up and modified by them." If Ruskin's observation is substantially correct, and his generalization would certainly seem to have the support of

theory, in maintaining that the high mountains are unfavourable to the genesis of those compact storm ranges of infinite grandeur so often seen in the plains. I would particularly emphasize this : that it is a wise dispensation which accords to dwellers in the more monotonous plains occasional glimpses of accumulations of clouds which in their type-form are strongly suggestive of mountain systems.

I have often noticed when at the sea-side how decidedly the marine cumulus which tends to develop at night or in the early morning differs in complexion and texture from the more clear-cut hard-edged land cumulus which forms by day or late in the afternoon. Along the English coasts both kinds may in certain phases of summer weather be seen to perfection, the morning form out at sea and the evening variety inland. I think I may safely attribute this difference between the sea-born and the land-born varieties of cumulus to differences in the character of that convectional driving power which is the source of every true cumulus : for it must be remembered that while day convection over the land is associated with the effects of surface heating the somewhat less vigorous action at a lower general level of temperature which takes place by night over the sea is connected with the fact that out at sea the diurnal range of temperature in the higher atmospheric levels at about 4,000 feet is much greater than that in the air close to the surface of the water.

The text in the Italian work will be of great utility to those who may take up practical cloud observations though it may possibly strike some as too technical to be a suitable accompaniment to a series of pictures for whose publication the apology is evidently the artistic skill displayed ; it discusses cloud photography and nomenclature and describes various kinds of nephoscope for observing with precision the motion of clouds. Mention may be made of an apparatus devised by the compiler of the atlas which combines the function of photographic camera, theodolite, and nephoscope so that the height and motion of the cloud photographed can be obtained. The system of nomenclature which is that used in the Belgian atlas, though apparently appreciated in France, is little known in England, and in any case is much too detailed to be of real utility. It is thoroughly inexpedient to attempt to classify clouds closely or to go beyond the primary division into such fundamental forms as *Cirrus*, *Stratus*, and *Cumulus*, or such definite intermediate forms as *Cirro-Cumulus*, *Cirro-Stratus*, *Alto-Cumulus*, and *Alto-Stratus*. The International Meteorological Committee fixed upon ten typical names and it is not wise to adopt any more for fear of confusion. The clouds, indeed, are much better described than classified.

It might be added that there are no fine descriptive passages in the Italian text, and in the absence of anything in the nature of word-painting the clouds as objects of beauty are left to speak for themselves.

## Correspondence.

*To the Editor of Symons's Meteorological Magazine*

## UNUSUAL HAIL STORM.

ON June 12th, 1919, a startling hail storm was experienced six miles to the south from Branhholme. This storm passed north-west in a belt well within two miles in width. At Carlanrig Farm house, 757 feet above sea, at the head of the Teviot river, and situated in the centre of this belt, the hail storm appears to have been at its worst and not much trace of it can be got further south. It commenced about 3.30 p.m., and lasted violently for about five minutes. There was at the time a warm gusty wind from the south, and the hail came with considerable force. The stones were not all shaped alike; but mostly nearly round, of the size of marbles or pigeon's eggs, icy hard, and clear.

Though rounded they cut the stems of plants, and were painful to people. A man who was outside during most of the storm, and who was wearing a cloth cap, had bumps and swellings all over the surface of his head caused by the hail. Cattle got quite distracted, and could not be gathered together. In the farm house about fifty panes of glass were broken. Leaves and twigs were stripped off trees, and garden crops severely damaged.

At Teviothead, shortly after 2 p.m., there was hail for a few minutes, then a lull, and then the blinding shower after 3 p.m. This last covered the ground to the depth of three to four inches. The whole lasted about half an hour. The darkness at this time could almost "be felt." For three miles at least going north-west from Carlanrig, there is the same story of broken glass and damaged gardens. At Teviothead some of the hailstones seemed to have sharp pieces of ice protruding from the ball. A few taken at random and measured were found to be from two to three inches in circumference.

There are reports of hail falling to the north and westward, a dozen or so miles from Teviothead, but apparently ordinary showers not causing damage.

JOHN G. WINNING.

*Branholme, 19th June, 1919.*

THERE was very heavy rain in Ayrshire during a severe thunderstorm on June 12th, 1919. I am told 4 inches fell in twelve hours at Knockdon Farm, Maybole. Other places in the district had 2.50 and 3 inches. We had the same thunderstorm here but only 1.02 in. of rain in four and a half hours. It was the worst thunderstorm in this district since August 12th, 1885.

R. M. KER

*Boghall, Milngavie, Dunbartonshire, June 16th, 1919.*

A SEVERE thunderstorm was experienced in this district on Thursday, 12th June, with an exceptional rainfall. The rainfall recorded at Kerse Filters, Patna, was 3.48 in. for the 24 hours ending 9 a.m. of the 13th. Rain came on about 10 a.m. on the 12th, and my gauge showed the fall from then till 6.30 p.m. to be 3 inches.

