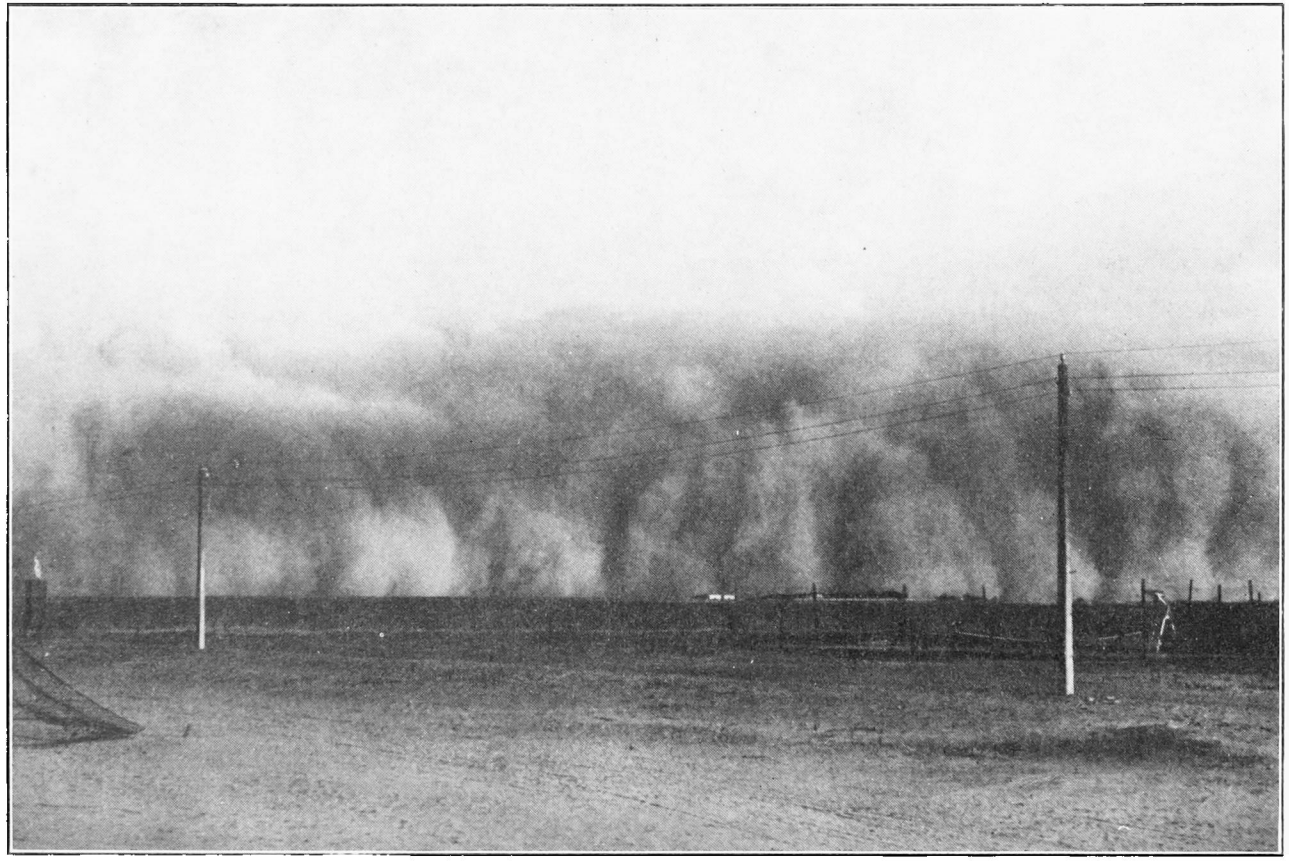

Haboob at Khartoum, June 7th, 1932 (see p. 262).

facing p. 249.

M.O. 347.

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The British Polar Expedition to Fort Rae

During the first International Polar Year in 1882-3 a combined British and Canadian expedition under Captain Dawson occupied Fort Rae on the shore of the Great Slave Lake in 63°N. In spite of its comparatively low latitude, this station was of great importance, especially for observations of terrestrial magnetism and aurora, because it lies very near the zone of maximum frequency of aurora which surrounds the magnetic pole. When the second International Polar Year was planned for 1932-3, one of the important aims was the determination of the change of the magnetic elements during the interval of fifty years, and for this purpose it was necessary to occupy as many as possible of the earlier stations. The re-occupation of Fort Rae fell to the British share, while other stations in the extensive sub-polar regions of North America were the objectives of Canada and the United States.

The British Expedition consists of a party of six, Mr. J. M. Stagg (leader), Mr. W. R. Morgans, Mr. P. A. Sheppard, Mr. A. Stephenson, Mr. W. A. Grinsted and Mr. J. L. Kennedy. Although the Polar Year did not officially start until August 1st, the party left England in May in order to have as long a time as possible for the construction of special huts, the erection of the instruments and generally to get the station into working order. They reached the settlement on June 19th, at the beginning of the short northern summer, accompanied by about

(100726) 107/27 1,050 12/32 M. & S. *Gp.303*

600 cases of instruments and food, all of which had been specially packed because of the cost and difficulty of transport. Mr. Stagg writes: "Our recollection of the bustle of the early days at Rae is full of packing cases, curious Indian onlookers and swarms of hard-sucking mosquitoes, which, taking advantage of our occupation along other lines, had ample opportunity to feast on the fresh English blood they seem to relish so much.

"The first big jobs were the preparing of huts for instrumental gear. By earlier arrangements with the Hudson Bay Company and the Royal Canadian Mounted Police, of which there is a detachment here, we were spared the trouble of erecting dwelling-house and sleeping quarters. But other disused Indian shacks had to be converted and reconditioned. One, to house the photographically recording magnetic instruments, was made non-magnetic, light-proof and heat-insulated by building a double-walled chamber with wood-wool from our packing cases in the interspace and then fitted with a double door and piled up with turf and muskeg outside. Another old log hut was dismantled and transplanted from one end of the settlement to the other for manufacturing hydrogen in and filling our pilot and meteorograph balloons, while a third to house the engine generator and storage battery for the continuous lighting of the photographic recording instruments was largely reconditioned. A special completely non-magnetic hut for the absolute magnetic observations was built. Fortunately we found, ready made, a substantial log hut we could use for the main meteorological observatory and office.

"By the beginning of July many of the meteorological instruments were erected and observations begun, but it was nearer the beginning of August before the magnetograph chamber was satisfactorily complete and all the three independent sets of magnetic recorders properly settled down. By August 1st every instrument was functioning, and the complete routine of observations every three hours throughout the day was instituted. Already, in July, aurora had been noticed on several evenings and all during August there was a display every evening. Rae must be near, if not actually inside, the zone of maximum auroral frequency.

"From our early days here, the Indians have been amused spectators of our activities. The balloons we send off daily specially interest them. They feel sure that the unusually long rainless period we had in August had some connexion with the ultimate purpose and fate of the balloons in the high atmosphere, and attribute to us a specialised form of super medicine-man technique. A thunderstorm with lightning flash to ground near the settlement, nearer than they cared to recollect they had ever seen one before, confirmed them in this belief."

The new station is not actually on the site of that of 1882-3,

but some 20 miles further up the lake in one of the largest Indian settlements in northern Canada. The old site was overgrown by bush, but the little island on which Captain Dawson erected his anemometer is still known by the natives as "White Man's Island." The old station has not been entirely abandoned, however, as the programme includes parallel magnetic observations at the old and new Forts to determine the secular change in the magnetic elements since the first Polar Year. Mr. Stagg adds: "We are taking advantage of the visits there to use the station as the other end of a base-line connecting the two Forts for simultaneous photography of aurora for height determinations. We had brought with us a light 'Silmalec' cable to be laid between the stations for use as a telephone line, but until the lake freezes in a few weeks we are using a couple of little wireless telephone transmitters which, though entailing a more elaborate technique in the auroral photography than the direct telephone line and less certain of maintaining communication during the disturbed periods when aurora appears, have already allowed us to get sets of parallactic photographs on two recent visits to the sub-station. These visits are made at this season by two members of the party in canoe and outboard motor, but when the lake is frozen dog-sledge will be our means of transport. We intend to occupy the Old Fort sub-station as frequently as possible throughout the auroral season.

"Working strictly in line with the recommendations of the International Polar Year Commission all our meteorological and associated work (such as atmospheric electrical observations) is done according to Zonal Mean Time, which for us is the time of the meridian 120°W., eight hours behind Greenwich; whereas the magnetic and auroral work, because of the more world-wide repercussions of activity in these fields, is carried on strictly according to Greenwich Time. The actual domestic time of the settlement is that of Canadian Mountain Time, seven hours behind Greenwich. Earlier in the season, when long daylight made day and night almost alike, the use of the three different times occasionally led to disconcerting results."

