M.O. 452

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JUNE, 1940

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THE METEOROLOGICAL MAGAZINE

M.O. 452

AIR MINISTRY : METEOROLOGICAL OFFICE

Vol. 75 JUNE 1940 No. 893

RECENT METEOROLOGICAL DISLOCATIONS

By the late Joseph Baxendell.

[*This article, which is one of the last from Mr. Baxendell's pen, was written in April, 1939. Mr. Baxendell died in January, 1940.*]

Few people, certainly few elderly people, are now without a belief that our weather since the Great War has frequently been much more unusual in character than that experienced for a long time previously; and meteorologists have statistics to prove this. Admittedly, prolonged severe frosts have been rare, but that itself is a notable circumstance. It appears, therefore, to be worth while to bring together and summarise various statements from recent meteorological publications and from other sources outlining these abnormal happenings.

In some countries, and in few directions even in the British Isles, the changes began very early in the present century, but that which I will venture to term the " great dislocation " occurred shortly after the war. Since then, as shown by Scherhag and Loewe the great majority of winters in and around the Arctic regions of the Northern Hemisphere have been abnormally warm. One result is a retreat of the sea ice towards the Arctic by some 150 miles (a state of matters unheard of during last century), and the thickness of the cold water surface layer in the Arctic Ocean has been halved; these obviously are cumulative effects. Scherhag finds that a rise of temperature in less high latitudes of central Europe set in at the opening of the present century but

that the Arctic was not affected until about 1922. It was about that time that there occurred in our own country the abrupt general meteorological dislocation which has more or less upset all weather and climatic elements. The disturbance has not been limited to this country and its immediate surroundings nor even to the Northern Hemisphere alone; its effects have been very noticeable so far away as Australia. For example, this is strikingly shown by Mr. E. A. Cornish in the third curve of Fig. 4, on page 487 of the *Quarterly Journal of the Royal Meteorological Society* for October, 1936. For the remainder of this article I shall for the most part confine my remarks to Great Britain.

It is common knowledge that since the war many long period meteorological " records " have been broken and, in many instances, several times at the observatories and at the older stations. This has been especially the case with the totals or means for individual months in all parts of the year; it has also been very noticeable in the day-to-day oscillations of air pressure and other elements. At the same time, several permanent changes, of undoubted significance, have arisen abruptly. The notable increase of winter temperature, if caused by an increase in the carbon dioxide content of the atmosphere, would have required an impossibly gigantic increase of consumption of coal and oil, etc., to produce it. Moreover other changes, in elements meteorologically more fundamental than temperature, also have taken place: a few may be instanced.

As shown in detail in the annual report of the Fernley Observatory for 1937, the frequencies of both NE and SW winds on the Lancashire coast were very materially reduced. In fourteen out of the last seventeen years, the total duration of winds from each of these two octants has been below—and several times greatly below—the average of the previous 23 years (exact records having begun in 1899). In the case of the SW wind, the most striking reduction has been in the month of April, where the totals in *every* year since 1920 have been below the previous average. (Another new feature of the English

April, from the early twenties until 1937, its general dullness, is well known.) Reasonably summarised autographic records of wind direction, for a sufficient number of years past, are deplorably few in this country, but I find from good eye-observations at Eastbourne—i.e. in nearly the opposite part of England to Southport—that the average annual frequency of NE winds there, from 1923 to 1938, was actually less than half, and that of SW winds, little more than half, of their respective average values for the period 1912 to 1922. At Southport, wind speed has been 9 per cent. less during the last 17 years than previously, and the average annual number of gales has been almost halved. Another noteworthy change since the " dislocation " has been a great reduction in the snowfall in coastal areas west of the lower Pennines. The average annual depth of all such falls at Southport, since then, amounts to less than a third of that recorded for many years previously.

But probably the most striking effect of this great change that has yet come to light, has been the havoc it has wrought with even the best authenticated meteorological periodicities. The shortest cycles disappeared first, indeed a little *before* the war; those of the order of a few years received staggering blows directly *after* that event, and terms even some decades in length then became more or less badly mauled. These last, however, do apparently still exist (though some of them in much feebler form), amidst the large, irregular, variations that have intruded. In brief, the periodic meteorological waves have fared in much the same way as those of light when a thick smoke cloud, or a fog intervenes; the short violet waves are completely lost, but the long red, and especially the infra-red, to a material extent carry through.

Scientific meteorologists who specialise in the investigation of periodicities, do not, of course, use that term in its strictly mathematical sense, but in the way in which astronomers commonly employ it in alluding to the irregular 11-year sunspot period and the quasi-periodic variations of numbers of the so-called long-period

Variable Stars. Yet, even considered from the mathematical standpoint, the meteorological cycles of nearly 5·1 and 3·1 years, and some much shorter ones, apparent in records 100 to 150 years long, have recently been admitted to have been " real " up to the war (or thereabouts), by competent statisticians who have applied to them the severe tests for reality devised by Sir Gilbert Walker and others. It must therefore have been a really great meteorological dislocation that wrought such havoc with them.

One sometimes sees incautious statements, as for example that some element in a certain country was dominated successively by cycles of, say, five, three, and two years, each of which in turn broke down. On the contrary, the truth really is that each of these periodicities existed, with only temporary irregularities from as far back as records extend (in some cases for a century and a half) until about 20 years ago, each being especially persistent and marked in its own particular habitat, but sometimes appearing for many years in pronounced form elsewhere, at times reinforced, and at times masked, by one or more interfering cycles.

Much misapprehension has arisen through searching for periodicities in unsuitable records, i.e. either at places (e.g. on our NE and E coasts) where, or in elements (e.g. surface temperature) in which few are operative to any material extent. The five-year (5·05 years) cycle was first found in rainfall of the Atlantic type (in north-west England) but has been *most* notable in wind direction at places so far apart as London and Southport. The three-year (3·09 years) was most persistently marked in some of the south-eastern counties, both in rainfall and wind, though analyses of 90 years' records of rainfall at Bolton, Lancashire, and of $1\frac{1}{2}$ centuries of air pressure at London, showed it very definitely. Halving of those two last-named records shows that the amplitudes of the mean sine waves of the earlier and the later halves are, in each case, almost identical; while the rainfall phases nearly coincide with the opposite phases of air pressure, the rainfall maxima apparently *slightly* preceding the air pressure minima—a

very natural circumstance. The " two-year " (really, 2·19, and 1·88, years) cycles were other similarly long-standing periodicities, found in various elements and places. Information regarding the notable pre-War quasi-periodic terms of the order of a few weeks, will be found on page 11 of the *Annual Report of the Fernley Observatory, Southport** for the year 1928; but these had come to their sudden end long before then.

