Some Facts about The Weather

BY

W. MARRIOTT, F.R.Met.Soc.

SECOND EDITION
REVISED

Price Sixpence

SOME FACTS ABOUT THE WEATHER

A POPULAR METEOROLOGICAL HANDBOOK

BY

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SECOND AND REVISED EDITION

LONDON

EDWARD STANFORD, 12, 13, & 14 LONG ACRE, W.C.

1909

CONTENTS

SOME FACTS ABOUT THE WEATHER

Weather Sayings.

EVERY one is interested in the weather, and it most frequently forms the first topic of conversation. The people of the present day, however, are not the first who have been interested in the weather; for we can go back right through the ages down to the time of Adam; who, as a farmer, must have been concerned about the changes of the weather for his crops.

Shepherds, sailors, and others engaged in outdoor occupations have been able by experience to foresee certain impending changes in the weather; and much of their knowledge has come down to us in the form of weather sayings and proverbs, such as :—

If the sun goes pale to bed,
'Twill rain to-morrow, it is said.

When the peacock loudly bawls,
Soon we'll have both rain and squalls.

When the wind veers against the sun,
Trust it not, for back 'twill run.

When the mist creeps up the hill,
Fisher, out and try your skill.

If woollen fleeces spread the heavenly way
Be sure no rain disturbs the summer day.

It is not proposed here to explain the old weather sayings; for they have been dealt with in a paper[1] read before the Royal Meteorological Society some years ago. The object of the following pages is rather to give some of the results which have been obtained from present-day systematic meteorological observations in the British Isles.

Meteorology.

John Ruskin has described the science of Meteorology in the following eloquent words :—

It is a science of the pure air, and the bright heaven; its thoughts are amidst the loveliness of creation; it leads the mind, as well as

[1] "Popular Weather Prognostics," by the Hon. R. Abercromby and W. Marriott, *Quart. Jour. Roy. Met. Soc.* vol. 9, p. 27.

the eye, to the morning mist, and the noonday glory, and the twilight cloud,—to the purple peace of the mountain heaven,—to the cloudy repose of the green valley; now expatiating in the silence of stormless æther,—now on the rushing wings of the wind. It is indeed a knowledge, which must be felt to be, in its very essence, full of the soul of the beautiful. For its interest, it is universal; unabated in every place, and in all time. He, whose kingdom is the heaven, can never meet with an uninteresting space,—can never exhaust the phenomena of an hour: he is in a realm of perpetual change,—of eternal motion,—of infinite mystery. Light and darkness, and cold and heat, are to him as friends of familiar countenance, but of infinite variety of conversation; and while the geologist yearns for the mountain, the botanist for the field, and the mathematician for the study, the meteorologist, like a spirit of a higher order than any, rejoices in the kingdoms of the air.[1]

Meteorology, in short, is that branch of science which deals with Climate and Weather.

Climate and Weather.

The term "Climate" may be defined as the average condition of meteorological phenomena at a given place; and under the term "Weather" may be included the precise condition of the atmosphere at any moment with regard to wind, pressure, temperature, cloud, moisture, precipitation, and electricity.

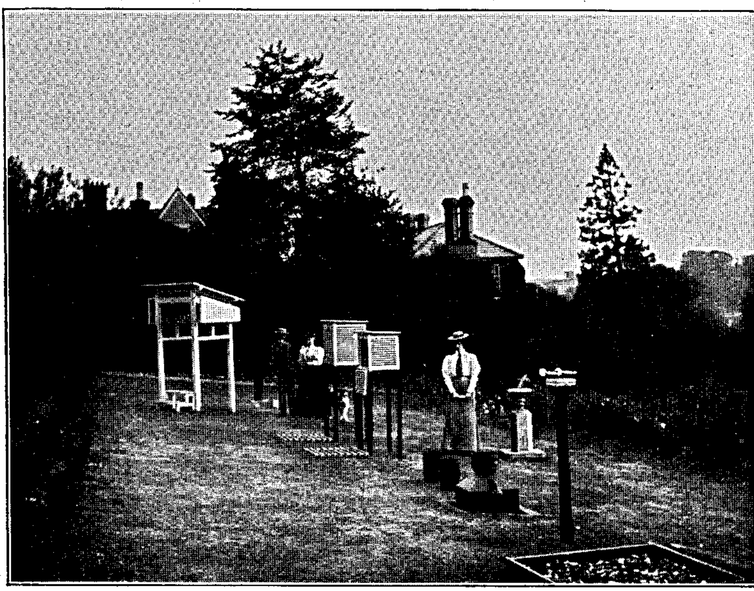
Most of the facts given in the following pages, which apply to the British Isles, really come under the designation of climate, but towards the end of the pamphlet reference will be made to weather and weather charts.

Instruments for observing Weather.

At a Climatological Station the necessary instruments are only a Stevenson Thermometer Screen containing Dry-Bulb, Wet-Bulb, Maximum, and Minimum Thermometers, and a 5-inch Snowdon Rain-Gauge. It is also desirable to have, if possible, a Campbell-Stokes Sunshine Recorder, a Grass Minimum Thermometer, and one or more Earth Thermometers. These should be placed on a lawn or in a field in the open, away from trees or buildings. The Stevenson screen should be so mounted that the bulbs of the thermometers shall be four feet above the ground, so that they may be nearly at the ordinary breathing level. The object of the thermometers is to give the tempera-

[1] *Transactions of the Meteorological Society*, vol. 1, 1839, p. 57.

ture of the air, and that can be obtained only by screening them from radiation and securing efficient ventilation. The rain-gauge must be fixed with its rim one foot above the ground; and the sunshine recorder must be so placed that it can command the sun the whole time that it is above the horizon. At many stations a barometer also is used, which should be of the Fortin or Kew pattern. The barometer is the most important of all



Climatological Station at Berkhamsted.

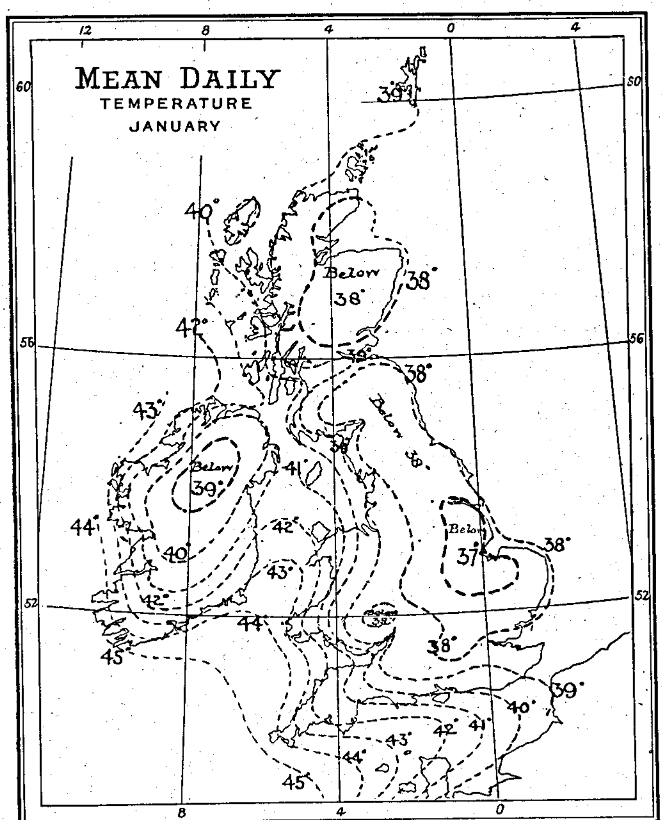
meteorological instruments for the investigation of the causes of weather, as will appear later; but more numerous stations are required for observing temperature, rainfall, and sunshine than for recording atmospheric pressure.