All the meteorological instruments are running in duplicate except a few, such as the main Dines anemometer. Even if the latter were to fail, two other anemometers are mounted and in auxiliary use, one of the swinging-plate type specially made by Mr. L. H. G. Dines, and the other a Robinson 4-cup indicating type. The duplication is usually such that one instrument produces a record on the scale recommended by the International Polar Year Commission, seven days on each chart; this is to facilitate reproduction. The other instrument is generally a daily, open scale and more sensitive type, serving as a subsidiary in case of accident to or failure of the standard, and also to

supply finer details than can usually be obtained from the weekly charts.

The party has found the Canadian people very helpful. During the journey out the Canadian National Railway Company " nursed " them right across the continent. Large supplies of tinned foods were presented by English and Canadian manufacturers, and all supplies were received safely. On the evening of August 1st a telegram was received conveying the good wishes of the National Polar Year Committee. At the time of the last despatch received from Mr. Stagg, dated September 18th, all the party were fit and working splendidly, looking forward to the experience of wintering in one of the world's reputed " cold poles."

Terrestrial Temperatures

By A. F. DUFTON and H. E. BECKETT,
Building Research Station, Garston, Herts.

In recent years, in the course of researches into the weathering of buildings, numerous observations have been made at this station of the surface temperatures of materials exposed to sunshine. The temperature in some instances has been found to exceed that indicated by a solar radiation thermometer (black bulb *in vacuo*), and it has been suggested that this phenomenon is likely to be of interest to meteorologists.

It is commonly thought that the temperature attained by a solar radiation thermometer is the maximum which can be recorded without concentration of the sun's rays, since the bulb of the thermometer is unable to lose heat by convection owing to the absence of air in the surrounding space. This idea, however, is fallacious. The temperature indicated by the thermometer is merely that at which the loss of heat by radiation to the surrounding glass globe (which is substantially at air temperature) is balanced by the energy received from the sun; in circumstances in which the loss of heat downwards is restricted, high temperatures may be attained by a material even when its upper surface loses heat by convection.

The surface of a specimen of bituminous roofing-felt laid horizontally on 1-inch boards with slag-wool underneath, for example, reached a temperature of 150°F. on a day when the air temperature rose to 69°F. and the black bulb to 133°F. On thin boards forming the roof of an ordinary wooden shed, bituminous felt has been found on a sunny day to reach a temperature identical with that of a black bulb *in vacuo*.

Within a well-insulated box, blackened internally and covered with a horizontal sheet of glass, temperatures as high as 250°F. have been frequently observed during warm sunny weather;

this is at least 100°F in excess of the corresponding temperature shown by a solar radiation thermometer. With this arrangement a blackened egg was successfully roasted.

Discussions at the Meteorological Office

The subjects for discussion for the next two meetings are:—

January 16th, 1933.—*The relationship of climatic and geological factors to the position of soil clay and the distribution of soil types.* By E. M. Crowther (London, Proc. R. Soc. B. 107, 1930, pp. 1-30), and *Analyses of agricultural yield, Part IV: Water-table movements on a farm in Egypt.* By W. L. Balls (London, Phil. Trans. R. Soc. B. 221, pp. 335-75). *Opener*—Dr. B. A. Keen.

Royal Meteorological Society

The opening meeting of this Society for the present session was held on Wednesday, November 16th, in the Society's Rooms at 49, Cromwell Road, South Kensington. Prof. S. Chapman, F.R.S., President, in the Chair.

The Buchan Prize of the Royal Meteorological Society for 1933 has been awarded to David Brunt, M.A., B.Sc., for papers contributed to the *Quarterly Journal* and *Memoirs* of the Society during the years 1927-31.

J. Edmund Clark, Ivan D. Margary, Richard Marshall and C. J. P. Cave.—The Phenological Report, 1931.

1931 was officially described as "wet and dull," the emphasis is on the latter; yet it was the tenth successive year with excess of rain, the total being that of eleven average years. A fresh table gives for each of the thirteen districts the number of weeks showing "decided" and "excessive" divergence from the average for temperature, rainfall and sunshine. Out of the 572 events thus possible for sunshine during the spring and summer months there were only five decidedly bright against 72 dull. December, 1930 and November, 1931 were alone much on the warm side; March and September cold. There were no records of "excessive" warmth in spring and summer, but twelve of "cold." Such short cold spells in spring threw the flower records back half a week, and although migrants reached our coasts to date their progress inland was belated. Figure 4, with its areas of earliness and lateness in flowering, shows only small and scattered cases of the former, covering but one-tenth of our islands. Nearly half lay in north-west Ireland, with four days early, whilst Dartmoor fell 20 days behind its natural lateness. Slugs and weeds, as might be expected, caused excep-

tional trouble. Figure 6A, showing the average advance of migrant arrivals for 16 years, adds to the value of the associated tables. Thanks to a second broadcast in March, 1931, the corps of observers slightly exceeded 600. More would be specially welcome in west Ireland and north Scotland. The tables are based on more than 17,000 records.

Sir Napier Shaw, F.R.S, and Com. L. G. Garbett, R.N.—A new sort of wind rose.

In ordinary meteorological practice for the representation of wind conditions for stations on land or selected areas at sea, figures or roses for the several months are set out on separate sheets. Consequently, anyone who wishes to visualise the sequence within a year has to take note of information on twelve separate pages. In this paper examples are given of diagrams in which the results for the twelve months of the year are combined without sacrificing the information for the separate months. With some slight varieties of type various rose diagrams are exhibited to represent the normal conditions of wind (1) for St. Mary's, Scilly, (2) for the southern part of the North Sea, (3) for two parts of the same zone of latitude in the region of the SE. Trade Wind of the Atlantic, (4) for beyond the Roaring Forties of the South Atlantic Ocean, and (5) for the region of the monsoon of the Arabian Sea. Included also are corresponding roses for the surface level, 1,000 metres and 2,000 metres above Colombo, Ceylon, to exhibit results obtained with pilot balloons.

G. S. P. Heywood.—Katabatic winds in a valley.

This paper describes an investigation of katabatic winds in a valley of the Cotswolds. A Dines pressure-tube anemometer was erected in the valley, with the vane 15 feet above the ground. The meteorological station at Leafield was situated 2½ miles away, and the records of the anemometer of that station were compared with those obtained in the valley. The speed of the katabatic flow was seldom greater than 1 m./s., when a katabatic flow was taking place, and the temperature records at Leafield showed an inversion on all those occasions. The conditions which lead to the cessation of the katabatic flow are discussed, and some observations of smoke drift show that katabatic flow may occur in a layer near the ground without influencing the anemometer at 15 feet.

Correspondence

To the Editor, *The Meteorological Magazine.*

The Colour of Moonlight

Dr. Simpson's letter in the November number of the *Meteorological Magazine* presents us with two distinct problems (1) why is blue commonly regarded as the colour of moonlight?

(2) assuming, with Mr. Bonacina, that the night sky is usually without colour, why should a blue coloration sometimes be observed in the night sky when there is a full or nearly full moon?

Physiological considerations in regard to colour vision no doubt enter into the first problem to some extent, but I think we may accept as a fact the statement that there is no physical reason why a blue coloration should ordinarily be associated with moonlight. That being so we can dismiss the moon itself from the problem and consider merely what is observed under conditions of faint daylight illumination. On the evening of November 23rd the sky was overcast, and in the company of an observer, Mr. B., who did not know what was afoot, I took up a position in a room where the faintly illuminated grey sky could be seen through a window. The electric light was switched on, and I asked Mr. B. to say what colour the sky appeared to be. The reply was " Air Force blue." I then switched out the light and he agreed, without hesitation, that the sky now appeared grey without a trace of blue coloration. Half an hour later the sky, which was still overcast, when viewed from the brightly illuminated street appeared to have the typical deep blue colour used by artists to depict the night sky. There was no doubt at all, however, that it was really grey.

The explanation of this illusion is very simple. Ordinary sources of artificial illumination are deficient in blue rays. Consequently we may describe faint daylight, or moonlight, as equivalent to artificial light plus blue. When you look at the sky through a window in an artificially illuminated room the common ingredients of the two illuminations are ignored and the excess of blue outside forces itself upon your attention, with the result that your mind creates, so to speak, a blue coloration that does not in fact exist. Blueness has thus become associated in our minds with nightfall and, therefore, with moonlight. If you get away from artificial lights and give your eyes a chance to see things as they are, the fact that the blueness is a pure optical illusion at once becomes manifest.