That surface-temperature should have proved to have been one of the most unfruitful of all meteorological elements in which, in England, to search for periodicities, is not surprising, and even transient recurrent wave-motion is not shown in it. Many years ago, when describing the short (10 to 30 minutes) wave-like oscillations of pressure, wind direction and velocity, and relative humidity, frequently recorded on and near our western coasts during the passage of anti-cyclonic wedges or ridges in winter and by night, I mentioned that such did not appear in thermograms. The clearly marked occurrence of these even in humidity, but their entire absence from surface temperature, has recently been independently observed and noted by G. A. Bull, from records at Abbotsinch.

The several old meteorological periodicities that either disappeared or were severely mauled, in the general dislocation, and have not since been restored (some of which, however, possibly only migrated to other areas), have apparently been succeeded in England by (*a*) a few presumably entirely new ones, (*b*) a marked strengthening of certain old, but (in *this* country) previously very weak terms, and (*c*) the incursion into England, certainly in northern areas, of important periodic variations hitherto in operation, for so far back as records extend, in other areas, e.g. in neighbouring higher latitudes. Of these, the most important one so far traced is that of $3\frac{3}{4}$ years, discovered by Dr. Goldie, in winds in Scotland, etc., and found by me to have appeared suddenly in the frequency of W and NW winds

* See Note at end of this article.

at Southport about the middle of the war, since which time it has functioned with surprising regularity, a very high maximum at the right time (the *sixth* consecutive one) having given us the great prevalence of westerly winds that characterised last year (1938).

It is not unlikely that several of the changes outlined above may prove to be of a fairly enduring character, but in regard to one matter a rather strong word of caution is necessary. It is highly improbable that anything like the *whole* of the increase of winter temperature will remain. The earliest statistics of this element show that it is one in which large and prolonged waves of abnormal and subnormal values appear in smoothed curves. Whether these major variations are, as some meteorologists have suggested, of a quasi-periodic character or not, it is quite possible that the spell of warm winters in recent decades has already largely spent itself; the winter of 1938–39 *may* possibly even have been a definite indication of this. (The lengthy series of dull Aprils has certainly been terminated by the occurrence of two of the sunniest on record, viz., those of 1938 and 1939.) In any case, as the late Mr. W. H. Dines, when mentioning his own belief that our winters were becoming somewhat warmer, was careful to add, occasional severe ones will, doubtless, still occur for a long time to come. Obviously, this is increasingly likely now that violent extremes have become so common in most meteorological elements. It should, however, certainly be mentioned here that H. Helm Clayton has recently stated, after an examination of all available data, that the number of icebergs is from two to three times as great in years of sunspot maxima as in those of sunspot minima; this may account, at least partly, for the prevalence of northern oceanic ice in the present year.

Note.—The Southport Corporation desire it to be known that copies of any of the Annual Reports of the Fernley Observatory up to that for 1938 (since 1919 also published by the Meteorological Office, under the name Southport Auxiliary Observatory), may be obtained, free of charge (except for postage), on application to the Chief Librarian, Atkinson Central Library, Lord Street, Southport, Lancs.

LETTERS TO THE EDITOR

The freezing of a tidal river

I was very interested in Mr. Corder's note in the April number of the Magazine. I believe, however, that the tide which eventually broke the ice was the one of January 24th, the predicted height of which was 14 ft. 4 ins., this tide, however, only attained about 10 ft. From my own observations the 10 ft. tide of January 23rd did not reach Bridgwater as the river was so badly obstructed lower down with what can only be termed " ice bergs ". At Dunball, below Bridgwater, the river is several hundred feet wide and with the exception of a small channel was entirely blocked with huge mounds of ice which were very similar to small ice bergs and varied from 5 to 10 ft. in height. I have some photographs of the freezing of the river in 1895 and in 1881. The one in which the fire is shown was stated to have been taken in 1895 and to represent the roasting of an ox, though Mr. Corder does not appear to agree that an ox was roasted on that occasion. However, it is quite clear that a substantial fire was lit on the ice.

I do not think that any of our other rivers produced unusual phenomena except that in some cases when the ice broke up, huge blocks were carried over the flood banks and were scattered over the river-side fields for quite a distance from the rivers.

E. L. KELTING.

Somerset Rivers Catchment Board,
West Quay, Bridgwater, Somerset.
April 19th, 1940.

NOTES AND NEWS

Halo phenomena on March 7th, 1940.

Unusual halo phenomena were reported from three places on March 7th. At Bircham Newton near Kings Lynn, Norfolk, the display as described and sketched by Mr. R. M. Poulter, took the form shown in fig. 1.

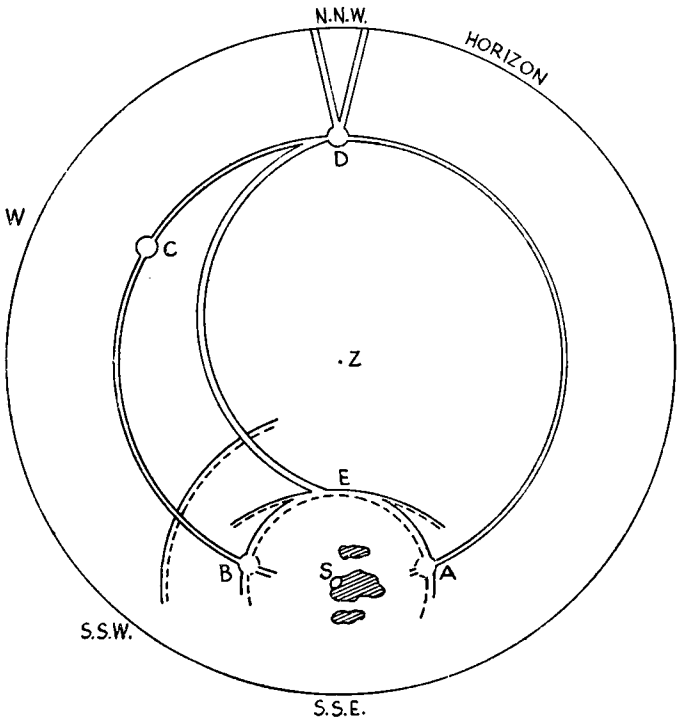

FIG. 1. HALO PHENOMENA AT BIRCHAM NEWTON ON MARCH 7TH, 1940.