A full description of the various instruments and the methods of observation is given in *Hints to Meteorological Observers*, 6th edition (price 1s. 6d.).

Temperature.

The dry-bulb or ordinary thermometer shows the temperature of the air at the time of reading. The usual hour for recording its reading and also for taking the other observations is nine o'clock in the morning.

From the readings of the maximum and minimum thermometers we obtain the highest and lowest temperatures during the day. We know from continuous records that the minimum, or lowest, temperature usually takes place just before sunrise; and that the maximum, or highest, temperature occurs usually

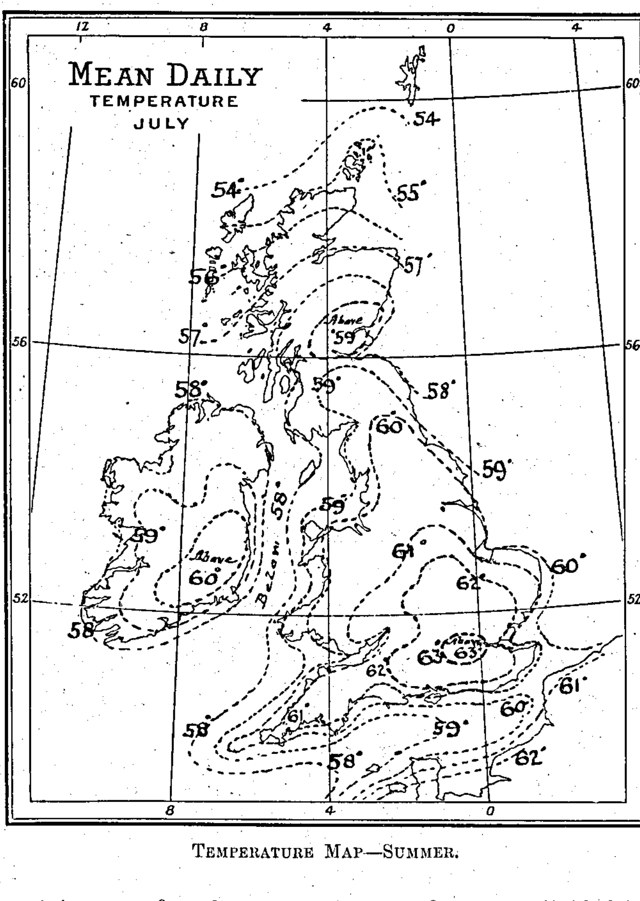


TEMPERATURE MAP—WINTER.

between one and two o'clock in the afternoon. The difference between these readings gives what is called the Range of Temperature during the day. This is an important element; for some places may have a greater range of temperature than others, and so may not be suitable for certain classes of invalids. The range of temperature is greatest at inland places, owing to radiation;

and it is least on the coast, where the moisture from the sea has a moderating effect on the range of temperature.

The "mean temperature" for the day is usually obtained by adding together the maximum and minimum temperatures and dividing the sum by 2. Thus, if the maximum be 64°·0 and



TEMPERATURE MAP—SUMMER.

the minimum 48°·0, the sum will be 112°·0; this divided by 2 gives 56°·0 as the mean. This is not exactly the same as the mean of 24 hourly observations, but very near it.

The mean temperature for the month is obtained by adding together the mean temperatures for the days which compose it and dividing the result by the number of days. The average of a large number of years shows that January is the month of lowest mean temperature, and that July is the month of highest mean temperature. In individual years the changes of temperature between the period of greatest cold and greatest heat are by no means regular. They always show considerable fluctuations, some of which have a tendency to recur about the same time each year; the most noticeable of which are the "cold days" about the middle of May, and the warm period at the end of November.

In summer time the temperature in the shade may reach 90°; it is not often, however, that it exceeds 93°. The only instances of such temperatures at the Royal Observatory, Greenwich, since 1841 are the following:—

93°·3—July 5, 1846.	94°·2—August 11, 1884.
94·5—June 16, 1858.	93·0—August 16, 1893.
93·0—July 18, 1859.	94·2—August 17, 1893.
96·6—July 22, 1868.	95·1—August 18, 1893.
93·0—July 15, 1876.	94·0—July 16, 1900.
94·0—July 17, 1876.	93·0—July 25, 1900.
93·8—August 14, 1876.	94·3—August 31, 1906.
93·1—August 15, 1876.	93·5—September 1, 1906.
97·1—July 15, 1881.	

In other parts of the country higher temperatures have been reported, as for instance: 100°·5 at Tonbridge on July 22, 1868.

In winter time the temperature may fall to 10° or lower. The only instances in which the temperature in the shade fell to, or below, that point at Greenwich since 1841 are the following:—

9°·8—January 8, 1841.	7°·7—January 4, 1867.
4·0—January 9, 1841.	6·6—January 5, 1867.
7·7—February 12, 1845.	9·8—December 25, 1870.
8·0—December 25, 1860.	9·6—February 7, 1895.
10·0—December 29, 1860.	6·9—February 8, 1895.

In some parts of the country which are favourable for great radiation at night, such as low ground and valleys, temperatures below zero are sometimes recorded, as for instance: −23° at Blackadder, Berwickshire, on December 4, 1879; and −17° at Braemar and −11°·1 at Buxton, Derbyshire, on February 11, 1895.

The British climate has the reputation of being very changeable. This is certainly true in regard to temperature, for there may be a rise or fall of 30° or 40° in the 24 hours. One of the greatest changes was that which occurred at Swarraton in Hants in January 1901, when the temperature fell to −1°·9 on the 9th, and rose to 49°·2 on the 10th; thus giving a rise of 51°·1 from one day to the next.

Spells of cold and warm weather may occur for days and weeks at a time. The prolonged frosts in London during the last century were as follows:—

Prolonged Frosts in London.

1813 December 26–1814 February 5	42 days.
1838 January 5–February 23	50 ,,
1855 January 10–February 25	47 ,,
1860 December 15–1861 January 19	36 ,,
1879 November 14–December 27	44 ,,
1881 January 7–26	20 ,,
1890 November 25–1891 January 22	59 ,,
1895 January 22–February 20	30 ,,

During the severe frost of 1895 the earth thermometers showed that the frost penetrated into the soil almost to the depth of 3 feet, and as a consequence water-pipes frequently burst which were not laid to that depth. This has shown the necessity of the water-pipes being laid fully 3 feet beneath the surface.