7, Wellington Square, Ayr, 14th June, 1919.

WILLIAM GRAY.

### A RAINFALL CONTRAST.

AFTER an excessive rainfall from January to the end of March, we have had a three months' dry spell, which has been more severe than any in my records. Up till June 20th, the drought seems to have been more severe in south-east England, as Atlantic depressions prevented from advancing over England by high pressure over the North Sea, had given occasional slight rainfall to our western and northern coasts. On June 20th, a secondary to one of these gave copious rains to the south of England, about 1.25 in. being recorded in the London area. Our district was, however, too far north-west to be affected by it, only .22 in. falling. I have never known the ground so dry and the outlook for potatoes and root crops is serious. Hereford, Salop, Monmouth, Radnor and Worcester (or parts of the same) seem to have suffered most. Below is given the fall from January 1st to June 30th, compared with the average :—

	Rainfall.	Excess.			Rainfall.	Deficit.
	in.	in.			in.	in.
Jan. ..	3.84	1.36	....	April ..	1.40	.82
Feb. ..	4.25	1.45	....	May ..	.37	2.23
March ..	5.80	2.36	....	June ...	1.00	1.19
Total ..	13.89	5.17			2.77	4.24

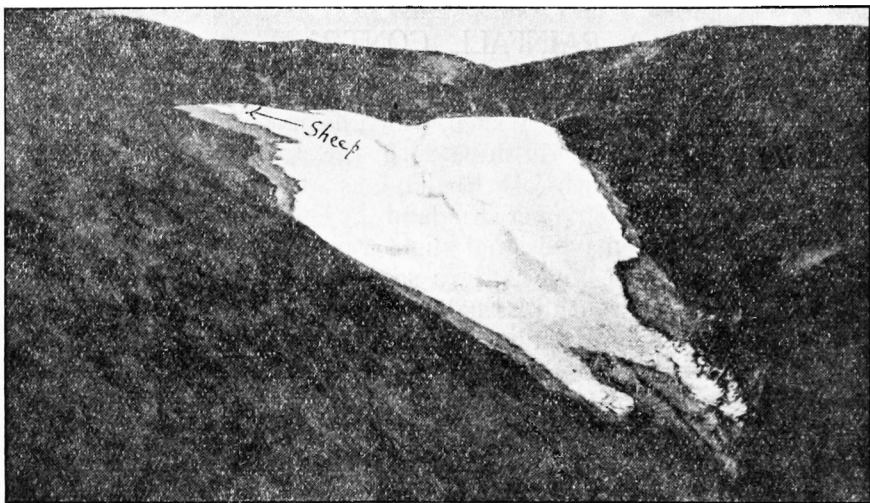
In the hot summer of 1911, April, May and June produced as much as 5.37 in., and in 1896, they produced the small total of 3.36 in. Throughout the last three months there has been no absolute drought, rain falling on 8 days in May, and on 12 in June. When the ground is bone dry and sun scorched, rain seems to have no encouragement to fall. I am speaking here only of cyclonic rain. If a drought is broken it seems to require a thunder-plump to do it, unless the air turns cold and cannot hold the moisture so well. On the several occasions on which minute quantities of rain fell in May and June with west-south-west winds, I am convinced that had the ground been thoroughly wet each of these occasions would have produced respectable downpours, the rain required to be met half way so to speak, but failing this, the dark clouds passed over and in a few hours the sun resumed his sway. This is an interesting question which I have never seen discussed, though I am fully persuaded that it is not a theory but an actual fact.

R. P. DANSEY.

Kentchurch Rectory, Hereford, July 1st, 1919.

## THE SNOWSPOT ON CARNEDD LLEWELYN.

I ENCLOSE a photograph taken on June 3rd by my son of the snow-spot on Carnedd Llewelyn described by me in *British Rainfall 1909* (see pp. 46-53). The length of the bed of snow was forty-five yards, and the greatest width, 10 yards. It was still visible from a distance on June 15th and appeared likely to last till the end of the month.



Considering the full sunshine which the snow actually faced for six weeks, it is a wonder that it lasted so long. The drifts above 2,500 feet on the Snowdonian range were, however, exceptionally large this year.

J. R. GETHIN-JONES.

*Bryn Awel, St. Mary's Road, Llandudno, June 21st, 1919.*

## METEOROLOGICAL NEWS AND NOTES.

MR. CARLE SALTER has been awarded the President's premium of the Institution of Water Engineers, for his paper on "The Relation of Rainfall to Configuration," read at the meeting on December 13th, 1918.

THE BRITISH SCIENTIFIC PRODUCTS EXHIBITION at the Central Hall, Westminster, illustrates the great part played by modern science in the prosecution of the war. Lectures on special aspects of the applications of Science to Industry are given at intervals, and a series of kinematograph films of scientific and technical interest is shown on other dates. The latter includes films illustrating, "The Water Powers of Canada and their Industrial Utilization."