We are now faced with Mr. Bonacina's statement that the night sky is really blue in certain circumstances. Now it is well known that the blue of the sky in the daytime is due to the scattering of sunlight by small particles, and there is only one difficulty in explaining a blue sky at night in the same way. The difficulty is that our colour sense disappears at low illuminations, and what one wants to know is whether the scattered light from the sky under conditions of bright moonlight is above the threshold value for the perception of colour. I should, personally, have thought not. Mr. Bonacina made his observation in the " late evening." Was it not possible that the blue tint he observed was really due to the last vestiges of daylight? Has anyone ever observed anything of this kind at midnight?

E. G. BILHAM.

November 24th, 1932.

The Blue Colour of Moonlight

Dr. Simpson asks in the November number of this magazine if anybody can say why moonlight appears bluish. Not that I even for a moment imagine that I could give a satisfactory explanation of that well-known fact—or is it an illusion?—But it has always seemed to me that even the strongest moonlight is totally insufficient to enable us to see the surrounding objects in their true colours, while quite strong enough on the other hand to be scattered and turned to a bluish tinge by small particles in the clear sky or in the remoter parts of the air above the landscape.

The result of this lack of intensity would seem to be that the landscape around us, not illuminated strongly enough to give us the impression of red, yellow, green and so on, is practically seen as a composition in black and white, viewed, however, through a very real bluish haze, and capped and dominated by a blue sky, the colour of which is real also and not an optical illusion. So much for the facts, which I would suggest can be explained by optical laws.

Now it further seems to me that in most cases the vividness of the phenomenon is exaggerated by illusion. We are all subject, I think, to the illusion that the intensest lights in our circle of vision—at least when not flagrantly red or green or violet—are white or so nearly so as to make no difference, and can be safely taken as a fixed base for judging other colours. For instance, at the moment I'm writing this at about 4 p.m. on a November afternoon, by the light of a really quite yellowish electric lamp; the sky, which is visible through my window, appears a vivid violet by contrast. Now even our whitest lights are yellowish in the extreme, and I expect that hardly anybody nowadays is ever looking at a moonlit landscape without having a few of our civilised lamps included in his range of vision. Even a distant pin-point of artificial " white " light produces the contrast necessary for the illusion. To find out how much of the bluishness is real, and how much optical illusion, we can resort to the very simple experiment of first looking up at the moon—to see what real white looks like—and immediately afterwards at the moonlit landscape.

We see then that an appreciable percentage of the blue tinge—that for which other factors can therefore be held responsible—has disappeared, but still the landscape looks bluish.

I think, therefore, that the cause of at least part of the blue colour can be no other than the fact that the intensity of light from the full moon never reaches a certain value, necessary for the human eye to distinguish such bright colours as tend to raise a landscape above the level of a monochrome.

J. C. M. KRUISINGA.

Vriezenveen, Overyssel, Holland. November 26th, 1932.

An Unusually Brilliant Lunar Halo

A lunar halo (22°) of extreme brilliance was observed on the morning of September 22nd, 1932, at 4h. 30m. G.M.T. When first seen the sky was half covered with well-defined cirrus and cirro-stratus, which moved fairly rapidly from south-west to north-east and gave rise to a perfect halo.

The planet, Venus, an already brilliant object in the sky to the south-east, later became affected by the veil of cloud and in turn, a tiny halo of diffused light became visible around it. The spectacle was, however, of short duration (20 minutes) owing to obliteration by dense cirro-cumulus in the transitional stage to alto-cumulus. With the passing of the alto-cumulus a lunar corona was visible at 4h. 55m. G.M.T. for a few minutes.

C. A. JUPP.

R.A.F. Station, Upper Heyford, Oxford. September 25th, 1932.

Duration of Lightning Flash

I do not know the record length of the existence of a lightning flash, but the accompanying enlargement of a portion of a ciné film may be interesting as giving evidence of a duration of approximately $\frac{5}{8}$ second.

During the night of August 12th while a violent thunderstorm was in progress at Netley Bridge, Inverness-shire, I thought it might be amusing to take a ciné picture, to see what would come out; for the flashes were so continuous that the landscape seemed to the naked eye to be almost always in view. Nothing of this came out on the film, but a single flash in front of the camera was recorded on five successive pictures. The first four of these are strong, the third being rather more prominent than the others, but the fifth is much fainter with a relatively strong representation of particular points on the flash. The preceding section of the film shows no trace of the flash. The reproduction is, of course, a negative.

My camera is an early form of the Pathé Baby ciné and runs at approximately 8 pictures a second. The black rectangles are, of course, the holes in the film by which it is drawn forward into position for each exposure. The film measures $7\frac{1}{2}$ mm. from centre to centre of successive rectangles.

M. M'CULLUM FAIRGRIEVE.

37, *Queens Crescent, Edinburgh. November 20th*, 1932.

The Weather of October, 1932

I am surprised to read in the *Meteorological Magazine* for November, 1932, under the heading "The Weather of October, 1932," that "on the 1st there was a gradual drop of temperature as northerly winds penetrated southwards," etc. This was

certainly not the case in the southern half of the country, as, generally speaking, temperature fell from 60°-65°F. to 30°-35°F. within 18 hours, and from 60° to 40° within 4 or 5 hours. Saturday, October 1st, was very warm forenooon with temperature above 60°, until the wind veered WNW. and NW. in the afternoon about 3 p.m., with heavy rain when the thermometer fell rapidly, being below 50° by 6 p.m. This is what occurred in the Isle of Wight, and I think it was general, at any rate in the southern half of the country. It was summer on Saturday, October 1st, up to 3 p.m., while by dawn the next morning, Sunday, October 2nd, there was rime on the grass, and winter! Can this be termed a "gradual" drop of temperature? I think not.

J. E. COWPER.

4*a*, *Moreton Terrace, S.W.*5. *November* 23*rd*, 1932.

[Mr. Cowper's criticism is valid for the south of England but not for the remainder of the British Isles, where the difference between the maximum on October 1st and the minimum during the following night was little more than the normal diurnal variation.—ED., *M.M.*]

The Vivid Meteor of September 26th, 1932

It may be of interest to state that the vivid meteor seen at Eskdalemuir at 18h. 31m. G.M.T. on September 26th and described in the October number of the *Meteorological Magazine*, was also seen at Aberdeen. Unfortunately the exact time of the observation cannot be given, but it was somewhere about 18h. 25m. G.M.T.

When first seen the meteor was between south-south-east and south, at an elevation of about 8°, and appeared to be moving towards the south-south-west, dropping quickly in elevation till it disappeared behind the roofs of a line of buildings after having been observed for about two seconds. The meteor, even in the daylight then existing, appeared to be at least four times as bright as Venus at the latter's maximum brilliancy, and was of a white or pale bluish-white colour. No definite tail was observed; the meteor appeared like a very bright star, but this brightness, coupled with the fact that the meteor was receding along the line of sight, may have sufficed to foreshorten and render invisible any tail which may have been present.

G. A. CLARKE.

Aberdeen Observatory. October 31*st*, 1932.

The Humours of Inspection

I thought the following were so good that they really ought to find a place in the *Meteorological Magazine*:—

An inspector of meteorological stations in a British Colony, during his inspection of a station, asked the administrative officer about the observations of temperature. "Oh," said the

administrative officer (with an Oxford accent) very definitely, "I can vouch for those; I always take them myself and never leave them to the native observer. If it is wet I get him to bring the thermometers in for me to read them!"

During the same tour of inspection, the inspector came to a rainfall station in charge of an equally responsible official, who informed him that the measuring glass of the rain-gauge was broken. "Why," said the inspector, "did you not report it and get a new one?" "Oh," said the officer, "I thought it was not necessary; I copied the scale of the glass and put it on the side of a wine bottle and used that."

E. GOLD.

December 6th, 1932.

Mirage off Newfoundland

I witnessed a remarkable and rather amusing sight whilst on the coast of Labrador this summer.

I was on meteorological work in connexion with the air mail service for the Imperial Conference at Ottawa. The air mail had to be transferred from the *Empress of Britain* in the Straits of Belle Isle to the aircraft, which flew it to Ottawa. At 8h. on August 17th, this procedure was in progress, and although it was perfectly clear and sunny where I stood on the shore, there was an extensive layer of fog at the scene of operations, about three miles out, and only the smoke of the *Empress* was visible above the layer. After watching for several minutes I was startled to see the *Empress* above the fog completely upside down with her hull pointing skywards and her masts apparently resting on the layer of fog. The illusion lasted for about one minute and was perfectly clear in every detail when it finally disappeared and the ship came out of the fog in its normal position.