The temperature maps of the British Isles show that in winter the highest mean temperature is on the south-west and west coasts, and that it decreases towards the north and north-east; the coldest parts, however, are the eastern inland districts, while in summer the inland districts are the warmest. The influence of the water of the Atlantic is shown in a very marked manner by its effects on the west coasts. The prevailing winds and the Gulf Stream drift, in fact, have a genial influence on the climate of the British Isles, causing it to be much milder than it would have been if the temperature decreased uniformly according to latitude from the Equator to the Pole.

The wind has considerable influence upon the temperature of the air. From a discussion of the Greenwich records it appears that on the average the North wind depresses the temperature throughout the year. The North-east wind does the same, except in summer, when its effect is small. The East wind lowers the temperature very much in winter, and raises it generally in summer. The South-east wind does the same, but less markedly in winter. The South wind raises the temperature much in winter, but scarcely affects it in summer. The South-west wind does nearly the same. The West wind decidedly raises the temperature in winter and lowers it in summer. The North-west wind lowers the temperature generally, but most in summer.

As regards the effect of clouds, the temperature with a cloudless sky is much lower than the mean in winter, and much higher in summer. With an overcast sky the temperature is lower in summer, and differs little from the mean in winter.

On clear nights there is often great radiation, when the temperature on the grass falls considerably below that in the screen. Sometimes the difference may amount to 10° or 12°, and on extreme occasions to as much as 18°. It is these low temperatures or frosts on the grass, especially in May, that are so destructive to vegetation.

Atmospheric Pressure.

We are not always conscious of the presence of the air around us, as it is invisible; but we feel its effects when it is in motion, as wind. Air, however, has weight; the weight of the air in a vertical column with a cross sectional area of one square inch is approximately 14½ lbs. It is not possible to fix any upper limit for the atmosphere, but the contribution of the air above 50 miles from the earth's surface to the pressure at the surface is practically inappreciable. It is this weight which raises the water in the common pump to the height of about 34 feet, this being practically the balance of the weight of the atmosphere. As mercury is about 13 times heavier than water, a column of about 30 inches of mercury is held up in a tube, which has been freed from air, by the pressure of the atmosphere; and such a column of mercury is used as a barometer, for showing the changes in the weight of the atmosphere by differences in the height which is supported.

The mercury in the barometer expands and contracts as the temperature changes, and so does the scale from which the height of the mercurial column is read. Every barometer has therefore a thermometer attached to it, in order to show the temperature of the mercury in the tube and the temperature of the scale; and by means of tables of corrections we are able to reduce the readings of the barometer to a certain fixed temperature, viz. freezing-point, 32°. As the pressure becomes less and less as we ascend, it is desirable to reduce the readings of the barometer to a standard level, which is always taken as sea-level, in order to make the observations at different places comparable with each other.

In addition to the large and irregular fluctuations with which we are all familiar, the barometric pressure has a regular variation from hour to hour during the day which is most marked in the Tropics, but is very slight in the British Isles. This variation consists of a double fall and rise; the first fall is greatest about

4 or 5 a.m., and the first rise is greatest about 10 a.m. The second fall, giving the more pronounced minimum, reaches its lowest point at 3 or 4 p.m., and the second rise reaches its maximum about 10 or 11 p.m., according to the time of year.

The average height of the barometer at sea-level in London is 29·955 inches. There is, however, often great variation from this value. The highest recorded readings in the British Isles have been :—

31·007 inches on February 24, 1808, at Gordon Castle, Banff.
31·065 ,, on January 9, 1820, at Leith.
31·108 ,, on January 9, 1896, at Ochtertyre, Crieff.
31·110 ,, on January 31, 1902, at Aberdeen.
31·097 ,, on January 28, 1905, at Falmouth.
31·060 ,, on January 23, 1907, at Aberdeen.

The lowest recorded readings have been :—

27·690 inches on January 7, 1839, at Aberdeen.
27·980 ,, on December 27, 1852, at Culloden.
27·630 ,, on December 31, 1865, at Hoy Low Light, Orkney.
27·332 ,, on January 26, 1884, at Ochtertyre, Crieff.
27·380 ,, on December 8, 1886, at Belfast.

So far as is known, the actual highest and lowest pressures which have been observed in other parts of the world are :—

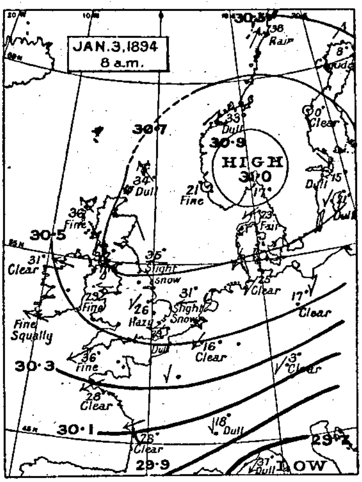
31·717 inches on December 20, 1896, at Irkutsk, Siberia[1]; and
27·135 inches on September 22, 1885, at False Point, on the coast of Orissa, India.

If the barometer readings, when reduced to sea-level, be plotted on maps, lines may be drawn through those places which have the same values, and the result is Isobaric charts, the lines called *isobars* representing equal barometric pressure. Such charts show very clearly where the pressure is highest or lowest. When bounded by more or less circular or elliptical isobars the areas of high pressure are called Anticyclones, and the areas of low pressure are called Cyclones.

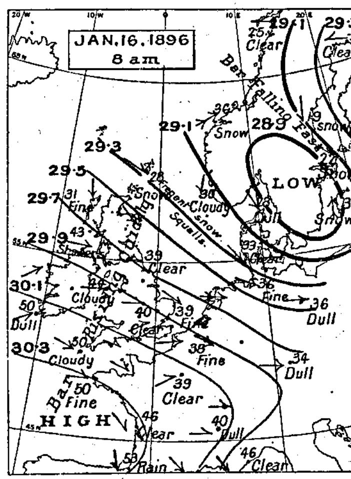
If on such charts the direction of the wind be also plotted by means of arrows, it is at once seen that the arrows fly nearly parallel with the isobaric lines, but tend towards the lower pressure. Round the areas of high pressure they move in the direction of the hands of a watch, blowing outwards on the whole from the highest pressure; but round the areas of low pressure they circulate in the direction opposite to the hands of a watch, and blow inwards on the whole towards the lowest pressure.

[1] This includes a very large correction for height above sea-level and may be affected by error. The highest barometer reading measured at sea-level was 31·510 inches at Riga on January 23, 1907.

These are the directions in the Northern Hemisphere; in the Southern Hemisphere the directions round the areas are reversed. We notice that when the isobaric lines are close together (a steep gradient) the wind is stronger than when the lines are wide apart (a gentle gradient). We also see by such charts how the distribution of the atmospheric pressure determines the direction of the wind. The pressure for the British Isles is on the average



ANTICYCLONE.



CYCLONE.

lowest in the north or north-west and highest in the south or south-east, thus corresponding with the prevailing direction of the wind from the South-west.

Wind.