MR. C. T. R. WILSON has been appointed Reader in Electrical Meteorology at Cambridge University.

## ROYAL METEOROLOGICAL SOCIETY.

A MEETING was held on June 18th, at 70, Victoria Street, S.W., Sir Napier Shaw, F.R.S., President, in the Chair.

A paper by Col. Sir Charles Close, K.B.E., F.R.S., entitled, "Note on the Rainfall at Southampton and London during a period of fifty-seven years (1862-1918)" was read. The form in which statistics are usually published does not readily lend itself to a clear appreciation of the existence of a simple seasonal period. If, after correcting for monthly inequalities, the accumulation of rainfall, reckoning from any fixed date, is tabulated and plotted, the rainfall assumes a more regular aspect. If further, from these monthly figures of accumulation, is deducted the average precipitation, the remaining figures approximate to a simple sine curve, with an annual period. The irregularities left over occur chiefly in September and October.

It would appear that at the places in question the rainfall can be considered to result from uniform precipitation throughout the year, modified by a simple annual harmonic term, further modified by small irregularities in September and October.

A discussion followed in which Mr. Carle Salter showed that an examination of average monthly values at many widely distributed stations exhibited a similar characteristic to that shown by Sir Charles Close. Mr. Giblett stated the results of a harmonic analysis of several records. Mr. J. E. Clark spoke of the effect of thunderstorms on average values for the summer months. Mr. H. E. Carter exhibited the results of hourly duration and amount of rainfall treated as Sir Charles Close had treated monthly values. Sir Napier Shaw spoke of the deviations of monthly values resulting from want of uniformity in the length of the months.

A "Note on Tornadoes," by Lieut. J. Logie, R.A.F., aimed at showing that no convection currents are capable of producing tornadoes of the intensity claimed for some of these storms. The author computed the difference of temperature between the air in the centre of the tornado and that outside. For a tornado having a pressure reduction of 50 millibars at the surface the mean temperature difference was found to be  $23^{\circ}\text{A}$  if the tornado extended to 5 kilometres (16,000 feet),  $10^{\circ}\text{A}$  if it extended to 10k., and  $5^{\circ}\text{A}$  if it extended to 15k. From the known values of the lapse-rate of saturated air it follows that under conditions of maximum instability a saturated ascending current not less than 8k. high might produce a tornado of this intensity. Since such instability rarely occurs, and in addition ascending currents of saturated air are usually everywhere penetrated by descending masses of cooler air, even a tornado of this intensity is unlikely to be so produced in natural conditions. It was suggested that the required rise of temperature may be due to lightning which is usually described as a characteristic of the funnel-cloud.

Lt.-Col. E. Gold quoted Mr. C. T. R. Wilson's results to refute the suggestion that lightning flashes are instrumental in causing the rise in temperature. Lieut. J. S. Turner, Mr. J. S. Dines, Mr. E. C. Barton and Sir Napier Shaw also contributed to the discussion.

A paper by Capt. D. Brunt, R.E., was entitled, "A Periodogram Analysis of the Greenwich Temperature Records." The monthly mean temperatures at Greenwich for the years 1841 to 1890 were represented by a Fourier Series up to 100 terms, to permit of the detection of any periods of length greater than one year. Periods of 9.5, 5 and 4 years, 23 months, and 20 months, were shown to exist, all having amplitudes of the order of  $0^{\circ} \cdot 5$  F. Many of the periods found were not continuous, *e.g.*, the 20-month period died away about 1894, being replaced by a period of about 23 months. The general result showed that periods in astronomical sense do not exist in these temperature records. The result of correcting the observations for the effect of the periods found produced an almost inappreciable diminution of the standard deviation of the observations, tending to show that variations of the monthly mean temperatures from year to year may be regarded as purely chance variations or as due to periods of length less than a year.

Mr. J. I. Craig, of the Egyptian Survey Dept., said he had found the existence of the nine-year and five-year periods in an investigation of the maximum annual height of the Nile during the past eight hundred years. Mr. C. E. P. Brooks, Mr. F. J. W. Whipple and Mr. W. W. Bryant also spoke.

Lt.-Col. E. Gold presented a summary of a paper by Lieut. E. Green, R.E., "on the Propagation of Sound in the Atmosphere." It contained a theoretical discussion in connection with experimental observations of the velocity of sound under normal atmospheric conditions as regards temperature and wind velocity. Numerical results were added for some interesting cases.

The following candidates were elected Fellows of the Society :—Mr. R. Brenard, Capt. J. Durward, R.E., Capt. C. Frobisher, R.A.F., Dr. W. Gordon, M.A., F.R.C.P., Major R. M. Ker, and Mr. T. Phillips.