Coloured orange - - -
White

It lasted from 8h. 30m. to 11h. G.M.T. The halo of 22° was coloured, with two brilliant coloured mock suns just outside the halo at A and B and the upper tangent arc at E, also showing colours. A part of the halo of 46° was also visible. The mock sun ring was almost complete and showed a white mock sun at a distance of 117° from the sun and another (anthelion) opposite the sun.

The most unusual phenomena, however, were a white

arc of about 60° radius from the mock sun at D to the top of the 22° halo, and at 180° from the sun a white inverted V resembling searchlight beams 5° to 7° apart at the horizon converging to the mock sun.

A less complete display (fig. 2) was sketched by

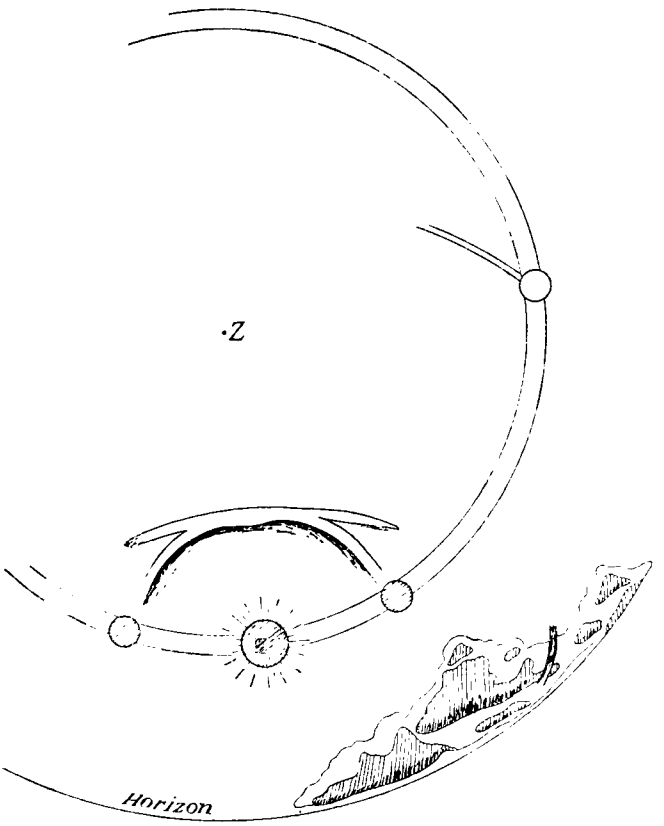

FIG. 2. HALO PHENOMENA AT WHITSTABLE ON MARCH 7TH, 1940.

Cumulus cloud is indicated on the horizon, with part of the 46° halo behind it.

Mr. G. S. Dunkin at Whitstable between 12h. and 13h. G.M.T. on the same date. The upper part of the 22° halo was seen, with part of the upper tangent arc and two brilliant coloured mock suns. A small arc which may have been part of the 46° halo, was seen near the horizon on the right. A large part of the mock sun ring was visible, with a white mock sun 90° to the right

of the sun and a very faint oblique white arc passing through it.

At Epsom Mr. K. R. Patrick observed a mock sun to the south of the sun at 16h. 55m. This lasted about four minutes. At 17h. 8m. another much brighter mock sun formed to the north of the sun, with parts of the 22° halo and mock sun ring. The mock sun ring and halo were coloured. The haloes formed in a slowly moving sheet of thin striated cirrostratus.

The anthelion at D is rare; it is usually attributed to light passing in through the vertical side of a horizontal columnar ice crystal, and out again through the same side, or in through the side above and out through the side below, after two internal reflections, at the base and the opposite side. It therefore requires that a considerable number of ice crystals should float in a stable position with their axes and two faces horizontal. An alternative explanation due to Besson is that they are formed by reflection in re-entrant right angles of crystal aggregates falling with their axis of symmetry vertical. On the latter basis the oblique arcs from the 22° halo to the anthelion and beyond would result from oscillations of the axis of symmetry about the vertical, but other explanations have also been given. The mock sun reported as 117° from the sun is no doubt the parhelion of 120°, which is attributed either to internal reflection across two adjacent columnar faces of hexagonal prisms of ice or to double reflexion at re-entrant angles of 120° in crystal aggregates.

The mock sun at 90° from the sun shown by Mr. Dunkin is also very rare. The short oblique arc passing through this mock sun is apparently a part of the rare halo of 90°. Various tentative explanations have been given; in this example the fact that both halo and mock sun were white shows that they were probably due entirely to reflection and not to refraction.

The characteristic shape of the 22° mock sun is clearly shown in the photograph, Fig. 3, from Bircham Newton, which also indicates faintly the position of the mock sun ring.

Photographer—R. M. Poulter.

FIG. 3. MOCK SUN AT BIRCHAM NEWTON, MARCH 7TH, 1940, 11h. G.M.T.

[*Facing page 90*

Haloes, March 25th and April 12th, 1940.

Mr. G. E. D. Alcock sent a sketch of a halo display seen at Peterborough, Northants, on the morning of March 25th between 8h. and 10h. 30m. The 22° halo was comparatively faint but showed mock suns on either side. That on the left was brilliantly coloured with colours of the spectrum. A part of the white mock sun ring extended outwards from each of these mock suns. A large part of the upper arc of contact was visible, with very bright colours, especially red. Higher in the sky was also another coloured arc, probably the upper arc of contact of the 46° halo.

Mr. Alcock also observed, on April 12th, the upper arc of contact of a 46° halo which he describes as the most brilliant halo spectacle he has ever seen, the colours being as bright as in a vivid rainbow. It excited much interest in the neighbourhood.