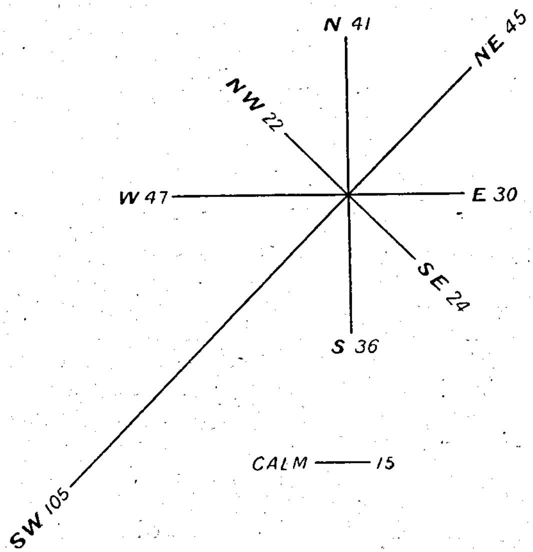
The direction and the force of the wind are determined by the distribution of barometric pressure.

The direction of the wind can be ascertained by observing a well-balanced vane or weathercock; or it may be continuously recorded by an anemometer.

The average number of days in the year on which the wind blew from the different points of the compass at the Royal Observatory, Greenwich, during the 50 years 1859-1908, is shown in the accompanying diagram or "wind-rose."

It will be seen, consequently, that the prevailing direction of the wind is from the South-west. In spring there is often a considerable prevalence of North-easterly winds. In exposed parts of the country the trees often give an indication of the usual direction of the wind, by the way in which the trunks are inclined or the branches permanently driven out in a trailing fashion.

At a number of observatories the pressure and velocity of the



Days of Winds from Different Points of the Compass.

wind are recorded by means of anemometers, and many interesting results are obtained from these instruments. When, however, the observer is unable to provide an anemometer, he can by experience roughly estimate the force of the wind by Beaufort's Scale. This, with the equivalent velocities determined from the most recent comparisons by the Meteorological Office, is as follows :—

Beaufort Scale.	Equivalent Velocity.
0 Calm	0 miles per hour.
1 Light Air	1-3 ,,
2 Light Breeze	4-7 ,,
3 Gentle Breeze	8-12 ,,
4 Moderate Breeze	13-18 ,,
5 Fresh Breeze	19-24 ,,
6 Strong Breeze	25-31 ,,
7 Moderate Gale	32-38 ,,
8 Fresh Gale	39-46 ,,
9 Strong Gale	47-54 ,,
10 Whole Gale	55-63 ,,
11 Storm	64-75 ,,
12 Hurricane	Above 75 ,,

The velocity of the wind on the average has a diurnal variation; the greatest being about midday, and the least during the night. On mountains, however, the velocity is least and the wind uphill in the day, and the velocity is greatest and the wind downhill at night.

On the coast, in settled weather, the wind blows off the sea to the land in the daytime, and off the land to the sea at night, producing what are called "land and sea breezes." These are due to the land heating during the day and cooling at night more rapidly than the sea.

During gales the wind attains a high velocity, the greatest recorded in one hour being between 77 and 80 miles at Fleetwood. In gusts, however, the velocity of the wind may momentarily exceed the rate of 100 miles an hour. At Pendennis Castle, Falmouth, the anemometer on one occasion recorded a gust at the rate of 103 miles per hour.

At times of irregular barometric conditions, especially with light gradients, whirlwinds may be formed. These are eddies or whirls of great intensity, and often only of a comparatively few yards in diameter; but they sometimes travel for many miles and cause great havoc in their path.

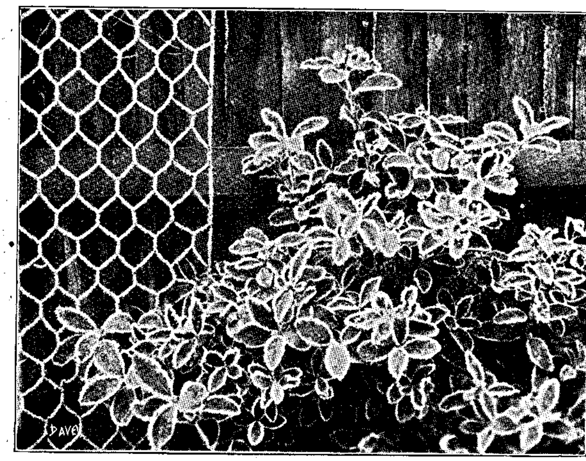
Moisture.

The late Mr. H. F. Blanford, F.R.S., used to relate the following incident that took place in Calcutta many years ago. A gentleman who had not much acquaintance with science was sitting one evening with a glass of iced brandy and water before him. It was in the rainy season, when the air, though warm, is very damp, and he had a large lump of ice in his tumbler. On taking it up he noticed, to his surprise, that the glass was wet on the outside, and was standing in quite a little pool of water on the table. At first he thought his tumbler was cracked, but putting some of the fluid to his tongue he found it was tasteless. "Very odd," he remarked; "the water comes through the glass, but the brandy doesn't."

This was given as an illustration of the presence of moisture in the air, which had been condensed on the outside of the glass, which had lowered it below the temperature at which it can contain all the moisture present, technically called the "dew-point," by the ice placed in the water. It is also an excellent warning against coming to a hasty conclusion from ill-considered observations.

On nearly every fine morning after a cloudless night we see the grass and leaves of the trees covered with dew; and in winter time the beautiful effects of hoar-frost and rime are produced in a similar manner by the air being cooled below the temperature of the dew-point, and consequently parting with some of its moisture.

The quantity of water-vapour or moisture which the air can contain is dependent on the temperature. The air at a temperature of 30° can contain 1·97 grains of water-vapour in a cubic foot; at 50° it can contain 4·10 grains; at 70° it can contain



HOAR-FROST.

8·01 grains; and at 90° it can contain 14·85 grains. Thus, the higher the temperature of the air, the greater is its capacity for moisture. When the full capacity of the air for vapour has been reached, the air is said to be "saturated."

The instruments used for measuring the amount of moisture present in the air are the Dry-Bulb and Wet-Bulb Thermometers. The dry-bulb is an ordinary thermometer, and shows the temperature of the air; the wet-bulb is a precisely similar thermometer, only it has the bulb covered with a piece of muslin, which is kept wet by a conducting thread passing into a small vessel of water. If the air is dry the moisture evaporates from the damp muslin, and in doing so lowers the temperature, and consequently this thermometer reads lower than the dry-bulb. If there is considerable difference between the readings of the two thermometers, it indicates that the air is very dry; but if the readings are almost alike, it shows that the air is nearly saturated with moisture.

By means of Hygrometrical Tables[1] we are able from the readings of these two thermometers to calculate the amount of moisture present in the air, and also to express it as "Relative Humidity," or the percentage of total saturation which is present.

The air obtains its moisture by the evaporation from the waters of the ocean and from other moist surfaces.

Cloud.

When the air is cooled below the dew-point, or point of saturation, the moisture becomes visible in the form of cloud or fog.

Much information on the conditions prevailing in the upper air may be obtained from observations of clouds.