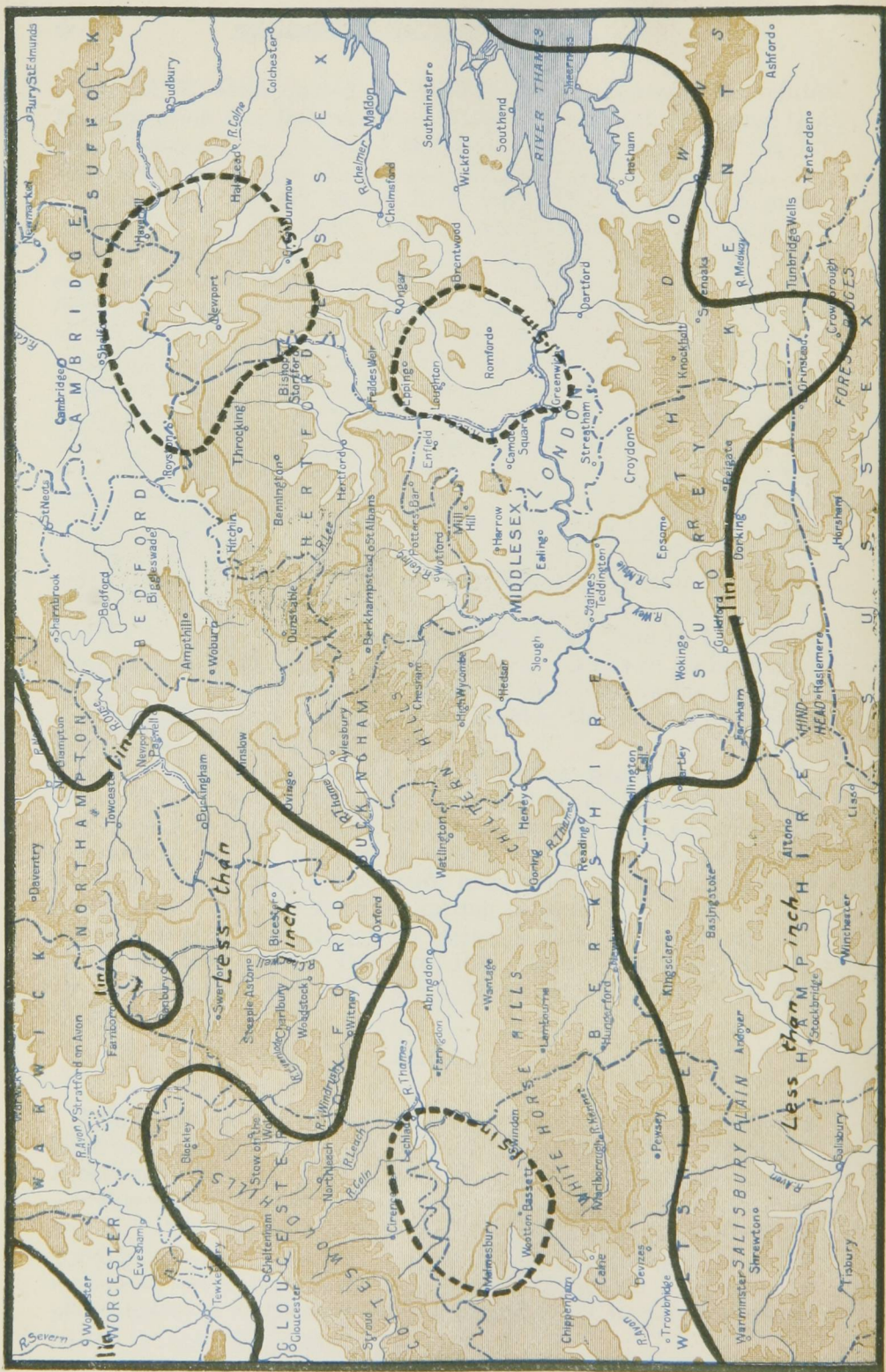
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A summer meeting of the Society was held on July 2nd, when a large company of Fellows and friends attended the Kew Observatory, Richmond. Mr. R. A. Watson-Watt, gave a demonstration of a portable wireless apparatus for use in the location of distant lightning flashes. Pilot balloon ascents were carried out from the Observatory grounds and Sir Napier Shaw exhibited two diagrams showing the motion of air in travelling depressions. A special exhibition of photographs of clouds and other meteorological phenomena added to the interest of the meeting.





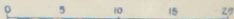
THAMES VALLEY RAINFALL, JUNE, 1919.