On a previous occasion I saw three mountains on the Newfoundland coast, fifteen miles distant; their summits appeared to be resting on the water while the bases were pointing skywards.

JOHN R. SHERWOOD.

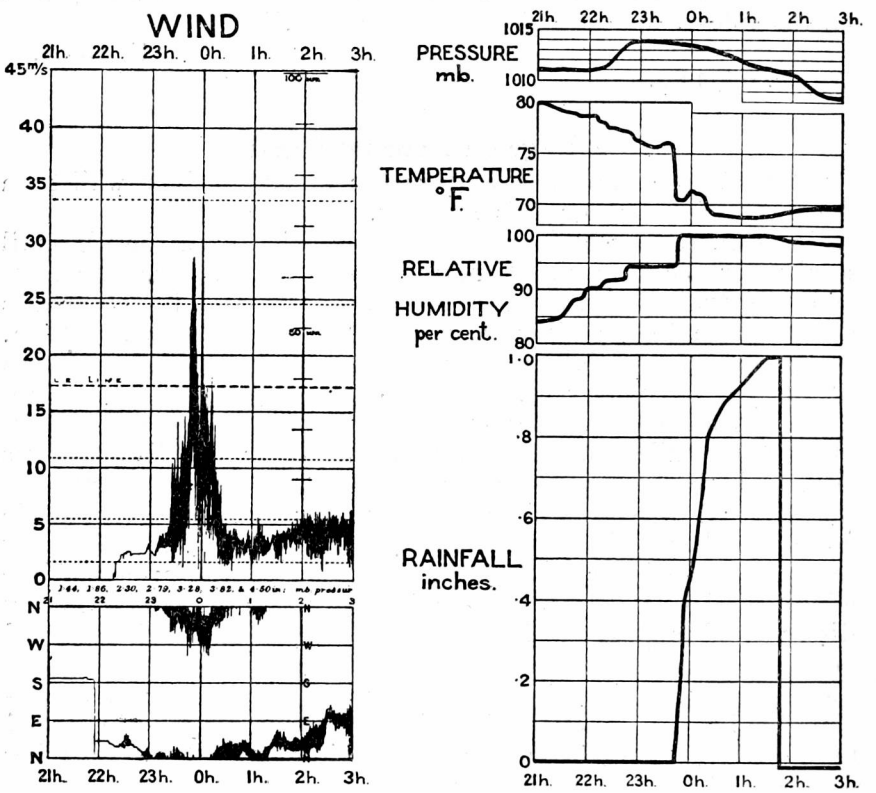
Royal Canadian Air Force, Camp Borden, Ontario, Canada.
November 10th, 1232.

NOTES AND QUERIES

Autographic Records of a "Sumatra" Squall

Mr. V. A. Lowinger, Surveyor-General, Malaya, recently forwarded to the Meteorological Office copies of interesting autographic records showing the passage of a "sumatra" squall. These records, which are believed to be the first of their kind received in this country, were taken at Bukit Jeram, on the west coast of Malaya, one of several first-order stations established in recent years by the Malayan Meteorological Service.

Mr. Lowinger remarks " This is the highest wind velocity recorded at any station in Malaya since we commenced installing the Dines anemometers in 1928. The records are also of interest in showing the typical features of a ' sumatra '—note the distinct rise in pressure immediately before the passage of the squall. The fall in temperature, commencement of rain, rise in humidity, and highest wind velocity occur practically simultaneously." As may be seen from the portions of the records reproduced, the start of intense rainfall coincided with the



AUTOGRAPHIC RECORDS AT BUKIT JERAM, MALAYA, LAT. 3°15′N., LONG. 10 18′E., FROM 21h., JULY 15TH, TO 3h., JULY 16TH, 1932.

sudden rise of wind above the " gale line "; 0·7 in. of rain fell in the first half-hour, after which 0·3 in. fell in an hour and a half. The highest velocity shown during the squall was 64 m.p.h., but this figure may well have been exceeded slightly, as the earlier part of the record (not reproduced) suggests that the velocity pen was not marking well on the upward movements.

Amongst published descriptions of " sumatras " of the Malacca Strait it is stated* that " the whole change (of wind) . . . . happens simultaneously along a more or less straight line which

*Malayan Meteorological Service, Summary of Observations, 1931.

may be 200 miles or more in length." In this case the evening maximum and the succeeding early morning minimum on the barogram, instead of showing the usual smooth curve tend to a "V" shape, which, however, is little evident on the figure—where the time-scale of the barogram has been expanded to fit that of the anemogram; but there is no sign of the *crochet de grain* associated with a line sqall in the latitude of the British Isles. It seems more probable that the "sumatra" is of the same type as the West African "tornado." The "sumatra" appears to die away within about 30 miles of the coast; of a number of storms recorded at Pintu Gedong, Port Swettenham, which lies about 20 miles south of Bukit Jeram, it is stated* that 60 per cent have disappeared or lost all force by the time they arrive in Kuala Lumpur, 28 miles away. "The Malacca Strait Pilot"† describes "sumatras or squalls from the south-west" and a less frequent phenomenon, "north-westers"; whether there is any essential difference between the two phenomena seems doubtful, but a decision on this as on many other doubtful points in the annals of "local winds" can be reached only with the aid of a series of autographic records.

It is to be hoped that in due course the Malayan Meteorological Service will be able to give an investigation on modern lines of the "sumatra."

S. T. A. MIRRLEES.

Rain Spells and Wet Spells at Newquay

Dr. C. C. Vigurs, Meteorologist to the Newquay Urban District Council, has forwarded some statistics as to the frequency of rain spells‡ and wet spells§ at Newquay. These statistics are available for the 39 years 1893 to 1931 and are summarised below:—

	No. of spells	Mean duration		Longest spell		No. of years with		
		Days	Mean rain per day	Days	Mean rain per day	None	1 or 2	3 or 4
			in.		in.			
Rain spells	63	20·2	0·21	35	0·17	5	26	8
Wet spells	13	18·8	0·28	24	0·15	28	11	0

Both the number of rain spells and wet spells are appreciably greater than those experienced at Camden Square (London), where during a similar period there were only 5 rain spells

*London, *Q.J.R. Meteor. Soc.*, XLIX, 1923, p. 237.

†London, Admiralty Hydrographic Dept., 1924.

‡A rain spell is a period of at least 15 consecutive days to each of which is credited ·01 inch of rain or more.

§A wet spell is a period of at least 15 consecutive days to each of which is credited ·04 inch of rain or more.

and no wet spells, the mean duration of the rain spells being 17 days.

The number of days with rain increases steadily from the south-east to the west and north of the British Isles, owing to the greater number of depressions and secondaries affecting north-western districts. Thus the average number of rain days for the period 1881 to 1915 was 163 at Camden Square and 252 at Enniscoe House, near Crossmolina in the north-west of Ireland. At Newquay the average number of rain days was 198 (rainfall 33.22in.). The corresponding values for rain spells for the two stations during the same period are set out below :—

	No. of rain spells	Mean duration		Longest spell		No. of years with			
		Days	Mean rain per day	Days	Mean rain per day	None	1 & 2	3 & 4	5 or more
			in.		in.				
Camden Square (London)	4	15·5	0·16	16	0.22	31	4	0	0
Crossmolina (Enniscoe)	153	24	0·25	62	0.27	0	4	13	18

There were 81 wet spells at Crossmolina (Enniscoe) during the period 1881-1915, and none at Camden Square.

These statistics demonstrate that while the number of days with rain is greater at Newquay than at London, it is appreciably less than at stations in the north-west of the British Isles.

Of the 63 rain spells, recorded during the 39 years at Newquay, only 8 occurred during the seven months March to September. Such rain spells as occurred were confined almost entirely to the four months January, February, October and December.

J. GLASSPOOLE.

Haboob at Khartoum

The photograph forming the frontispiece of this number is one of several sent by Mr. R. H. Matthews and taken at Khartoum by Sergt.-Major Hayward, who writes :—

" A haboob occurred here on June 7th, while we were having our afternoon's siesta. Word went round that there was a haboob coming, so we all went out to see it. We could look out over the Blue for a distance of about twenty miles, and could see what looked like small pillars of sand. I mounted on the roof with a camera and waited. I suppose it took about thirty minutes to arrive, and just before it burst over us I want you to imagine brilliant sunshine with a towering wall of miles of

sand. I took the pictures and ran for shelter, and had just reached the bunk and shut doors when instead of sunshine came impenetrable blackness, wind roaring outside, and heaps of sand coming in everywhere. This lasted for about three-quarters of an hour, and then sunshine again. The camp looked terrible, with sand everywhere and in everything."