Luke Howard, a Quaker gentleman, in 1803 devised a nomenclature for the various forms of cloud. This was in use until some few years ago, when a meeting of the meteorologists of all nations devised the following modification of it as an international nomenclature, which is now generally used:—

Cloud Forms.

Name.	Abbreviation.	Approximate Altitude.
Cirrus (Mare's Tail)	Ci	27,000 to 50,000 feet.
Cirro-Stratus	Ci-St.	Average 29,000 ,,
Cirro-Cumulus (Mackerel Sky)	Ci-Cu	10,000 to 23,000 ,,
Alto-Cumulus	A-Cu	10,000 to 23,000 ,,
Alto-Stratus	A-St.	10,000 to 23,000 ,,
Strato-Cumulus	St.-Cu	About 6,500 ,,
Cumulus	Cu	4,500 to 6,000 ,,
Cumulo-Nimbus (Storm Cloud)	Cu-Nb	4,500 to 24,000 ,,
Nimbus (Rain Cloud)	Nb	3,000 to 6,500 ,,
Stratus	St	0 to 3,500 ,,

By noticing the type of cloud, and also its direction and rate of motion, we can usually form some idea as to the kind of weather that is likely to follow. The high clouds, especially Cirrus, are often the first warning of a coming change of weather, and the ragged forms of Cumulo-Nimbus are a common prognostic of thunderstorms.

It is usual to observe the proportion of the sky covered with cloud. This is done by estimation, the scale adopted being 0 to 10; 0 indicating a cloudless sky, and 10 a sky which is completely covered with cloud or overcast.

Cloudless days are most numerous in spring and autumn, and

[1] These may be consulted in *Hints to Meteorological Observers.*

least so in winter and summer. The days of medium cloud are much more numerous in summer than in winter; while the overcast days are much more numerous in the winter half-year, and least numerous in the summer months.

Rain.

Rain is produced by the cooling of the air; and in nearly all cases this cooling is produced by the expansion of the air in ascending from lower to higher levels in the atmosphere, clouds being usually a stage in rain-formation.

For the purpose of measurement the rain is collected in a rain-gauge, and the water measured off in a graduated glass jar in hundredths of an inch. By an inch of rain is meant the height to which the water would stand on the level, provided it did not run off, or soak into the ground, or evaporate. An inch of rain over an acre of surface is equal to 101 tons of water.

The average monthly rainfall at the Royal Observatory, Greenwich, for the 90 years 1815-1904 is as follows:—

	ins.		ins.
January	1·81	July	2·45
February	1·54	August	2·32
March	1·52	September	2·24
April	1·60	October	2·71
May	1·95	November	2·28
June	1·95	December	1·95

Yearly Total, 24·32 ins.

The average rainfall for London as a whole is 25 inches. February and March are the driest months, and October is the wettest month. There is, however, a considerable increase in the rainfall from June to July—in fact, July is a wet month. This is due to the thunderstorms which often occur at that time of the year. The difference between the June and July rainfall is a very marked feature all over the country.

The rainfall is very variable from month to month: some months may have as much as 6 inches, while others may have only a few hundredths of an inch or even none at all.

At Seathwaite in Borrowdale, Cumberland, the average yearly rainfall is about 135 inches; while at the Stye Head, a mile from Seathwaite, the annual rainfall is about 170 inches. In that district the falls are usually large in amount, and may often exceed 1 or 2 inches, and sometimes even 3 or 4 inches, in one day. The greatest recorded fall at Seathwaite was 8·03 inches on November 12, 1897. This, however, is not the largest amount that has fallen in this country on one day. For on August 6, 1857, 9½ inches were measured at Scarborough, and the fall was still heavier, for the gauge overflowed.

A "rain day" is taken to be a day on which ·01 inch has been recorded. The average number of rain days is about 150 per annum in the south-east of England, and the number increases to over 250 in the north-west of Ireland and Scotland.

It is generally understood that rainfall increases with altitude above sea-level. This is borne out by observations, as will be seen by the following results of the grouping of over 300 stations in England and Wales for each 100 feet altitude during the period 1881-90 [1] :—

Altitude.	Rainfall.	Altitude.	Rainfall.
100 feet	27·69 ins.	500 feet	[2] 40·64 ins.
200 ,,	30·50 ,,	600 ,,	37·38 ,,
300 ,,	31·49 ,,	700 ,,	39·01 ,,
400 ,,	32·49 ,,		

As already stated, the prevailing wind in this country is from the South-west. The air comes from the Atlantic charged with a considerable amount of moisture, and in the western districts it has to rise until it reaches the highest summits. In doing so, it is cooled, and so its capacity for moisture is greatly reduced, and, as a consequence, it has to part with some of its moisture. On descending on the leeward, or eastern side, the air becomes warmer, and, having parted with a considerable amount of its moisture, it is much drier. Hence it is that in the western part of the country there is more rain than in the eastern part. This will be seen very strikingly in the following figures :—

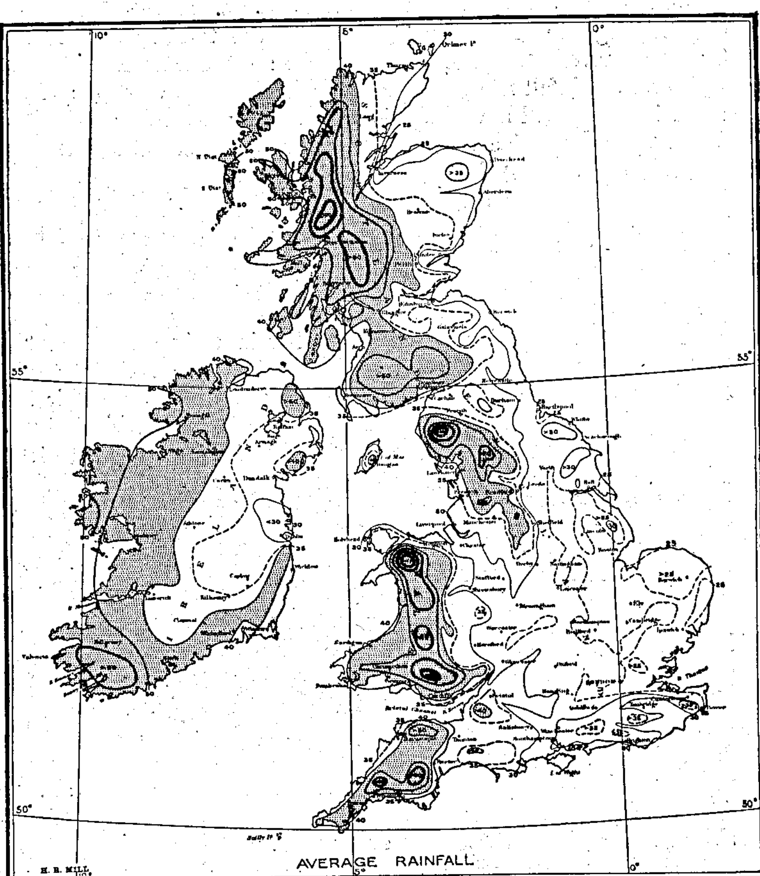
Altitude.	Rainfall. West.	Rainfall. East.
100 feet	33·15 ins.	24·82 ins.
200 ,,	35·87 ,,	25·94 ,,
300 ,,	35·72 ,,	26·89 ,,
400 ,,	39·56 ,,	28·45 ,,
500 ,,	[2] 46·08 ,,	29·87 ,,
600 ,,	38·08 ,,	35·84 ,,
700 ,,	41·25 ,,	35·27 ,,

The rainfall map of the British Isles brings out these features very prominently. We see at once that the western parts of the country, and especially the hilly districts, are much wetter than the eastern parts. The driest district is over the eastern counties, where the average is only a little over 20 inches. The average rainfall over the whole surface of the British Isles is about 39½ inches; over England it is about 32 inches, over Wales 49 inches, over Scotland 47 inches, and over Ireland 42·6 inches.