ALTITUDE SCALE

Below 250 feet	250 to 500 feet	500 to 1000 feet	Above 1000 feet
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SCALE OF MILES



## THE WEATHER OF JUNE.

UNTIL about the 18th, the type of pressure distribution over the major part of the United Kingdom was anti-cyclonic, and the weather was therefore mainly fair and very dry. One or two important exceptions were, however, observed. Thunderstorms occurred in many places on the 1st, and on the two succeeding days, when the prevailing winds were from N. or N.W., the weather was decidedly cool. Ground frost was observed in several districts on the night of the 2nd, the exposed thermometer falling to a minimum of  $24^{\circ}$  at Greenwich and Rhayader, and to  $25^{\circ}$  at Wisley. Next day shade maxima below  $60^{\circ}$  were recorded at a number of stations in the north and east of England; at Cromer and Norwich the thermometer did not rise much above  $50^{\circ}$ . Another marked exception to the general run of fair weather occurred on the 12th, when Ireland and the west of Scotland were visited by severe thunderstorms and extremely heavy falls of rain, amounting to between 2 and  $2\frac{1}{2}$  inches in many places. (*See* letters on pp. 64 and 65 ante). In Ireland and Scotland the thermometer never reached a high summer level, but over a large portion of England shade maxima of  $80^{\circ}$  and upwards were recorded on at least three occasions, viz.: about the 7th, the 11th and the 16th, the reading at Camden Square (in the Glaisher screen), on the 11th being as high as  $85^{\circ}$ . In the rear of a depression which passed eastward across Ireland and England between the 11th and 13th, a cold northerly wind sprang up, and on the last mentioned date the thermometer in many places failed to reach  $60^{\circ}$ ; while on the following night a slight ground frost was observed in isolated parts of England and Wales.

Between the 19th and 20th the development of a shallow depression over southern England was attended by copious and very welcome falls of rain in the Home counties; and for the remainder of the month when the prevailing winds were from between north and west the weather was cool, cloudy and rather changeable, though mostly dry. During the closing week there were at least two or three occasions upon which the thermometer over a large portion of the country failed to reach  $60^{\circ}$ . At some places on the 26th it did not touch  $55^{\circ}$ , and at night a sharp ground frost was again experienced locally, the exposed thermometer falling to  $24^{\circ}$  at Greenwich,  $26^{\circ}$  at Wisley, and  $28^{\circ}$  at Raunds and Tunbridge Wells.

In most of the western and northern districts the total duration of bright sunshine was below the average, but over the greater part of England, where the second week was extremely fine, there was a general, though not very large, excess.

The total rainfall was generally deficient over England but exceeded the average over a small area in Wales, the whole of the west of Scotland, and all but the southern counties of Ireland. Large areas in the south of England and the Midlands had a total fall under one inch, and practically the whole of England, excluding Wales and the Lake District, had less than 2 inches. A large area in Wales had more than 5 inches, and nearly 1 inch fell on Plinlimon. In Scotland the total ranged from about an inch in the extreme north-east to more than 10 inches west of the Caledonian Canal and nearly 20 inches at Loan. In Ireland, only a small area in Co. Cork had less than an inch, and 4 inches was exceeded at many inland and west coast stations. The general rainfall expressed as a percentage of the average was:—England and Wales, 62; Scotland, 139; Ireland, 105; British Isles, 96.

In London (Camden Square) the partial drought, which had lasted for seven weeks, broke up on the 19th and thereafter the weather was cool and showery. Duration of sunshine 214.3 hours, and of rainfall 27.3 hours. Evaporation 3.39 inches