Solar halo observed from Waddington, Lincs, on May 12th, 1940.

The special feature of this halo was a vertical beam OC and a luminous area at the arc of contact, ECF. The halo was visible from about 19h. 30m. to 19h. 38m.

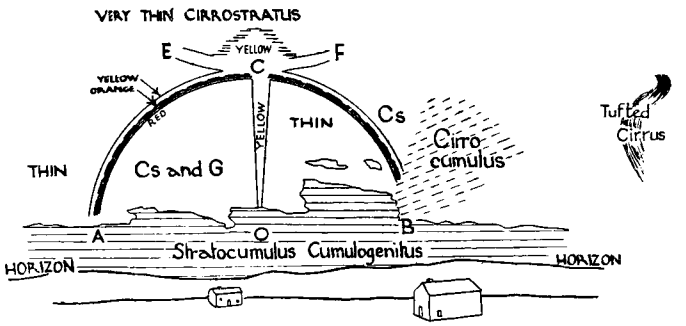

FIG. 1. SOLAR HALO OBSERVED FROM WADDINGTON, MAY 12TH, 1940.

Note: " Cs and G " should read " Cs and Ci."

G.M.T. during which time the sun was setting behind a layer (trace) of stratocumulus (cumulogenitus). An

area of cirrus and cirrostratus had developed rapidly in the west but did not reach above 45°. The visibility at the time was abnormal for this locality, being between 20 and 30 miles. On the northern side of the halo was a patch of cirrocumulus which partly masked the lower portion of the halo at that side. When the halo began to disappear it was noticed that the cirrostratus was gradually changing to cirrocumulus. The colouring of the halo was quite strong, the outer edge having a greenish yellow tinge. The elements OC and ECF were a bright yellow.

Other features observed were:—

(i) AB subtended an angle of 43° approximately.
(ii) The elevation of C above the horizontal was 23°.
(iii) Direction of CO from Waddington was 297° (true).

G. W. RADGE.

Sun pillar and halo observed at Digby, Lincs, on May 12th, 1940.

On May 12th, 1940, a fairly well formed sun pillar and 22° halo with upper arc of contact and a portion of the mock sun ring on either side of the halo were observed. The phenomenon was observed to increase and decrease in brilliance between 19h. and 20h. G.M.T. and reached its maximum extent at 19h. 30m., a quarter of an hour before sunset. The sun was obscured behind stratocumulus cloud low down on the horizon and the phenomenon was observed through very thin and very high altocumulus, the cirrostratus being almost invisible.

The sun pillar was yellowish white in appearance and at the top of the pillar, at the point of contact of arc and ring, was a bright oval patch with red coloration on the side nearest the sun, and white on the other side.

D. C. EVANS.

White rainbow at Cardiff.

On April 6th Mr. W. H. Ireson observed a white rainbow. It was first seen at 6h. 43m. G.M.T. when it was only three-quarters developed. By 6h. 46m. it was fully formed. At 6h. 53m. it began to disappear,

the centre first, and by 6h. 55m. only a small part on the left remained. The arc was approximately two degrees wide with a slight brownish tint on the outer edge. The centre was at 280° and the elevation 28°. The cloud in the area consisted of altocumulus.

Royal Meteorological Society.

A meeting of the Society was held on Wednesday, May 22nd, in the Society's rooms at 49, Cromwell Road, South Kensington. Sir George Simpson, K.C.B., C.B.E., F.R.S., President, was in the Chair.

The following papers were read and discussed:—

A new approach to the study of the seasonal incidence of British rainfall.—By P. R. Crowe, B.Sc.

The rainfall records for the period 1881-1930 of seventy British stations are analysed by a method of direct comparison of monthly values which does not involve the calculation of means. Taking the country as a whole the periods of most rapid change in precipitation conditions are shown to have been from June to August and from December to February. There is, however, a considerable amount of regional contrast, particularly in comparison of August with October values, whilst the distribution of anomalous conditions in September is also of interest. The analysis is then carried back to the period 1831-1880 for twelve stations. Rapid rainfall transitions during that period fell between April and June, October and December. The rainy period was thus the same length as in the later half century but occurred earlier in the year. At the same time the September anomaly disappeared.

The formation of depressions of the khamsin type.—By M. G. Elfandy, D.I.C., B.Sc.

A further study has been made of the conditions in spring which produce khamsin conditions in Egypt. Depressions are then formed which travel from west to east to the south of, and roughly parallel to, the north African coast; and, as a rule, while the more vigorous depressions usually originate far to the west of Egypt, shallow depressions form in Egypt or slightly to the west of it. Such depressions are regarded as produced in the manner suggested by Margules—unstable conditions prevailing between intensely heated air to the south and cool air to the north, the moisture of the air being unimportant. The cold air is due to an anticyclonic distribution in the Mediterranean, while the hot air is drawn northward from the Sudanese low when it suffers large oscillations towards the north. These oscillations are in the main brought about by the travelling depressions, the current bringing the hot air being specially strong when the depresssions reach the Red Sea.

A Dutch radio-meteorograph.—By C. M. A. Insje and J. L. van Soest.

This paper contains an account of the radio-meteorograph which has been developed in Holland in order to secure accuracy, lightness and cheapness. Following Moltchanov's principles, it sends out letters in the Morse code which can be received on an ordinary short-wave receiving set. One valve is employed. The signaller is driven by a small electric motor and the set is operated by either one or two $4\frac{1}{2}$-volt flashlight batteries, according to the height to be reached. The total weight is 585 grams. Experience shows that a very large proportion of the radio-meteorographs are recovered in good condition, fit for further use.

Auroral Notes, February to April, 1940.

There was fairly frequent but not strong auroral activity in February. Displays, which were never of more than moderate intensity, were noted at Lerwick on the 8th, 10th, 11th, 12th, 13th, 15th, 22nd, 24th, 27th and 28th. The phenomenon was also observed in Skye on the 9th, at Wick on the 11th, at Gordon Castle on the 12th, at Aberdeen on the 23rd and at Nairn on the 28th.