[1] *Quarterly Journal of the Royal Meteorological Society*, vol. **26**, p. 273.

[2] This value is greatly increased by the heavy rainfall at Seathwaite and neighbouring stations.

The late Mr. G. J. Symons, F.R.S., started the British Rainfall Organisation in 1860, and through his instrumentality a large amount of data on the question of rainfall has been collected; this work is now being continued by Dr. H. R. Mill,



DISTRIBUTION OF ANNUAL RAINFALL (DR. H. R. MILL).

aided by more than 4500 observers scattered over the British Isles. The information thus obtained is of the greatest scientific value, and is also useful on questions relating to water supply, agriculture, and drainage.

From the long-continued series of rainfall records it is readily seen that there are considerable variations in the annual amounts.

The London records of rainfall show that from 1730 to 1750 there was a succession of dry years, and that from 1875 to 1883 there were nine consecutive wet years. And we all know that from 1892 to 1908, with one or two exceptions, notably that of 1903, there has been a succession of dry years.

With regard to limited fluctuations in the total rainfall, Mr. Symons arrived at the following results: (1) The wettest year will have a rainfall nearly half as much again as the average; (2) the driest year will have one-third less than the average; (3) the driest two consecutive years will each have one-quarter less than the average; and (4) the driest three consecutive years will each have one-fifth less than the average.

These general features are applicable to all parts of the country, subject to the slight modification, namely, that at the wet stations the extremes of both wettest and driest are less pronounced than at dry ones.

At times excessively heavy falls of rain may occur in all parts of the country. For instance, on July 14, 1875, 5 inches fell in twenty-four hours over the whole of Monmouthshire. The heaviest rainfall recorded in one hour in any part of the British Isles was 3·63 inches at Maidenhead on July 12, 1901. When such heavy falls take place serious floods ensue. Much valuable information as to the rate at which rain falls may be obtained from self-recording rain-gauges. This is of great assistance to engineers and surveyors in enabling them to provide drains of sufficient capacity to carry off the storm water.

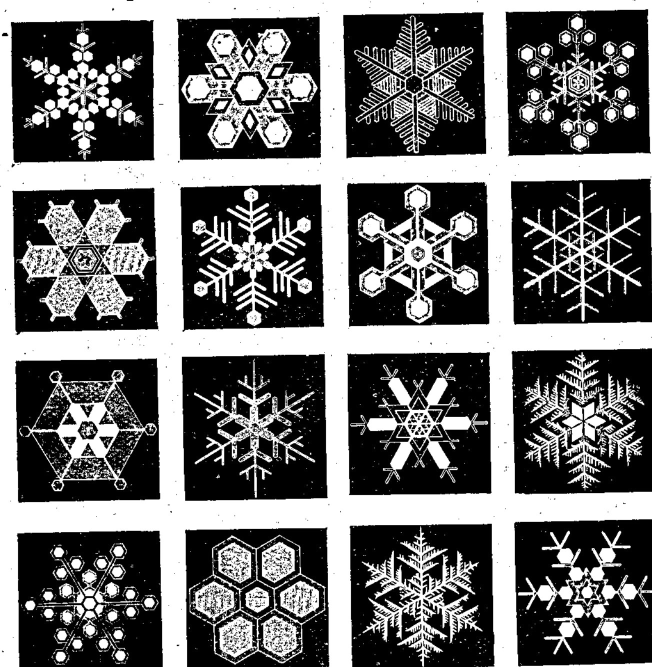
At times droughts ensue, when the supply of water falls very low or becomes exhausted. It is necessary that the engineer should make the reservoirs of sufficient capacity to provide for all these contingencies. The question of water-supply has become a very serious matter; for not only is a larger quantity used for domestic purposes, but vastly larger amounts are now used for manufacturing purposes. As the underground waters are also drawn upon by pumping operations, the reserves of water available are becoming less and less every year.

Snow.

When the temperature is below the freezing-point, precipitation usually takes the form of snow.

Snowflakes in very cold weather are small six-pointed crystals, and exhibit great variety. Scoresby, Glaisher, and others have made a large number of drawings of snow crystals; and these show that they are of extreme beauty. During recent years many photographs of snowflakes under the microscope have also been obtained, notably by Mr. W. A. Bentley, of Jericho City, Va., U.S.A.

It is extremely interesting to examine on the sleeve of the coat the snowflakes as they fall, and to look at them under a magnifying glass. Any one who does this is sure to be charmed by their exquisite beauty. The large feathery snowflakes



Snow Crystals observed by James Glaisher, F.R.S.

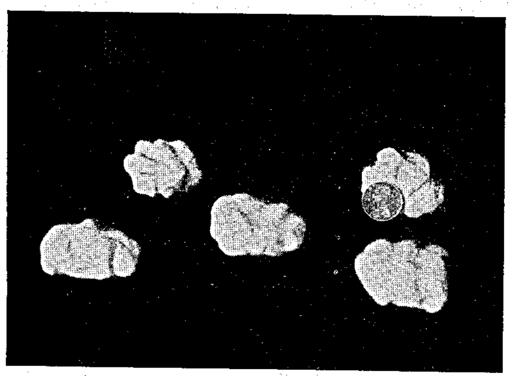
common in this country are composed of a number of snow crystals entangled together and usually just melting.

Although snowflakes are so small and light, still, when they accumulate, they often do a great deal of damage—especially if the wind is high and causes snow-drifts. These render traffic almost impossible, and often cause loss of life.

A foot of snow is roughly equal to an inch of rain. Snow, however, varies much in density; and 16 inches of very loose snow may only produce an inch of water. At other times, especially in blizzards, snow may be granular, something like sand, and then 7 inches may produce an inch of water.

Hail.

Occasionally, especially in thunderstorms, the precipitation takes the form of hail, which is frozen rain. Ordinary hailstones are small; but at times they may be very large. There are many instances on record in this country in which hailstones as large as eggs have fallen, and in some cases even as large as an orange. A notable case was that at Richmond in Yorkshire on July 8, 1893, when hailstones 6 to 7 inches in circumference fell. Photographs were taken of these hailstones, and they showed that the outer coating of the hailstones was of a white



Models of Hailstones which fell at Montereau, France, August 15, 1888.
(A penny, which is 1·2 inch in diameter, is placed by the side.)