## RAINFALL TABLE FOR JUNE, 1919.

		RAINFALL.						
STATION.	COUNTY.	Aver. 1875— 1909. in.	1919. in.	Diff. from Av. in.	Per cent. of Av.	Max. in 24 hours. in.	No. of Days	
Camden Square.....	London.....	2.28	1.51	— .77	66	.85	20	
Tenterden.....	Kent.....	2.03	.47	— 1.56	23	.39	20	
Arundel (Patching).....	Sussex.....	2.13	.79	— 1.34	37	.60	20	
Fordingbridge (Oaklands)...	Hampshire.....	1.93	.92	— 1.01	48	.36	20	
Oxford (Magdalen College).....	Oxfordshire.....	2.27	.89	— 1.38	39	.24	12	
Wellingborough (Swanspool).....	Northampton.....	2.14	.74	— 1.40	35	.29	21	
Bury St. Edmunds (Westley).....	Suffolk.....	2.21	1.26	— .95	57	.42	20	
Geldeston [Beccles].....	Norfolk.....	1.77	1.26	— .51	71	.44	20	
Polapit Tamar [Launceston].....	Devon.....	2.18	1.06	— 1.12	49	.35	24	
Rousdon [Lyme Regis].....	„.....	2.18	.68	— 1.50	31	.30	20	
Ross (Birchlea).....	Herefordshir.....	2.43	1.08	— 1.35	44	.43	12	
Church Stretton (Wolstaston).....	Shropshire.....	2.59	1.04	— 1.55	40	.47	13	
Boston.....	Lincoln.....	1.95	.91	— 1.04	47	.23	30	
Worksop (Hodsock Priory).....	Nottingham.....	2.06	.92	— 1.14	45	.20	21	
Mickleover Manor.....	Derbyshire.....	2.55	1.00	— 1.55	39	.36	12	
Congleton (Buglawton Vic.).....	Cheshire.....	2.69	2.36	— .33	88	.55	12	
Southport (Hesketh Park).....	Lancashire.....	2.26	1.35	— .91	60	.31	19	
Wetherby (Ribston Hall).....	York, W.R.....	2.17	.86	— 1.31	40	.20	24	
Hull (Pearson Park).....	„ E.R.....	2.09	.68	— 1.41	33	.15	30	
Newcastle (Town Moor).....	Northland.....	2.04	1.48	— .56	73	.42	22	
Borrowdale (Seathwaite).....	Cumberland.....	6.94	5.86	— 1.08	84	...	...	
Cardiff (Ely).....	Glamorgan.....	2.55	1.42	— 1.13	56	.67	12	
Haverfordwest.....	Pembroke.....	2.74	2.53	— .21	92	1.16	12	
Aberystwyth (Gogerddan).....	Cardigan.....	2.97	5.02	+ 2.05	169	2.95	12	
Llandudno.....	Carnarvon.....	1.97	1.52	— .45	77	.39	12	
Cargen [Dumfries].....	Kirkcudbrt.....	2.84	1.93	— .91	68	.52	19	
Marchmont House.....	Berwick.....	2.38	1.54	— .84	65	.28	3	
Girvan (Pinmore).....	Ayr.....	3.04	4.37	+ 1.33	144	2.45	13	
Glasgow (Queen's Park).....	Renfrew.....	2.41	3.48	+ 1.07	145	1.47	12	
Islay (Eallabus).....	Argyll.....	2.80	5.40	+ 2.60	193	.84	15	
Mull (Quinish).....	„.....	3.30	6.42	+ 3.12	194	1.15	7	
Loch Dhu.....	Perth.....	4.45	4.25	— .20	96	.80	16	
Dundee (Eastern Necropolis).....	Forfar.....	2.06	1.56	— .50	76	.26	24	
Braemar.....	Aberdeen.....	2.18	1.94	— .24	89	.50	29	
Aberdeen (Cranford).....	„.....	2.02	1.16	— .86	57	.18	29	
Gordon Castle.....	Moray.....	2.13	2.70	+ .57	127	...	...	
Drumnadrochit.....	Inverness.....	2.26	3.11	+ .85	138	.75	28	
Fort William.....	„.....	3.77	6.60	+ 2.83	175	1.27	15	
Loch Torridon (Bendamph).....	Ross.....	4.07	11.79	+ 7.72	290	1.72	15	
Dunrobin Castle.....	Sutherland.....	2.10	1.78	— .32	85	.33	10	
Glannire (Lota Lodge).....	Cork.....	2.91	.79	— 2.12	27	.19	10, 11	
Killarney (District Asylum).....	Kerry.....	2.92	1.38	— 1.54	47	.24	11	
Waterford (Brook Lodge).....	Waterford.....	2.79	1.82	— .97	65	.66	12	
Nenagh (Castle Lough).....	Tipperary.....	2.70	2.31	— .39	86	.59	11	
Ennistymon House.....	Clare.....	3.18	2.81	— .37	88	.69	11	
Gorey (Courtown House).....	Wexford.....	2.59	1.58	— 1.01	61	.78	12	
Abbey Leix (Blandsfort).....	Queen's Co.....	2.58	4.48	+ 1.90	173	2.08	12	
Dublin (Fitz William Square).....	Dublin.....	2.00	3.12	+ 1.12	156	1.81	12	
Mullingar (Belvedere).....	Westmeath.....	2.72	3.88	+ 1.16	143	2.18	12	
Crossmolina (Enniscoe).....	Mayo.....	3.17	4.95	+ 1.78	156	.82	15	
Cong (The Glebe).....	„.....	3.18	3.33	+ .15	105	.57	18	
Collooney (Markree Obsy.).....	Sligo.....	3.11	4.07	+ .96	131	.52	3	
Seaforde.....	Down.....	2.88	3.03	+ .15	105	1.48	12	
Ballymena (Harryville).....	Antrim.....	2.89	3.15	+ .26	109	.43	10, 12	
Omagh (Edenfel).....	Tyrone.....	2.82	3.70	+ .88	131	.57	11	