The photograph selected for illustration shows clearly the " buttressed " character of the sand wall. These buttresses are caused by whirling columns of air preceding the advance of the main wall and merging into it.

Wind Velocity in a Tornado

The *Bulletin of the American Meteorological Society* for August and September contains some calculations by Mr. J. D. Marshall, Consulting Engineer, of wind velocities during a tornado at Washington, Kansas, on July 4th, 1932, from the pressure required to cause certain types of damage. A railroad switch signal was bent over by the wind, the estimated velocity being 210 m.p.h. A railroad crossing warning sign was blown down flat, the estimated wind velocity being 128 m.p.h. The most reliable estimate, however, was obtained from the blowing down of a steel standpipe for water storage, requiring an estimated velocity of 145 m.p.h. The tornado was well developed, causing a large amount of damage. On previous occasions velocities have been estimated as high as 400 m.p.h., but probably on insufficient evidence.

A Lunar Rainbow

Mr. Kidson, Director of the New Zealand Meteorological Service, has sent the following extract from the *Southland Times* of August 24th, 1932 :—

" The unusual spectacle of a lunar rainbow was observed by two women residents of Otahuhu shortly after five o'clock on Wednesday morning, states the *New Zealand Herald*. Rainbows formed by moonlight are usually very faint and the colours are generally difficult to distinguish. However, it was stated by one of the observers that the lunar rainbow was almost as clear as those seen in daylight, and the reflection of the bow in the Tamaki river was most impressive."

Bibliography of Actinometry

In any scientific research one of the first essentials is a summary of the previous literature on the subject, but scientific papers are so scattered, and many of them are so long and difficult, that this preliminary is often a research in itself. Most specialists prepare and keep up to date their own collections of abstracts, and some valuable compilations prepared in this way have been published from time to time in book form. The International Actinometric Laboratory of Trappes has made a

further step, and includes in its programme of work the formation and publication of an annotated bibliography of actinometry which will be added to year by year.

The enterprise owes its inception to M. Volochine, and proposes first the issue of abstracts of recent papers, to be followed by those published during the past 30 years, to a total of about 2,000. When the retrospective bibliography is completed, the normal issue will consist of 300 to 400 sheets a year. The cost will depend on the number of subscribers, but thanks to the facilities of reproduction offered by the National Meteorological Office of France, it will be small.

We have now received the first three instalments totalling 203 sheets, mainly dealing with papers by C. G. Abbot, C. E. Brazier and L. Gorczynski. Each abstract is on a separate sheet, headed by the author's name, to facilitate filing. They form an excellent commencement, and the issue of further series will be awaited by meteorologists with interest.

Reviews

India Meteorological Department, Scientific Notes. Vol. iv, No. 39. *A Study of the Structure of the Bay Storm of November*, 1926, by Sobhag Mal, M.Sc., and B. N. Desai, M.Sc., B.A.

The Bay of Bengal storm of November, 1926, took an unusual track, moving in a north-easterly direction instead of the usual north-westerly one, and in this paper the authors have investigated the cause of its unusual movement and also if its structure resembled the structure of the depressions of middle latitudes. From the synoptic charts of the period 19th to 26th, observations from ships' logs, upper wind observations from Port Blair, and rainfall, temperature and humidity observations at various stations, a front analysis has been made from the initial stages of the storm up to its dissipation. A series of 17 charts is reproduced in the paper giving the position of the fronts at various stages of the storm.

The disturbance in its early history seems to have formed by the protusion of a tongue of warm moist southerly or south-easterly air into a relatively cold current from east and north-east, thus forming a warm sector. Until the disturbance developed into storm proportions, its movement was more or less the same as that of the air in the warm sector. The disturbance appears to have intensified into a storm after the development of a back-bent occlusion acting as a second cold front, and the storm then moved in a north-easterly direction, *i.e.*, in the direction of the south-westerly winds in the sector between its first and second cold fronts. Indirect evidence is produced that the second cold front had a considerably greater temperature and wind contrast at its boundary than did the first one, and the intensification of the disturbance after the appearance of

the second cold front seems to have been due to the artificial enlargement of the warm sector in the manner pointed out by Bjerknes and Solberg for some depressions of middle latitude. When the south-westerly current was cut off by the north-westerly current behind the second cold front the storm weakened rapidly and dispersed. Surface air trajectories for the Bay are reproduced in the paper and confirm in a convincing way the existence of three different sectors in the storm, the air masses in each having different properties owing to their different origin. The characteristics of the three different sectors and the surfaces of discontinuity of the storm are summarised by the authors and compared with the corresponding features of the depressions of middle latitudes.

The authors are to be congratulated on the way in which they have made full use of the somewhat meagre data at their disposal and carried out a very interesting and, on the whole, convincing analysis of the structure of this storm of low latitudes.

W. C. KAYE.

India Meteorological Department. Scientific Notes. Vol. I, No. 9. *Comparison of temperatures in Stevenson screens at heights of 6ft., 4ft. and 2ft.* By K. R. Ramanathan, M.A., D.Sc., and Vol. II, No. 11. *Comparative observations of temperature inside white painted, unpainted and black painted Stevenson screens.* By Barkat Ali, M.Sc.

In the first paper, an analysis is made of a year's observations of temperature and humidity at about 8.30 a.m., and of maximum and minimum temperatures in Stevenson screens at Agra. Screens were mounted with bases at heights of 6ft., 4ft. and 2ft. above the ground. It appears that of the elements considered, minimum temperatures are most affected by deviations from the standard height, and to keep the errors small, the deviation of the height of the base of the screen above ground from the standard of 4ft. should not exceed 4in. In the second paper, a comparison is made of temperature inside white painted, unpainted and black painted Stevenson screens. The conclusion reached is that so long as screens are not painted a dark colour, the type of paint used is immaterial, and apparently lack of regular re-painting is not likely to have any appreciable effect on the records of temperature.

S. T. A. MIRRLEES.

Obituary

Mr. Thomas Duncan Bell.—We regret to announce the death on November 24th of Mr. T. Duncan Bell, at the age of 78. Mr. Bell

was born on June 14th, 1854, and educated at Lewisham Congregational School. He joined the staff of the Meteorological Office in November, 1869, as a temporary clerk; at first he was attached to the Observatory Branch, but he was soon transferred to the General Office or Correspondence Department under Mr. J. S. Harding, the chief clerk. At this time the library formed part of that department, and this became Mr. Bell's special charge. Among other innovations he replaced the cumbersome ledgers by a card catalogue under authors, and later instituted a subject card catalogue, employing the classification published by the Royal Society in the International Catalogue of Scientific Literature. He also took a large share in the preparation of the 14 volumes on meteorology in the International Catalogue from the beginning in 1899, both in collecting the material published in the British Isles and in co-ordinating the data from abroad. In 1906 he was promoted to principal assistant in the Statistics and Library Branch, and to his work on the library was added the task of dealing with inquiries of all kinds, both personal and by letter, under the supervision of the Superintendent of Statistics. It was at this stage of his career that he was first known to me, and the impression of his work which I received was of efficiency without fuss. This was nowhere better displayed than in his handling of legal inquiries; a difficult and responsible duty in which he earned general approbation. In April, 1914, he succeeded Mr. J. A. Curtis as chief clerk, a position which he held throughout the difficult period of the War until his retirement on March 31st, 1920.

In his private life Mr. Bell was well known to a large circle of friends. In 1873 he was admitted to the Camberwell Green Congregational Church, of which he was elected a deacon in April, 1891, at the early age of 37. In June, 1891, he became church secretary, a post which he held until June, 1929, and in 1927 he was Chairman of the London Congregational Union. He also played a part in municipal politics, serving as Alderman of the Borough of Camberwell from 1900 to 1903 and Councillor from 1903 to 1906.

An impressive funeral service at the Camberwell Green Congregational Church on November 29th was attended by a large gathering which included a number of Mr. Bell's official colleagues.

C. E. P. BROOKS.

News in Brief

Meteorological Committee.—Professor S. Chapman, F.R.S., has been chosen as representative of the Royal Society in place of Sir Arthur Schuster, F.R.S., who has resigned. Capt. J. A. Edgell, O.B.E., R.N., has succeeded Vice-Admiral H. P. Douglas, C.B., C.M.G., as Hydrographer to the Navy and as representative of the Admiralty on the Meteorological Committee. Sir

Henry Lyons, F.R.S., has been appointed Vice-Chairman of the Committee in place of Sir Arthur Schuster, F.R.S.