In March, aurora was seen on 14 nights but observations earlier than the 24th were confined to the Shetlands, where it was observed on the 4th, 6th, 8th, 9th, 12th, 13th, 16th, and to a single report from Wick on the 9th. The only noteworthy display in this period was on the 12th when, under a cloudless sky, some striking effects were noted at Lerwick. The display commenced at 19h. 50m. with a glow in the north up to 20 degrees of altitude. By 20h. 40m. bundles of rays, and bands with ray structure, from WNW to ENE extended up to the zenith. Diffuse homogeneous bands stretched across the sky from east to west, passing 15 degrees south of the zenith. At 21h. 57m. a curtain, bright in intensity, extended from West to NE with bundles of rays over the northern sky converging to a corona in the zenith. Changes in form and intensity continued until about 22h. 35m. when the whole aurora became faint.

During the period 23rd to 26th March an intense magnetic storm occurred. Telegraph and telephone wires were made inoperative for a time and transatlantic cable services were also upset during the afternoon of

the 24th. On the night of the 24th auroral displays were widely seen, reports coming from Fortrose, Nairn, Aberdeen, Edinburgh, Paisley, Wolfelee, Thornaby-on-Tees and Cromer. At Thornaby-on-Tees Mr. R. F. M. Hay observed a corona at 21h. 5m. centred at altitude 80 degrees, azimuth 160 degrees (i.e. to SSE). Streamers extended up to the corona from about 20 degrees above the north horizon and there were red patches of glow at altitude 60 degrees, azimuth 220 degrees, and altitude 50 degrees, azimuth 90 degrees. The corona consisted of thick masses of streamers (generally pale yellow) pointing radially inwards to a clear patch of sky about 6 to 7 degrees angular diameter, with an irregular patch of glow inside it like an unclosed ring. Upper clouds interfered with observations between 21h. 25m. and 22h. 10m. but a faint glow extending to 20 degrees of altitude was seen between NW and NE at 22h. 15m. At 23h. low cloud made further observation impossible. Aurora was observed on the 25th at Kettins, Balfron, Paisley and Newton Stewart; on the 26th at Auchincruive; on the 27th at Wick and Nairn; and on the 28th at Aberdeen and as far south as Tiverton (Devon).

There was renewed intense magnetic disturbance from March 29th to 31st, and reports of aurora on March 29th were received from widely scattered stations including Wick, Duntuilm in Skye, Paisley, Kilmarnock, Ross-on-Wye, Salisbury and Exeter. Mr. F. J. Parsons, who observed the display at Ross-on-Wye, writes: " In the NW and North the sky was bright with a whitish grey light, not unlike the long all-night twilight experienced on cloudless nights at mid-summer, but much brighter and extending higher into the zenith. It was bright enough to render the stars almost invisible. About 22h. 45m. a slender pillar of light extended from the horizon, remaining vertical and stationary for some time. Its rays did not finish abruptly on meeting the under surface of clouds but continued above them. The bright auroral light lasted well into the early hours ". At Exeter, Mr. W. N. Lavis observed the northern sky to be illuminated as if by lingering twilight between

19h. and 20h. and at 21h. 15m. the whole of this sector was lit by a steady, faint, rose-pink glow, tailing off at an elevation of about 40 degrees near the apparent position of the constellation Cassiopeia. At 22h. 20m. the light had assumed the form of a faint bluish-white cigar-shaped glow extending roughly from NNW to NNE at a height of about 35 degrees. The phenomenon was still persisting when observations were discontinued about 22h. 30m. Throughout the period of observation the sky was clear with bright stars. Aurora was seen at many places in Scotland on the 30th, from Kirkwall in the north to Eskdalemuir in the south. On the 31st it was reported from Lerwick and Wick.

During April aurora was observed on nine nights at various Scottish stations. It was seen at Wick and Aberdeen on the 1st and at Lerwick, Strathy, Wick, Nairn and Leuchars on the 2nd. At Lerwick homogeneous arcs of moderate intensity appeared at 20h. 35m. on the 2nd from NW to NE at an altitude of 10 degrees. Five minutes later the form changed to arcs of ray structure, bright in intensity. For rather more than an hour there were short periods of rapidly changing auroral form. At one time bundles of rays appeared, followed by arcs with ray structure, and then by diffuse luminous surfaces extending over the northern half of the sky up to 40 degrees altitude. Aberdeen and Eskdalemuir noted aurora on the 3rd, and Lerwick, Nairn and St. Abbs Head on the 4th. A single report on the 8th came from Paisley. The phenomenon was next reported on the 21st at Lerwick. It was seen again at Lerwick on the 24th, and at Nairn, Aberdeen and St. Abbs Head on the 25th. The last observations in April were on the 26th when it was observed at Wick, Leuchars and St. Abbs Head.

H. E. C.

The Great Drought of 1540.

The year 1540 was extremely hot and dry both in England and in central Europe, probably the hottest on record. In England rain fell only six times between February and September 19th.

General Rainfall, May, 1940.

	Per cent.
England and Wales	72
Scotland	64
Ireland	68
British Isles	69

Sunshine, May, 1940.

The distribution of bright sunshine for the month was as follows:—

	Total hrs.	Diff. from average hrs.		Total hrs.	Diff. from average hrs.
Stornoway	167	−12	Chester	218	+52
Aberdeen	209	+39	Ross-on-Wye ..	199	+13
Dublin	177	− 3	Falmouth ..	250	+43
Birr Castle	165	− 4	Gorleston	266	+43
Valentia	236	+52	Kew	247	+49

Kew temp., mean 56.6° F. diff. from average + 2.1° F

OBITUARY

DR. T. W. WOODHEAD.—We regret to announce the death on March 5th, 1940, of Dr. T. W. Woodhead, who as Honorary Director of the Tolson Memorial Museum was responsible for the meteorological station there from 1921 onwards.

The museum was planned by Dr. Woodhead and the meteorological station was installed there in continuation of an earlier station at Egerton Cemetery.

Dr. Woodhead was well known for his biological and educational work. His studies of the succession of floras represented by pollen in peat-bogs contributed materially to the study of climatic changes in Britain.