## SUPPLEMENTARY RAINFALL, JUNE, 1919.

Di v.	STATION.	Rain inches.	Div.	STATION.	Rain inches
II.	Sevenoaks, Speldhurst Close.	1·03	XI.	Lligwy .....	1·62
„	Ramsgate .....	·85	„	Douglas, Isle of Man .....	...
„	Hailsham .....	·48	XII.	Stoneykirk, Ardwell House...	3·00
„	Totland Bay, Aston House...	·98	„	Carsphairn, Shiel .....	7·04
„	Stockbridge, Ashley.. .....	·93	„	Langholm, Drove Road .....	2·43
„	Grayshott .....	·83	XIII.	Selkirk, The Hangingshaw..	1·53
„	Upton Nervet .....	·99	„	North Berwick Reservoir.....	1·87
III.	Harrow Weald, Hill House...	1·36	„	Edinburgh, Royal Observatory.	1·70
„	Pitsford, Sedgebrook.....	·64	XIV.	Biggar.....	2·36
„	Woburn, Milton Bryant.....	1·40	„	Maybole, Knockdon Farm ...	5·92
„	Chatteris, The Priory.....	1·15	XV.	Shiskine .....	3·80
IV.	Elsenham, Gaunts End .....	1·59	„	Ardgour House .....	10·92
„	Rayleigh .....	1·23	„	Oban.....	6·80
„	Colchester, Hill Ho., Lexden	1·15	„	Holy Loch, Ardnadam.....	5·96
„	Aylsham, Rippon Hall ....	1·51	„	Loch Venachar.....	3·20
„	Swaffham .....	1·48	XVI.	Glenquey .....	3·50
V.	Bishops Cannings .....	1·34	„	Loch Rannoch, Dall .....	2·32
„	Weymouth.....	·73	„	Blair Atholl .....	...
„	Ashburton, Druid House.....	·99	„	Coupar Angus .....	1·83
„	Cullompton .....	·89	„	Montrose, Sunnyside Asylum.	·91
„	Lynmouth, Rock House ..	1·36	XVII.	Balmoral .....	2·03
„	Okehampton, Oaklands.....	...	„	Fyvie Castle .....	2·65
„	Hartland Abbey.....	1·28	„	Keith Station ..	3·46
„	St. Austell, Trevarna .....	·98	XVIII.	Rothiemurchus .....	3·85
„	North Cadbury Rectory.....	1·41	„	Loch Quoich, Loan .....	19·80
VI.	Clifton, Stoke Bishop .....	1·46	„	Skye, Dunvegan .....	8·65
„	Ledbury, Underdown.....	·95	„	Fortrose.....	1·81
„	Shifnal, Hatton Grange.....	1·29	„	Glencarron Lodge .....	8·67
„	Droitwich.....	1·20	XIX.	Tongue Manse .....	3·56
„	Blockley, Upton Wold.....	1·18	„	Melvich .....	3·19
VII.	Grantham, Saltersford.....	·85	„	Loch More, Achfary .....	8·40
„	Louth, Westgate .....	·64	XX.	Dunmanway, The Rectory ..	1·01
„	Bawtry, Hesley Hall .....	·81	„	Mitchelstown Castle.....	1·28
„	Derby, Midland Railway.....	·77	„	Gearahameen .....	3·20
VIII.	Nantwich, Dorfold Hall ....	1·88	„	Darrynane Abbey.....	1·53
„	Bolton, Queen's Park .....	1·29	„	Clonmel, Bruce Villa .....	2·65
„	Lancaster, Strathspey .....	1·97	„	Roscrea, Timoney Park ...	3·97
IX.	Langsett Moor, Up. Midhope	·63	„	Broadford, Hurdlestown.....	2·81
„	West Witton .. .....	·85	XXI.	Enniscorthy, Ballyhyland...	2·96
„	Scarborough, Scalby .....	1·19	„	Rathnew, Clonmannon .....	1·14
„	Ingleby Greenhow .....	1·50	„	Hacketstown Rectory .....	2·83
„	Mickleton .....	·20?	„	Ballycumber, Moorock Lodge	3·37
X.	Bellingham, High Green Manor	1·70	„	Balbriggan, Ardgillan .....	2·55
„	Ilderton, Lilburn Cottage ...	1·06	„	Castle Forbes Gardens.....	2·62
„	Keswick, The Bank.....	3·22	XXII.	Ballynahinch Castle.....	5·47
„	Orton .....	2·44	„	Woodlawn .....	2·66
XI.	Llanfrehfa Grange .....	·89	„	Westport House .....	2·80
„	Treherbert, Tyn-y-waun .....	3·73	„	Dugort, Slievemore Hotel ...	6·51
„	Carmarthen, The Friary .....	2·45	XXIII.	Enniskillen, Portora.....	3·16
„	Fishguard, Goodwick Station.	2·72	„	Dartrey [Cootehill] .....	4·43
„	Crickhowell, Tal-y-maes.....	1·50	„	Warrenpoint, Manor House ..	2·67
„	Birmingham W.W., Tyrmynydd	3·32	„	Belfast, Cave Hill Road .....	2·36
„	Lake Vyrnwy .....	...	„	Glenarm Castle .....	2·94
„	Llangynhafal, Plas Drâw.....	3·69	„	Londonderry, Creggan Res...	3·81
„	Rhiwbryfdir .....	6·52	„	Milford Manse .....	3·66
„	Dolgelly, Bryntirion.....	5·37	„	Killybegs .....	4·27