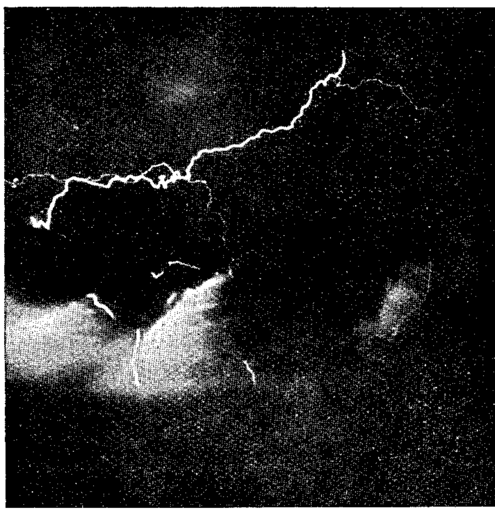
opaque substance; the next coating was of clear ice; and this was followed by alternate coatings of opaque and clear ice. Some of the hailstones had as many as nine distinct coatings. When hailstones of such size fall, it is no wonder that great quantities of glass are destroyed, and that even corrugated iron is perforated by them.

Lightning.

Artists have frequently been accustomed to depict flashes of lightning by a series of zigzag lines. Photographs, however, which have been taken of lightning flashes show that they are not of this angular appearance.

A lightning flash may assume various forms. Sometimes it is a sinuous wavy line, at others it has a number of branches, and occasionally it appears to dart all over the sky. There is no doubt lightning takes what may be called "the path of least resistance," and this accounts for its apparently erratic course.

Sometimes lightning may appear to flicker. This is probably due to there being a succession of flashes following one another along the same path. This has been clearly shown on a number of photographs which have been taken by a camera which has been moved during the exposure, by the stationary objects on the photograph having the same amount of displacement as the



LIGHTNING.

lightning flashes. On one occasion the camera was purposely swayed to and fro during a thunderstorm, when a succession of flashes following the same path were shown on the photographic plate. At the brighter parts of the flash, the lightning was so intense and prolonged as to produce streaks across the plate from one flash to the next. This shows that, on the occasion in question, the lightning was not instantaneous, but was of sufficient duration to cause streaks of light to appear on the photograph.

If we count the number of seconds between the time of seeing the flash and of hearing the thunder, we can estimate the distance of the storm, because lightning is seen practically instantaneously, while the sound of thunder travels at a definite rate. An interval of five seconds would indicate that the flash is about a mile distant. By determining the interval between the lightning and thunder for successive flashes, and noting whether it is decreasing or increasing, we can readily know whether the storm is approaching or receding.

Lightning is liable to strike exposed objects; so it is desirable that houses and buildings should be provided with efficient lightning-conductors. Trees also are very frequently struck by lightning (some kinds of trees more often than others); so it is not desirable for any one to take shelter under a tree during a thunderstorm. Animals are frequently struck by lightning when sheltering under trees; and several cases have been reported where a whole herd of cattle, 12 or 16 in number, have been killed by a single flash.

Many persons have stated that during a thunderstorm they have seen a ball or globe of fire fall to the earth or run along the ground. This may possibly be due to the lightning coming in the direct line of vision to the observer, and so being visible and brighter for a longer time than the other parts of the flash. It is a phenomenon which is not yet fully understood, and any observations of lightning of this form are of value.

Deaths by lightning are fortunately not numerous. In England and Wales, during the 29 years 1852-80, there were in all 546 deaths, the yearly average being 19. The average annual rate is, however, rather less than 9 per 10,000,000 living.

Reports are often circulated that a "thunder-bolt" has fallen. When these reports are investigated, it is frequently found that the so-called thunder-bolt is merely some wire or metal which has been melted by the lightning. When lightning strikes soil of a sandy character it fuses the particles of sand, and forms what is called a "fulgurite."

Sheet-lightning, or the popularly called "summer lightning," is the reflection of lightning taking place during a thunderstorm at a considerable distance away. Instances have occurred in which lightning has been seen at night for a distance of over 100 miles from the actual thunderstorm with which it was associated.

Thunderstorms.

Thunderstorm formations are usually small atmospheric whirls. As the wind nearly always falls light or calm during their occurrence, while there is considerable and often violent motion in the clouds above, and as the thunder-clouds are of no great altitude, it is most probable that the whirl is confined to a stratum of air at only a little distance above the earth's surface. The whirl may vary from 1 mile to 10 miles or more in diameter. Sometimes a violent wind occurs during a thunderstorm; this probably takes place when the storm is of low altitude. There are often several whirls near together, or following one another along the same track. Thunderstorms evidently take the path of least resistance, and consequently are most frequent on flat and low ground.

The areas affected by individual thunderstorms are usually narrow and irregular in form as traced by the amount of rainfall, and it is not uncommon to find a number of storm areas in a straight line separated by nearly dry patches.

Thunderstorms appear to travel at an average rate of about 18 miles per hour in ill-defined low barometric systems, but at a higher rate in squally conditions, accompanying subsidiary barometric depressions or "secondaries."

Several thunderstorms have been tracked across England in a direct line from south to north for over 400 miles, the rate of progression being about 50 miles per hour.

There is also another type of thunderstorm in which the region of simultaneous thunder disturbance extends along a line which may be 100 miles long. This line advances parallel to itself, usually in a direction from north-west to south-east, and its rate of progress may amount to 50 miles an hour. Such storms have been called "line thunderstorms."

Sunshine.

Great importance is nowadays attached to the question of the duration of sunshine. This is best recorded by the Campbell-Stokes Sunshine Recorder, which consists of a solid glass ball 4 inches in diameter, in the focus of which a card is placed, on which the sun burns its own record.

It appears that the greatest amount of sunshine during the year is recorded along the south coast, and less at inland places, especially in the neighbourhood of manufacturing districts, where the large quantities of smoke belched forth into the air obstruct the sun's rays.

The average monthly amounts of bright sunshine at five stations in various parts of England for the 25 years 1881-1905 are as follows:—

	Falmouth.	Hastings.	Kew.	Oxford.	York.
	hrs.	hrs.	hrs.	hrs.	hrs.
January	57	61	42	48	30
February	83	82	56	66	57
March	138	137	106	113	102
April	179	173	149	151	136
May	236	235	201	195	178
June	227	229	196	193	176
July	228	240	208	203	178
August	213	213	188	185	151
September	160	167	141	145	120
October	117	119	94	101	84
November	73	71	50	57	39
December	55	56	36	41	25
Year	1766	1783	1467	1498	1276

Sunshine has in most cases a very beneficial effect upon health.

The Upper Air.

Attempts have been made at various times to ascertain the meteorological conditions prevailing in the upper atmosphere.