We learn that the Governor of Sierra Leone is introducing into the Legislative Council a Daylight Saving Bill to enable the clock to be put forward twenty minutes from October 1st to March 31st. The change came into operation this year on December 1st.

We learn from *Nature* that a Roosevelt Medal for achievement in science has been presented to Dr. Robert Andrews Millikan, director of the Norman Bridge Laboratory of Physics and chairman of the executive council of the California Institute of Technology.

Prof. Dr. R. Süring retired from the Directorship of the Meteorological and Magnetic Observatory on the Telegraphenberg, Potsdam, on October 1st, 1932.

Prof. Dr. Kurt Wegener has been appointed Professor of Meteorology and Geophysics at the University of Graz as successor to his brother, the late Prof. A. Wegener.

Errata

November, 1932, page 234, line 8, *for* "other arcs tangent to the 45° halo have been seen on about the horizontal" *read* "other arcs tangent to the 22° halo have been seen at about 45° from the horizontal."

October, 1932, page 214, fifth line from the bottom of the page, *for* "at an elevation of 40°" *read* "at an elevation of about 20°."

The Weather of November, 1932

Except for the western coast of North America, Greenland, Iceland, Spitsbergen, the northern coast of Russia, northern Egypt and around Madeira, pressure was above normal from Alaska across North America, the North Atlantic and Europe to Russia and Turkey. The greatest excesses were 9·8mb. at 50°N., 50°W. and 5·8mb. at Lemberg, while the greatest deficit was 5·4mb. at Isafjord. Temperature was above normal in Spitsbergen and northern and central Europe, while rainfall was below normal in western and central Europe and parts of Scandinavia, but 70 per cent. above normal in Svealand and 25 per cent. above normal in north-west Gothaland and south-east Norrland.

The outstanding feature of the weather of November over the British Isles was the marked deficiency of both sunshine and rain. Lympne reported the smallest November total (26 mm.) for rainfall since the station opened in 1920 and Liverpool the lowest November total (35 hrs.) for sunshine since 1908 when the

sunshine records started there, while at Kew the total of 26 hrs. was the lowest total for sunshine since 1888. During the first four days a complex area of low pressure passed across the country giving mild unsettled weather generally with fairly heavy rain and local strong winds or gales in the north and west on the 2nd and 3rd, 1·54 in. fell at Tiree on the 3rd and 1·46 in. at Tynywaum (Glamorgan). 60°F. was reached at many places in England and Ireland on the 2nd and 3rd. On the 5th a high pressure area spread eastwards and anticyclonic conditions prevailed from then until the 18th. The 5th was generally sunny over the whole country with 8 hrs. and more of bright sunshine at Leuchars, Eskdalemuir, Armagh, Valentia, Cockle Park, Stonyhurst, Blackpool, Llandudno, Colwyn Bay, Aberystwyth and Pembroke, but later sunshine records were rather poor, only a few places having good records occasionally, *e.g.*, 8·1 hrs. at Oxford on the 7th, 6·9 hrs. at Auchincruive (Ayr) on the 13th. The weather during this period was mainly rather cold and quiet with local drizzle or slight rain at times, the 7th was very cold in Scotland a maximum of 33°F. being recorded at Renfrew, and the 18th very cold in England, the maximum at Birmingham being 37°F. The 18th was a particularly sunless day, the largest amount of sunshine reported being 0·4 hrs. at Lerwick. Much mist or fog occurred locally during this time. From the 19th to the end of the month depressions centred to the north of the British Isles moved north-eastwards and caused unsettled weather with fairly heavy rain at times and bright periods. Thunderstorms occurred in the north and west on the 22nd and 23rd, while strong winds and gales were experienced in the north and west on these days and over the country generally on the 26th and 27th. Snow and sleet fell in parts of Scotland between the 21st and 26th and hail locally in the Midlands, but it was milder further south. The 28th was a generally sunny day with no rain at most places—7·0 hrs. of bright sunshine were experienced at Clacton and 6·9 hrs. at Ross-on-Wye. On the 29th and 30th strong winds and gales occurred first in the north and later in the south, and a belt of heavy rain moved in a southerly direction across the country—1·95 in. fell at Llyn Fawr (Glamorgan) on the 29th and 2·50 in. at Holne (Devon) on the 30th. The distribution of bright sunshine for the month was as follows:—

	Total (hrs.)	Diff. from normal (hrs.)		Total (hrs.)	Diff. from normal (hrs.)
Stornoway	46	+ 3	Liverpool	35	—24
Aberdeen	56	+ 1	Ross-on-Wye	49	—14
Dublin	60	—11	Falmouth	51	—25
Birr Castle	48	—16	Gorleston	43	—19
Valentia	52	—13	Kew	26	—26

The special message from Brazil states that the rainfall in the northern regions was generally scarce, the average being 0·67 in. below normal and in the central and southern regions irregular with averages 0·04 in. and 0·20 in. above normal respectively. Seven anticyclones passed across the country, which was, however, partly under the influence of the prevailing continental depression. The crops were in good condition. At Rio de Janeiro the mean pressure for the month was normal and the mean temperature 0·4°F. above normal.

Miscellaneous notes on weather abroad culled from various sources. Bad weather was experienced over the Black Sea about the 6th. Violent storms were reported off north Norway early in the month and near Iceland about the 12th. Exceptionally severe thunder and hail storms devastated a large area of the province of Calabria about the 10th. Bridges were swept away and the country flooded—17 deaths occurred while numerous families were rendered homeless. A waterspout swept over a large tract of the Beira province of Portugal, causing the rivers to inundate fields and vineyards and destroying a large olive-oil factory. Navigation closed at Uleaborg (Finland) on the 26th, but Neva Bay and Kronstadt were ice free (*The Times*, November 7th-December 1st).

A typhoon struck the Luchu Islands on the 14th and then passed up the coast and raged over Tokyo from 11 p.m. to 4 a.m. The Hakone Observatory registered a wind velocity of 46 m/s. (nearly 98 m.p.h.) at the height of the storm. A landslip occurred at Yokohama about the same time—23 people were killed in all and 108 injured or missing. The steamer *Unkai Maru* was lost during the typhoon, but part of the crew were saved. (*The Times*, November 16th-17th.)

It is estimated that 3,000,000 banana trees were destroyed by the strong winds accompanied by heavy rains which occurred over Jamaica between about the 3rd and 7th. On the 8th a hurricane struck the western side of Jamaica and the incessant rain caused landslips. The hurricane then swept over the Cayman Islands and across Cuba from Santa Cruz del Sur to Port Nuevitas affecting an area 100 miles wide. By the 12th it was centred opposite Wilmington, North Carolina, about 500 miles off the United States coast. About 2,000 persons were killed in Cuba and 67 in Cayman Brac, and extensive damage was done to crops and property. The wind velocity is reported to have reached 125 m.p.h. (*The Times*, November 8th-14th.)

Rainfall, November, 1932—General Distribution

England and Wales	69	per cent of the average 1881-1915.
Scotland	86	
Ireland	58	
British Isles	71	

Rainfall: November, 1932: England and Wales.