## Climatological Table for the British Empire, January, 1919.

STATIONS.	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.										
<i>(Those in italics are South of the Equator.)</i>														
	°		°		°	°	°	0-100	°	°	inches			
London, Camden Square	54·3	15	25·1	23	42·6	33·1	35·5	91	74·0	21·1	3·22	22	7·8	
Malta ... ..	64·4	2, 3	40·0	21	59·3	50·9	...	90	112·0	41·0	3·59	18	7·5	
Lagos ... ..	97·0	3	73·0	1	82·8	73·4	74·6	77	147·2	73·0	·12	3	7·3	
Cape Town ... ..	87·1	19	53·0	9	78·2	59·6	55·3	62	...	...	·98	7	3·4	
Johannesburg ... ..	84·5	15	50·9	19	76·6	57·4	57·2	80	...	52·8	4·78	17	6·0	
Mauritius ... ..	94·8	15	68·5	2	89·9	73·3	71·1	74	...	65·2	5·76	16	6·3	
Bloemfontein .. ..	92·8	12	51·3	29	87·3	59·6	56·4	57	..	...	2·87	10	3·7	
Calcutta... ..	83·4	12	49·4	17	78·2	58·9	58·6	72	...	38·5	·58	1	4·6	
Madras ... ..	87·4	30	64·5	2	85·3	72·1	70·0	78	155·6	61·2	·37	1	3·6	
Colombo, Ceylon ... ..	91·8	16	65·9	12	88·0	73·0	71·1	77	162·6	58·1	4·33	12	5·0	
Hongkong ... ..	78·4	10	46·8	3	65·4	58·6	...	81	...	...	·63	11	8·5	
Sydney ... ..	97·9	21	58·8	18	80·1	65·5	60·4	63	152·0	51·9	1·55	10	5·2	
Melbourne ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...	
Adelaide ... ..	106·3	5	51·6	25	85·7	60·4	51·5	44	167·0	41·3	·33	2	3·0	
Perth ... ..	98·0	25	54·6	28	81·2	61·5	58·4	65	159·6	49·0	·26	2	2·7	
Coolgardie ... ..	111·8	22	56·8	2*	95·1	63·0	49·2	31	170·2	56·0	·17	2	2·0	
Brisbane ... ..	94·6	26	63·6	12	86·6	69·5	64·8	66	158·1	58·9	·32	3	4·4	
Hobart, Tasmania .. ..	87·8	2	42·6	26	69·4	51·4	45·4	54	154·9	38·9	2·05	14	5·8	
Wellington ... ..	71·8	28	43·5	12	65·2	55·4	52·0	74	143·0	32·1	3·74	10	7·1	
Jamaica, Kingston .. ..	88·9	20	65·3	5	85·7	69·4	67·6	78	...	...	2·17	8	3·8	
Grenade ... ..	85·0	Sev.	70·0	Sev.	83·0	72·0	...	73	137·0	...	2·81	17	2·5	
Toronto ... ..	46·9	22	0·5	10	36·6	21·9	22·4	81	115·6	—4·8	1·04	13	6·8	
Fredericton ... ..	41·0	22	—16·0	28	30·7	12·3	14·3	76	48·0	...	1·75	8	...	
St. John, N.B. ... ..	46·3	2	—12·5	12	30·6	14·7	17·0	79	114·2	—13·0	5·61	16	6·7	
Victoria, B.C. ... ..	52·0	13	33·0	30	45·0	37·6	39·0	89	99·0	23·0	5·81	16	7·8	

\*6 and 25.

Johannesburg.—Bright sunshine 252·0 hours.

COLOMBO, CEYLON.—Mean temp. 80°·5, or 1°·6 above, dew point 1°·5 above, and R 1·04 in. above, averages. Mean hourly velocity of wind 4·2 miles. TSS on 5 days. Storm on 31st with 1·70 in. of R.

HONGKONG.—Mean temp. 61°·5. Bright sunshine 81·8 hours. Mean hourly velocity of wind 13·8 miles.

Sydney.—R below average. Very severe T and H storm on 19th.

Adelaide.—Mean temp. 1°·0 below, and R ·39 in. below, averages.

Perth.—R ·08 in. below average.

Coolgardie.—Temp. 1°·7 above, and R about ·30 in. below, averages.

Brisbane.—Temp. slightly above, and R below, averages for 12th successive month.

Wellington.—Mean temp. same as average, and R ·45 in. above average. Bright sunshine, 179·5 hours. Weather unsettled, with strong N.W. winds.