Rainfall: May, 1940: England and Wales

Co.	Station.	In.	Per cent of Av.	Co.	Station.	In.	Per cent of Av.
Lond'n	Camden Square.....	1·05	60	*Warw*	Alcester, Ragley Hall.	3·24	157
Surrey	Reigate, Wray Pk. Rd.	1·71	94	,,	Birminghm, Edgbaston	2·65	124
Kent .	Tenterden, Ashenden.	·99	63	*Leics* .	Thornton Reservoir...	·84	42
,, .	Folkestone, I. Hospital	·71	..	,, .	Belvoir Castle.....	·70	33
,, .	Margate, Cliftonville..	·10	6	*Rutl'd*	Ridlington	..	..
,, .	Edenb'dg.,Falconhurst	2·64	142	*Lincs*.	Boston, Skirbeck.....	1·23	70
Sussex	Compton, Compton Ho	1·76	79	,, .	Cranwell Aerodrome..	1·31	72
,, .	Patching Farm.....	1·00	54	,, .	Skegness, Marine Gdns	..	..
,, .	Eastbourne, Wil. Sq..	1·62	98	,, .	Louth, Westgate.....	1·21	60
Hants.	Ventnor, Roy.Nat.Hos.	·79	46	,, .	Brigg, Wrawby St....	1·18	..
,, .	Southampton, East Pk	·31	15	*Notts* .	Mansfield, Carr Bank..	1·10	52
,, .	Ovington Rectory....	·41	19	*Derby*.	Derby, The Arboretum	1·34	67
,, .	Sherborne St. John...	·71	37	,, .	Buxton, Terrace Slopes	1·24	40
Herts .	Royston, Therfield Rec	1·37	71	*Ches* .	Bidston Obsy.....	2·18	115
Bucks.	Slough, Upton.....	1·62	96	*Lancs*.	Manchester, Whit. Pk.	1·36	64
Oxford	Oxford, Radcliffe.....	1·49	80	,, .	Stonyhurst College...	1·14	40
N'hant	Wellingboro,Swanspool	1·04	54	,, .	Southport, Bedford Pk	2·43	116
,, .	Oundle	..	..	,, .	Ulverston, Poaka Beck	1·77	56
Beds .	Woburn, Exptl Farm.	1·57	81	,, .	Morecambe.....	1·79	78
Cambs	Cambridge, Bot. Gdns.	1·60	91	,, .	Blackpool.....	1·95	89
,, .	March	1·07	62	*Yorks*.	Wath-upon-Dearne...	·74	36
Essex.	Shoeburyness.....	1·00	77	,, .	Wakefield,Clarence Pk.	·48	24
,, .	Lexden Hill House....	·38	..	,, .	Oughtershaw Hall....	1·10	..
Suff .	Haughley House.....	1·70	..	,, .	Harrog'te, HarlowMoor	·86	39
,, .	Campsea Ashe, High Ho	·22	15	,, .	Hull, Pearson Park...	·89	46
,, .	Lowestoft Sec. School.	1·33	83	,, .	Holme-on-Spalding...	1·21	60
,, .	Bury St. Ed.,WestleyH	·78	43	,, .	Felixkirk, Mt. St. John	·98	52
Norf..	Wells, Holkham Hall.	1·01	63	,, .	York, Museum.....	2·08	105
,, .	Thetford W. W.....	1·23	..	,, .	Scarborough.....	·47	25
Wilts .	Porton, W.D. Exp'lStn	·39	23	,, .	Middlesbrough.....	1·55	81
,, .	Bishops Cannings	1·44	74	,, .	Baldersdale, Hury Res.	..	..
Dorset	Weymouth, Westham.	..	..	*Durhm*	Ushaw College.....	1·41	65
,, .	Beaminster, East St ..	1·82	88	*Norl'd*	Newcastle, Leazes Pk.	·87	44
,, .	Shaftesbury	1·14	..	,, .	Bellingham, Highgreen	1·85	77
Devon.	Plymouth, The Hoe...	1·54	74	,, .	Lilburn Tower Gdns..	·82	35
,, .	Holne, Church Pk.Cott	2·15	68	*Cumb*.	Carlisle, Scaleby Hall.	1·76	74
,, .	Teignmouth, Den Gdns	1·53	84	,, .	Borrowdale,Seathwaite	1·75	25
,, .	Cullompton	1·23	57	,, .	Thirlmere,DaleHeadH.	2·07	43
,, .	Sidmouth, U.D.C.....	1·91	..	,, .	Keswick, High Hill...	1·23	39
,, .	Barnstaple,N. Dev.Ath	1·16	56	,, .	Ravenglass, The Grove	1·50	54
,, .	Dartm'r,Cranmere P'l	1·90	..	*West* .	Appleby, Castle Bank.	1·05	48
,, .	Okehampton, Uplands.	1·83	68	*Mon* .	Abergavenny, Larchf'd	2·67	100
Cornw	Bude, School House ..	1·84	100	*Glam* .	Ystalyfera, Wern Ho..	2·01	58
,, .	Penzance,Morrab Gdns	·57	26	,, .	Treherbert, Tynywaun	2·14	..
,, .	St. Austell, Trevarna..	1·58	65	,, .	Cardiff, Penylan.....	2·39	98
Soms .	Chewton Mendip.....	3·03	110	*Pemb* .	St. Ann's Head.....	·88	44
,, .	Long Ashton	2·68	127	*Card* .	Aberystwyth	2·64	..
,, .	Street, Millfield	2·75	147	*Radn'r*	Bir. W. W. Tyrmynydd	2·50	73
Glostr.	Blockley	2·10	..	*Mont* .	Lake Vyrnwy.....	2·94	93
,, .	Cirencester, Gwynfa ..	1·36	66	*Flint* .	Sealand Aerodrome...	2·39	131
Here .	Ross-on-Wye	2·19	103	*Mer* .	Blaenau Festiniog....	2·25	43
,, .	Kington, Lynhales....	2·19	94	,, .	Dolgelley, Bontddu...	2·15	65
Salop .	Church Stretton.....	2·79	..	*Carn* .	Llandudno	2·63	148
,, .	Shifnal, Hatton Grange	2·13	103	,, .	Snowdon, L. Llydaw 9	3·25	..
,, .	Cheswardine Hall	1·81	82	*Angl* .	Holyhead, Salt Island.	1·53	78
Worc .	Malvern, Free Library.	2·60	120	,, .	Lligwy.....	1·88	..
,, .	Ombersley, Holt Lock.	3·14	153	*I.Man*	Douglas, Boro' Cem...	1·15	46