Co.	Station	In.	Per-cent. of Av.	Co.	Station	In.	Per-cent. of Av.
Lond.	Camden Square	1·38	58	*Leics.*	Belvoir Castle	1·67	75
Sur.	Reigate, Alvington	1·41	45	*Lut.*	Ridlington	1·67	73
Kent.	Tenterden, Ashenden	1·09	36	*Lincs.*	Boston, Skirbeck	1·50	75
,, .	Folkestone, Boro. San.	1·28	...	,,	Cranwell Aerodrome	1·56	83
,, .	Margate, Cliftonville	·82	34	,, .	Skegness, Marine Gdns	1·37	63
,, .	Sevenoaks, Speldhurst	1·12	...	,, .	Louth, Westgate	1·85	72
Sus.	Patching Farm	1·74	49	,, .	Brigg, Wrawby St.	1·34	...
,, .	Brighton, Old Steyne	1·36	43	*Notts.*	Worksop, Hodsock	1·06	54
,, .	Heathfield, Barklye	2·09	56	*Derby.*	Derby, L. M. & S. Rly.	1·67	77
Hants.	Ventnor, Roy. Nat. Hos.	2·60	81	,, .	Buxton, Devon Hos.	4·40	94
,, .	Fordingbridge, Oaklnds	2·17	63	*Ches.*	Runcorn, Weston Pt.	2·71	98
,, .	Ovington Rectory	2·32	70	,, .	Nantwich, Dorfold Hall	2·78	...
,, .	Sherborne St. John	1·58	55	*Lancs.*	Manchester, Whit Pk.	2·63	100
Berks.	Wellington College	1·27	50	,, .	Stonyhurst College	3·32	73
,, .	Newbury, Greenham	1·82	65	,, .	Southport, Hesketh Pk	2·64	84
Herts.	Welwyn Garden City	1·67	...	,, .	Lancaster, Strathspey	3·03	...
Bucks.	H. Wycombe, Flackwell	1·86	...	*Yorks.*	Wath-upon-Dearne	1·26	62
Oxf.	Oxford, Mag. College	1·19	54	,, .	Bradford, Lister Pk.	2·20	75
Nor.	Pitsford, Sedgebrook	...	...	,, .	Oughtershaw Hall	5·87	...
,, .	Oundle	1·23	...	,, .	Wetherby, Ribston H.	2·18	93
Beds.	Woburn, Crawley Mill	1·22	54	,, .	Hull, Pearson Park	1·58	72
Cam.	Cambridge, Bot. Gdns.	...	...	,, .	Holme-on-Spalding	1·35	...
Essex.	Chelmsford, County Lab	1·12	50	,, .	West Witton, Ivy Ho.	2·38	69
,, .	Lexden Hill House	1·08	...	,, .	Felixkirk, Mt. St. John	1·70	69
Suff.	Haughley House	1·21	...	,, .	Pickering, Hungate	1·45	58
,, .	Campsea Ashe	1·22	55	,, .	Scarborough	1·03	42
Norf.	Norwich, Eaton	...	...	,, .	Middlesbrough	1·42	67
,, .	Wells, Holkham Hall	1·52	71	,, .	Balderdale, Hury Res.	3·21	81
,, .	Swaffham, The Villa	1·57	63	*Durh.*	Ushaw College	1·01	40
Wilts.	Devizes, Highclere	1·58	59	*Nor.*	Newcastle, Town Moor	·74	31
,, .	Bishops Cannings	1·92	67	,, .	Bellingham, Highgreen	1·75	51
Dor.	Evershot, Melbury Ho.	3·81	89	,, .	Lilburn Tower Gdns.	·91	27
,, .	Creech Grange	2·95	72	*Cumb.*	Geltsdale	2·44	...
,, .	Shaftesbury, Abbey Ho.	1·79	55	,, .	Carlisle, Scaleby Hall	1·93	64
Devon.	Plymouth, The Hoe	2·81	77	,, .	Borrowdale, Seathwaite	10·00	78
,, .	Launceston, Werringt'n	3·45	...	,, .	Borrowdale, Moraine	8·57	...
,, .	Holne, Church Pk. Cott.	5·46	85	,, .	Keswick, High Hill	3·46	60
,, .	Cullompton	2·56	74	*West.*	Appleby, Castle Bank	2·22	67
,, .	Sidmouth, Sidmount	2·78	89	*Glam.*	Cardiff, Ely P. Stn.	2·31	55
,, .	Filleigh, Castle Hill	3·28	...	,, .	Treherbert, Tynywaun	8·36	...
,, .	Barnstaple, N. Dev. Ath	2·87	73	*Carm.*	Carmarthen Friary	3·69	74
,, .	Dartm'r, Cranmere Pool	6·00	..	*Pemb.*	Haverfordwest, School	3·93	78
Corn.	Redruth, Trewirgie	3·34	69	*Card.*	Aberystwyth	3·45	...
,, .	Penzance, Morrab Gdn.	2·75	60	,, .	Cardigan, County Sch.	3·10	...
,, .	St. Austell, Trevarna	3·12	63	*Brec.*	Crickhowell, Talymaes	2·80	...
Soms.	Chewton Mendip	3·57	83	*Rad.*	Birm W. W. Tyrmynydd	5·28	79
,, .	Long Ashton	2·02	64	*Mont.*	Lake Vyrnwy	4·96	89
,, .	Street, Millfield	2·80	101	*Denb.*	Llangynhafal	2·67	87
Glos.	Blockley	1·91	...	*Mer.*	Dolgelly, Bryntirion	5·20	87
,, .	Cirencester, Gwynfa	2·42	81	*Carn.*	Llandudno	2·69	87
Here.	Ross, Birchlea	1·43	56	,, .	Snowdon, L. Llydaw 9	15·25	...
,, .	Ledbury, Underdown	1·64	67	*Ang.*	Holyhead, Salt Island	3·50	85
Salop.	Church Stretton	2·56	87	,, .	Lligwy	3·27	...
,, .	Shifnal, Hatton Grange	1·99	83	*Isle of Man*			
Worc.	Ombersley, Holt Lock	1·32	58		Douglas, Boro' Cem.	2·93	61
War.	Birminghm, Edgbaston	2·06	87	*Guernsey*			
Leics.	Thornton Reservoir	2·26	100		St. Peter P't. Grange Rd	2·60	62

Rainfall: November, 1932: Scotland and Ireland.

Co.	Station	In.	Per-cent. of Av.	Co.	Station	In.	Per-cent. of Av.
Wigt .	Pt. William, Monreith	2·88	67	*Suth* .	Melvich	3·73	...
,, .	New Luce School	4·36	65	,, .	Loch More, Achfary	8·44	99
Kirk .	Carsphairn, Shiel	7·94	100	*Caith* .	Wick	2·93	93
Dumf .	Dumfries, Crichton, R.I	2·65	76	*Ork* .	Pomona, Deerness	4·52	115
,, .	Eskdalemuir Obs.	5·55	96	*Shet* .	Lerwick	3·20	75
Roxb .	Branxholm	1·90	57	*Cork* .	Caheragh Rectory	2·35	...
Selk .	Ettrick Manse	4·31	79	,, .	Dunmanway Rectory	3·33	54
Peeb .	West Linton	2·97	...	,, .	Ballinacurra	1·68	42
Berw .	Marchmont House	1·19	40	,, .	Glanmire, Lota Lo	1·88	44
E. Lot .	North Berwick Res.	1·49	67	*Kerry* .	Valentia Obsy	2·11	39
Midl .	Edinburgh, Roy. Obs.	1·56	70	,, .	Gearahameen	5·60	...
Lan .	Auchtyfardle	3·62	...	,, .	Killarney Asylum	2·43	43
Ayr .	Kilmarnock, Kay Pk.	...	...	,, .	Darrynane Abbey	2·15	42
,, .	Girvan, Pinmore	4·60	87	*Wat* .	Waterford, Gortmore	1·90	51
Renf .	Glasgow, Queen's Pk.	3·36	90	*Tip* .	Nenagh, Cas. Lough	2·26	56
,, .	Greenock, Prospect H.	7·25	113	,, .	Roscrea, Timoney Park	1·84	...
Bute .	Rothesay, Ardencraig	5·13	...	,, .	Cashel, Ballinamona	1·73	49
,, .	Dougarie Lodge	3·11	...	*Lim* .	Foynes, Coolnanes	2·22	56
Arg .	Ardgour House	16·17	...	,, .	Castleconnel Rec.	2·59	...
,, .	Glen Etive	...	...	*Clare* .	Inagh, Mount Callan	3·90	...
,, .	Oban	7·01	127	,, .	Broadford, Hurdlest'n.	2·46	...
,, .	Poltalloch	5·85	105	*Wexf* .	Gorey, Courtown Ho	1·49	43
,, .	Inveraray Castle	10·76	127	*Kilk* .	Kilkenny Castle	1·52	49
,, .	Islay, Eallabus	4·42	82	*Wick* .	Rathnew, Clonmannon	·80	...
,, .	Mull, Benmore	8·70	...	*Carl* .	Hacketstown Rectory	2·12	54
,, .	Tiree	5·01	104	*Leix* .	Blandsfort House	1·95	58
Kinr .	Loch Leven Sluice	1·93	54	,, .	Mountmellick	2·24	...
Perth .	Loch Dhu	8·50	98	*Offaly* .	Birr Castle	1·28	41
,, .	Balquhidder, Stronvar	5·75	...	*Kild'r* .	Monasterevin	1·91	...
,, .	Crieff, Strathearn Hyd.	2·43	56	*Dublin* .	Dublin, FitzWm. Sq.	1·16	43
,, .	Blair Castle Gardens	2·49	71	,, .	Balbriggan, Ardgillan	·99	34
Angus .	Kettins School	1·64	53	*Meath* .	Beauparc, St. Cloud	1·71	...
,, .	Dundee, E. Necropolis	1·31	54	,, .	Kells, Headfort	1·99	59
,, .	Pearsie House	2·14	...	*W. M* .	Moate, Coolatore	1·80	...
,, .	Montrose, Sunnyside	1·33	50	,, .	Mullingar, Belvedere	1·77	52
Aber .	Braemar, Bank	2·55	66	*Long* .	Castle Forbes Gdns.	2·58	72
,, .	Logie Coldstone Sch.	1·79	58	*Gal* .	Ballynahinch Castle	3·20	53
,, .	Aberdeen, King's Coll.	1·65	56	,, .	Galway, Grammar Sch.	1·98	...
,, .	Fyvie Castle	2·53	73	*Mayo* .	Mallaranny	5·44	...
Moray .	Gordon Castle	3·09	107	,, .	Westport House	3·73	76
,, .	Grantown-on-Spey	...	...	,, .	Delphi Lodge	8·44	81
Nairn .	Nairn	2·77	117	*Sligo* .	Markree Obsy	3·27	77
Inv's .	Ben Alder Lodge	7·32	...	*Cavan* .	Belturbet, Cloverhill	1·79	58
,, .	Kingussie, The Birches	4·51	...	*Ferm* .	Enniskillen, Portora	2·80	...
,, .	Loch Quoich, Loan	20·10	...	*Arm* .	Armagh Obsy	2·04	72
,, .	Glenquoich	18·02	148	*Down* .	Fofanny Reservoir	2·44	...
,, .	Inverness, Culduthel R.	3·49	...	,, .	Seaforde	1·62	43
,, .	Arisaig, Faire-na-Squir	6·64	...	,, .	Donaghadee, C. Stn.	1·98	65
,, .	Fort William, Glasdrum	11·49	...	,, .	Banbridge, Milltown	1·31	48
,, .	Skye, Dunvegan	6·11	...	*Antr* .	Belfast, Cavehill Rd.	2·32	...
,, .	Barra, Skallary	4·74	...	,, .	Glenarm Castle	...	...
R & C .	Alness, Ardross Castle	4·38	109	,, .	Ballymena, Harryville	3·11	77
,, .	Ullapool	6·37	119	*Lon* .	Londonderry, Creggan	4·91	120
,, .	Achnashellach	10·96	120	*Tyr* .	Omagh, Edenfel	2·86	75
,, .	Stornoway	4·58	79	*Don* .	Malin Head	3·88	...
Suth .	Lairg	4·16	104	,, .	Dunfanaghy	4·20	...
,, .	Tongue	4·34	95	,, .	Killybegs, Rockmount	4·62	73