Rainfall: May, 1940: Scotland and Ireland

Co.	Station.	In.	Per cent of Av.	Co.	Station.	In.	Per cent of Av.
Guern.	St.PeterP't.GrangeRd.	1·20	71	*R&C.*	Stornoway, C.G.Stn...	1·67	69
Wig .	Pt. William, Monreith.	1·49	63	*Suth .*	Lairg	1·14	45
,, .	New Luce School.....	1·55	55	,, .	Skerray Borgie.....	1·56	..
Kirk .	Dalry, Glendarroch...	1·80	57	,, .	Melvich	1·23	60
Dumf.	Eskdalemuir Obs.....	1·47	45	,, .	Loch More, Achfary..	3·90	89
Roxb .	Hawick, Wolfelee	..	..	*Caith .*	Wick	1·74	84
,, .	Kelso, Broomlands....	1·45	75	*Orkney*	Kirkwall, Bignold Park	1.50	72
Peebs .	Stobo Castle.....	1·64	72	*Shet .*	Lerwick Observatory.	1.65	79
Berw .	Marchmont House....	1·23	50	*Cork .*	Cork, University Coll.	2·19	97
E.Lot.	North Berwick Res...	1·58	79	,, .	Roches Point, C.G.Stn.	2·28	94
Midl .	Edinburgh, Blackfd. H	1·70	83	,, .	Mallow, Hazlewood ..	1·21	..
Lanark	Auchtyfardle	·92	..	*Kerry.*	Valentia Observatory.	1·59	50
Ayr .	Kilmarnock, Kay Park	·82	..	,, .	Gearhameen	2·00	38
,, .	Girvan, Pinmore	1·62	55	,, .	Bally McElligott Rec.	1·88	..
,, .	Glen Afton, Ayr San..	1·55	52	,, .	Darrynane Abbey....	1·25	42
Renf .	Glasgow, Queen's Park	1·16	48	*Wat .*	Waterford, Gortmore.	2·24	97
,, .	Greenock, Prospect H.	·85	26	*Tip .*	Nenagh, Castle Lough.	1·50	61
Bute .	Rothesay, Ardencraig.	1·82	60	,, .	Cashel, Ballinamona..	1·68	71
,,	Dougarie Lodge.....	2·32	84	*Lim .*	Foynes, Coolnanes....	·80	34
Argyll	Loch Sunart, G'dale..	1·83	51	,, .	Limerick, Mulgrave St.	·98	41
,,	Ardgour House	3·27	..	*Clare .*	Inagh, Mount Callan..	3·16	..
,,	Glen Etive	..	..	*Wexf .*	Gorey, Courtown Ho..	·71	32
,,	Oban	2·24	..	*Wick .*	Rathnew, Clonmannon	·79	..
,,	Poltalloch.....	2·90	100	,, .	Newcastle.....	..	..
,,	Inveraray Castle	1·72	44	*Carlow*	Bagnalstown FenaghH	1·14	46
,,	Islay, Eallabus	..	..	,, .	Hacketstown Rectory.	1·19	46
,,	Mull, Benmore.....	3·90	52	*Leix .*	Blandsfort House	1·26	52
,,	Tiree	..	..	*Offaly.*	Birr Castle	·90	40
Kinr .	Loch Leven Sluice....	·88	36	*Dublin*	Dublin, Phoenix Park.	·99	48
Fife .	Leuchars Aerodrome..	1·12	57	*Meath.*	Kells, Headfort.....	..	..
Perth .	Loch Dhu	1·20	27	*W.M .*	Moate, Coolatore.....	2·78	..
,, .	Crieff, Strathearn Hyd.	1·62	65	,, .	Mullingar, Belvedere..	2·93	120
,, .	Blair Castle Gardens..	1·37	67	*Long .*	Castle Forbes Gdns ..	2·68	104
Angus.	Kettins School.....	1·59	59	*Galway*	Galway, Grammar Sch.	2·23	90
,, .	Pearsie House	1·82	..	,, .	Ballynahinch Castle ..	2·26	63
,, .	Montrose, Sunnyside..	1·32	65	,, .	Ahascragh, Clonbrock.	1·94	70
Aberd.	Balmoral Castle Gdns.	1·11	48	*Rosc .*	Strokestown, C'node..	3·10	129
,, .	Logie Coldstone Sch ..	1·39	56	*Mayo.*	Blacksod Point	2·22	79
,, .	Aberdeen Observatory.	1·50	64	,, .	Mallaranny.....	2·90	..
,, .	New Deer SchoolHouse	1·40	64	,, .	Westport House.....	2·35	79
Moray	Gordon Castle	1·73	82	,, .	Delphi Lodge.....	4·43	73
,, .	Grantown-on-Spey ...	..	..	*Sligo .*	Markree Castle.....	3·20	114
Nairn.	Nairn.....	1·37	76	*Cavan.*	Crossdoney, Kevit Cas.	3·83	..
Inv's .	Ben Alder Lodge.....	..	..	*Ferm .*	Crom Castle	2·47	89
,, .	Kingussie, The Birches	1·10	..	*Arm'h*	Armagh Obsy.....	·92	39
,, .	Loch Ness, Foyers....	..	..	*Down.*	Fofanny Reservoir ...	2·42	..
,, .	Inverness, Culduthel R	1·58	85	,, .	Seaforde	1·60	61
,, .	Loch Quoich, Loan...	..	..	,, .	Donaghadee, C. G. Stn.	1·65	73
,, .	Glenquoich.....	3·30	60	*Antrim*	Belfast,Queen's Univ .	1·12	48
,, .	Arisaig House	3 70	107	,, .	Aldergrove Aerodrome	1·29	57
,, .	Glenleven, Corrour ...	1·80	47	,, .	Ballymena, Harryville.	1·83	64
,, .	Ft. William, Glasdrum	..	..	*Lon .*	Garvagh, Moneydig...	1·20	..
,, .	Skye, Dunvegan	..	..	,, .	Londonderry, Creggan.	1·90	73
,, .	Barra, Skallary	1·19	..	*Tyrone*	Omagh, Edenfel.....	1.75	68
R&C.	Tain, Ardlarach.....	1.93	85	*Don .*	Malin Head.....	1·67	68
,, .	Ullapool	2·02	79	,, .	Dunfanaghy	..	..
,, .	Achnashellach	2·72	61	,, .	Dunkineely.....	2·31	..