Climatological Table for the British Empire, June, 1932

STATIONS	PRESSURE		TEMPERATURE							Relative Humidity	Mean Cloud Am'nt	PRECIPITATION			BRIGHT SUNSHINE	
			Absolute		Mean Values				Mean							
	Mean of Day M.S.L.	Diff. from Normal	Max.	Min.	Max.	Min.	½ max. and min.	Diff. from Normal	Wet Bulb			Am'nt	Diff. from Normal	Days	Hours per day	Percentage of possible
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F	°F.	%	0—10	in.	in.			
London, Kew Obsy. ..	1018·3	+ 1·6	79	42	67·5	50·9	59·2	0·0	51·8	78	6·4	0·26	— 1·89	5	7·0	43
Gibraltar.....	1016·7	— 0·7	82	57	76·4	60·1	68·3	— 2·2	59·4	81	3·3	0·56	+ 0·08	4	..	..
Malta	1015·8	+ 0·6	82	57	76·4	65·4	70·9	— 1·8	65·3	77	4·4	0·02	— 0·07	1	10·7	74
St. Helena	1017·1	+ 1·1	67	55	62·5	56·4	59·5	— 1·0	57·6	91	9·2	3·80	..	18	..	..
Sierra Leone	1013·5	+ 1·5	89	69	85·1	72·8	78·9	— 1·4	75·8	83	7·5	20·56	+ 0·52	20	..	..
Lagos, Nigeria	1012·8	+ 0·4	86	72	82·6	74·4	78·5	— 1·0	75·2	89	9·6	14·10	— 4·38	23	3·5	28
Kaduna, Nigeria	1013·7	— 0·1	91	65	86·8	69·2	78·0	+ 1·5	71·9	80	7·7	5·38	— 1·71	13	6·5	51
Zomba, Nyasaland ..	1016·7	— 0·8	79	46	73·8	51·3	62·5	— 0·4	..	73	4·5	0·26	— 0·22	1	..	..
Salisbury, Rhodesia ..	1021·7	— 0·2	73	37	69·3	43·0	56·1	— 0·8	49·0	51	2·9	0·00	— 0·05	0	7·8	70
Cape Town.....	1021·5	+ 1·4	78	40	62·6	50·6	56·6	+ 0·9	51·2	91	7·6	4·79	+ 0·29	15	..	..
Johannesburg	1021·6	0·0	69	28	61·2	42·2	51·7	+ 1·0	39·7	35	1·2	0·04	— 0·10	2	9·1	87
Mauritius	1019·1	+ 0·1	79	56	75·2	62·8	69·0	— 0·4	66·6	76	5·1	7·45	+ 4·65	21	6·7	61
Calcutta, Alipore Obsy.	998·7	— 1·0	98	75	91·4	80·3	85·9	+ 0·8	80·7	88	8·5	7·44	— 4·47	11*	..	..
Bombay	1005·2	+ 1·2	94	73	90·3	79·4	84·9	+ 0·9	78·1	79	6·6	10·62	— 9·25	14*	..	..
Madras	1003·9	+ 0·1	107	74	99·4	82·0	90·7	+ 0·7	75·2	56	5·5	1·14	— 0·83	3*	..	..
Colombo, Ceylon	1009·3	+ 0·7	86	74	85·4	78·3	81·9	+ 0·3	77·9	79	6·8	1·68	— 5·64	18	6·5	52
Singapore	1008·8	— 0·1	90	70	86·4	74·6	80·5	— 1·0	76·8	82	7·6	7·07	+ 0·20	15	5·4	44
Hongkong	1004·9	— 0·9	90	76	86·0	79·1	82·5	+ 1·1	78·9	83	9·0	25·29	+ 9·59	22	4·1	30
Sandakan	..	..	94	73	87·8	75·6	81·7	0·0	77·3	82	6·1	6·88	— 0·62	15	..	..
Sydney, N.S.W.	1015·9	— 2·0	74	36	63·0	46·0	54·5	— 0·2	47·9	74	5·0	1·13	— 3·61	6	6·1	62
Melbourne	1015·9	— 2·6	68	35	56·3	43·3	49·8	— 0·6	45·4	81	7·0	2·10	+ 0·04	19	3·2	33
Adelaide	1018·3	— 0·8	68	37	60·6	47·2	53·9	+ 0·4	49·4	76	5·5	4·48	+ 1·38	19	4·8	50
Perth, W. Australia ..	1018·3	+ 0·3	73	38	65·3	48·8	57·1	+ 0·3	51·2	74	5·6	6·47	— 0·47	16	5·8	58
Coolgardie	1019·9	+ 1·0	76	32	63·9	41·9	52·9	+ 0·1	45·9	68	3·2	0·39	— 0·87	4	..	..
Brisbane.....	1017·7	— 0·6	77	42	68·1	51·9	60·0	— 0·2	53·0	65	4·0	0·60	— 2·17	6	6·3	61
Hobart, Tasmania....	1009·5	— 4·8	64	32	52·7	41·7	47·2	+ 0·2	42·8	77	6·3	2·48	+ 0·25	19	3·4	37
Wellington, N.Z.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Suva, Fiji	1013·5	— 0·1	87	65	80·9	70·1	75·5	+ 0·8	71·5	80	5·8	2·43	— 4·28	17	5·6	50
Apia, Samoa	1011·4	— 0·2	89	66	85·1	72·4	78·7	+ 0.9	75·3	76	3·7	1·31	— 4·04	7	8·0	71
Kingston, Jamaica ..	1012·4	— 1·4	91	71	88·3	74·2	81·3	0·0	73·9	79	6·9	3·09	— 1·01	9	4·6	35
Grenada, W.I.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Toronto	1012·3	— 2·4	83	43	75·7	57·0	66·3	+ 2·5	59·5	71	4·0	1·00	— 1·66	7	9·0	58
Winnipeg	1010·6	— 1·2	91	42	79·1	56·7	67·9	+ 5·6	58·6	75	5·3	2·91	— 0·20	11	9·3	57
St. John, N.B.	1010·6	— 2·9	81	38	63·7	47·4	55·5	— 1·0	52·1	81	5·9	3·65	+ 0·38	13	..	..
Victoria, B.C.	1016·9	+ 0·1	88	45	67·1	50·2	58·7	+ 1·7	53·4	71	3·8	0·91	+ 0·07	2	11·0	69

* For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.