Climatological Table for the British Empire, November, 1939

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...	1011·5	− 3·1	58	31	52·9	44·6	48·7	+ 5·2	45·9	92	7·8	4·43	+ 2·21	24	1·2	14
Gibraltar.....	1020·6	+ 2·6	70	51	64·4	55·3	59·9	− 0·1	54·7	82	5·3	2·97	—	8	6·7	66
Malta.....	1017·9	+ 2·0	78	50	67·6	59·4	63·5	− 0·4	57·7	75	4·7	1·33	− 2.24	7	6·4	63
St. Helena	1017·3	− 0·3	67	54	63·4	56·1	59·7	+ 1·2	56·7	94	9·7	2·39	+ 1·21	15	—	—
Freetown, Sierra Leone	1011·5	+ 2·1	87	70	81·7	75·1	78·4	--	74·0	89	7·4	3·26	− 1·86	12	—	—
Lagos, Nigeria	1011·4	+ 1·3	89	70	86·0	73·4	79·7	− 2·0	74·4	94	7·5	0·54	− 2·13	6	6·2	53
Kaduna, Nigeria	1011·3	—	91	53	88·6	58·3	73·5	+ 4·4	58·7	57	2·9	0·00	− 0·21	0	9·5	82
Zomba, Nyasaland....	1010·5	+ 1·6	93	59	83·4	64·9	74·1	+ 1·5	68·8	75	5·8	1·52	− 3·56	11	—	—
Salisbury, Rhodesia ..	1011·3	− 0·5	85	53	77·8	58·4	68·1	− 2·6	60·9	63	4·9	5·87	--	12	6·9	53
Cape Town	1016·3	+ 0·5	92	49	77·2	57·6	67·4	+ 3·0	60·5	68	3·6	1·19	+ 0·10	6	—	—
Johannesburg	1012·2	− 0·4	83	42	71·4	52·2	61·8	− 1·9	54·8	62	5·2	8·34	+ 3·38	13	7·8	58
Mauritius	1015·7	− 0·4	87	60	83·5	67·1	75·3	− 0·2	69·8	63	4·5	1·11	− 0·65	16	8·4	65
Calcutta, Alipore Obsy.	1011·9	− 1·4	88	57	84·2	65·4	74·8	+ 1·3	66·5	79	3·3	0·35	− 0·30	1*	—	—
Bombay	1010·4	− 1·6	94	68	90·3	72·9	81·6	+ 1·0	70·9	72	2·0	0·15	− 0·30	1*	—	—
Madras	1009·6	− 1·7	89	60	83·9	72·0	77·9	− 1·0	73·9	87	7·4	13·00	− 0·61	10*	—	—
Colombo, Ceylon ...	1009·8	− 0·2	88	71	84·5	73·9	79·2	− 0·8	76·1	81	7·1	19·71	+ 7·95	20	6·0	51
Singapore	1009·3	− 0·1	89	73	85·4	75·3	80·3	− 0·3	77·4	78	8·0	9·47	− 0·44	15	5·1	43
Hongkong.....	1015·9	− 1·7	87	54	76·6	67·4	72·0	+ 2·4	65·7	71	7·1	4·83	+ 3·09	5	4·1	37
Sandakan	1008·5	--	92	73	86·7	74·9	80·8	− 0·1	77·2	84	8·2	9·37	− 5·35	20	—	—
Sydney, N.S.W.....	1011·9	− 1·9	93	49	74·5	60·1	67·3	+ 0·3	60·9	61	6·4	2·05	− 0·80	13	8·1	58
Melbourne	1012·0	− 2·4	90	41	69·8	51·1	60·5	− 0·8	53·7	60	7·7	4·58	+ 2·35	17	5·6	40
Adelaide	1014·2	− 1·1	93	44	75·3	54·5	64·9	− 2·1	56·5	50	7·1	3·58	+ 2·44	13	6·6	47
Perth, W.Australia....																
Coolgardie																
Brisbane.....	1013·8	− 1·6	92	56	80·8	63·9	72·3	− 1·2	66·5	63	6·2	2·54	− 1·19	9	8·5	63
Hobart, Tasmania....	1008·4	− 1·2	88	39	64·3	48·2	56·3	− 0·9	51·4	60	7·4	3·88	+ 1·41	20	6·1	42
Wellington, N.Z.....	1015·7	+ 3·6	74	41	62·8	50·5	56·7	− 0·1	53·8	72	7·9	2·37	− 1·15	13	6·3	44
Suva, Fiji.....	1011·9	+ 0·8	89	67	82·1	70·4	76·3	− 0·8	71·2	77	7·3	10·82	+ 1·03	19	5·6	43
Apia, Samoa	1008·6	− 0·9	88	73	85·6	75·2	80·4	+ 1·7	76·4	76	6·1	5·98	− 3·85	15	8·5	67
Kingston, Jamaica ...	1010·8	− 1·6	92	69	85·1	72·3	78·7	− 0·6	71·5	91	7·1	25·97	+22·94	17	5·1	45
Grenada, W.I.																
Toronto.....	1023·4	+ 6·1	62	20	43·4	30·4	36·9	− 0·1	30·2	73	6·2	0·32	− 2·31	5	4·0	41
Winnipeg	1021·2	+ 3·8	61	5	41·6	20·5	31·1	+ 9 8	23·4	77	4·5	0·06	− 1·01	3	4·3	47
St. John, N.B.	1016·6	+ 2·0	53	16	40·9	27·6	34·3	− 2·4	28·3	77	5·1	2·16	− 2·25	6	5·1	53
Victoria, B.C.....	1018·5	+ 2·6	59	42	52·2	44·7	48·5	+ 4·0	47·0	86	8·7	4·17	− 1·24	24	2·1	23

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

(52049) Wt. 23/26/3717 1200 6 40 Hw. G.377.6