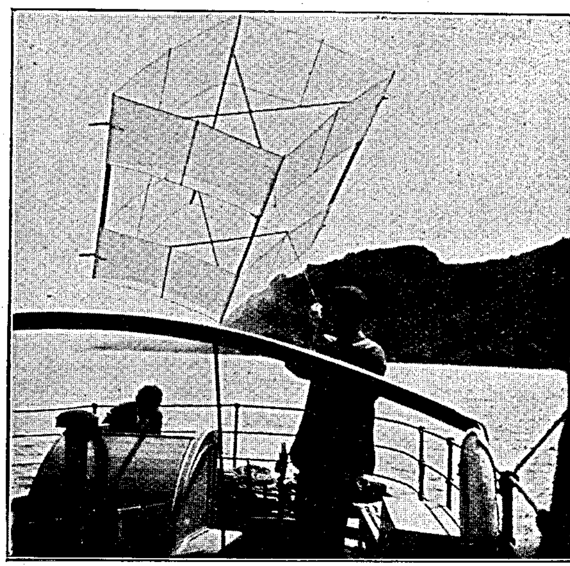
In the years 1862-6 Mr. James Glaisher, F.R.S., made over twenty balloon ascents for this purpose, along with Mr. Coxwell, the aeronaut, on behalf of the British Association. The most remarkable ascent was that from Wolverhampton on September 5, 1862, when it was estimated that they reached an altitude of seven miles above the earth.

A few years later it was thought that much valuable and regular information on the upper air might be obtained from the summits of mountains, and accordingly a number of observatories were established in various countries. In this country the Observatory on Ben Nevis was started in 1883, at a height of 4400 feet above sea-level, and it was continued for a period of twenty-one years, during which time observations were made at every hour day and night.

As the temperature of the air decreases at the rate of about 1° for nearly every 300 feet, the temperature on the summit of Ben Nevis is about 15° colder than at Fort William, and consequently the snow on the top thus remains unmelted for the greater part of the year. It is found that the mountains themselves become heated by the sun's rays and also deflect the air currents. The results obtained from mountain observatories are therefore not quite the same as those in the free air.

During recent years great success has attended the efforts to obtain information as to the meteorological conditions in the upper free air by means of kites. The pattern of kite used for this purpose is the box kite, and the object of sending it up is to carry a meteorograph, which is a combined instrument for recording the pressure, temperature, and humidity of the free air. As these kites often ascend to a height of several miles above the surface, it is necessary to use steel wire, and also to have an engine for winding it out and in.

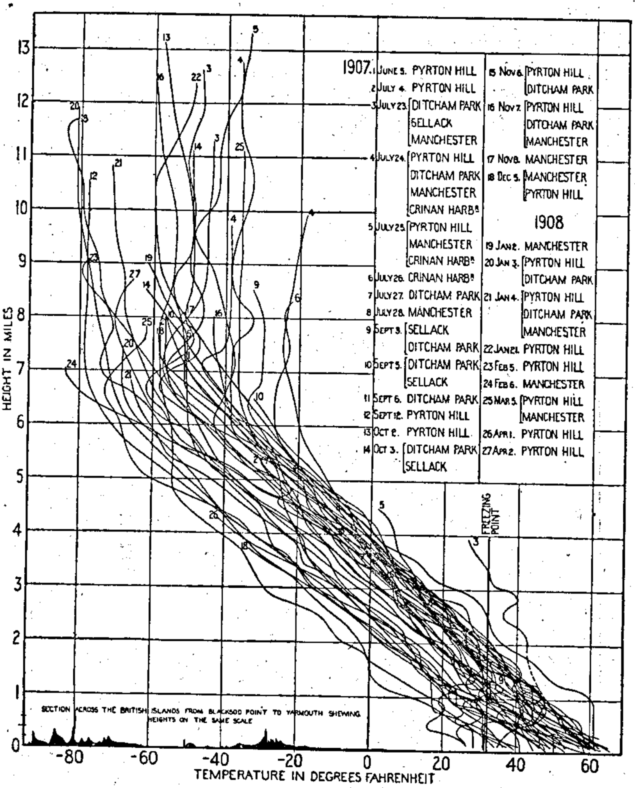
Kite observations have been carried out in this country by Mr. W. H. Dines, F.R.S., on behalf of a Joint Committee of the



MR. DINES STARTING A KITE.

Royal Meteorological Society and the British Association. They are now continued officially by the Meteorological Office and also by several private observers. Small pilot balloons are also sent up for determining the drift of the upper currents. Much valuable information has been obtained from these observations as to the temperature and humidity of the air, and the direction and force of the wind, at great altitudes during different types of weather.

On specified occasions a sounding balloon carrying a very light meteorograph is sent up, and such balloons sometimes reach an altitude of as much as 16 miles above the earth's surface. The interesting point brought out from the records obtained during the ascents of these balloons, is that the temperature of the air decreases pretty uniformly up to about 6 or 7 miles above the



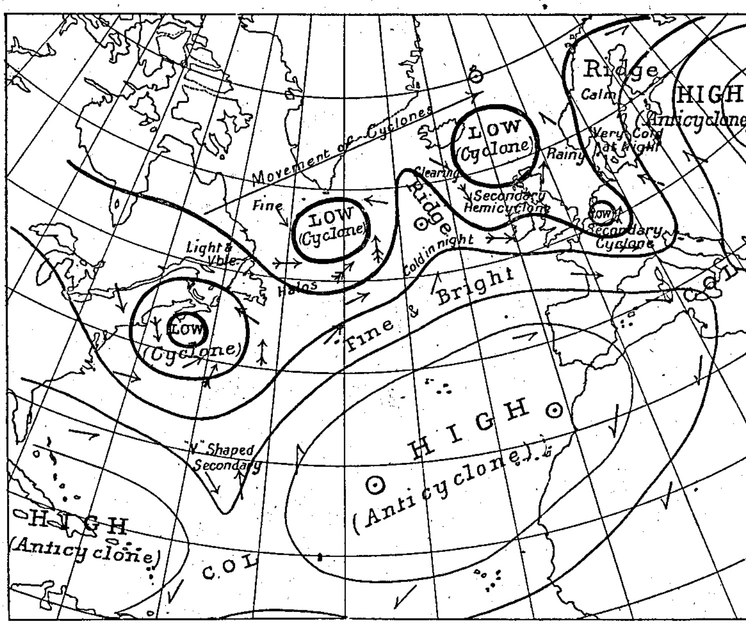
VARIATION OF TEMPERATURE WITH HEIGHT. FROM "BALLON-SONDE" ASCENTS, 1907-8. [From the Report of the Meteorological Committee, 1908, by permission of the Controller of H.M. Stationery Office.]

earth, but beyond that height there is little or no change, and in fact there is often an increase in temperature.

Weather Charts.

In nearly every civilised country there is a Government Weather Service, charged amongst other duties with publishing daily synoptic charts of the distribution of atmospheric pressure, temperature, wind, rain, etc. Such a map for the British Isles and North-west Europe for 6 p.m. appears the following morning in *The Times* newspaper, and another for 7 a.m. is published with the data on which it is founded in the *Daily Weather Report* of the Meteorological Office.

From these charts it is evident that there is a distinct relation existing between the distribution of pressure and the direction and force of the wind, and the temperature and weather generally.



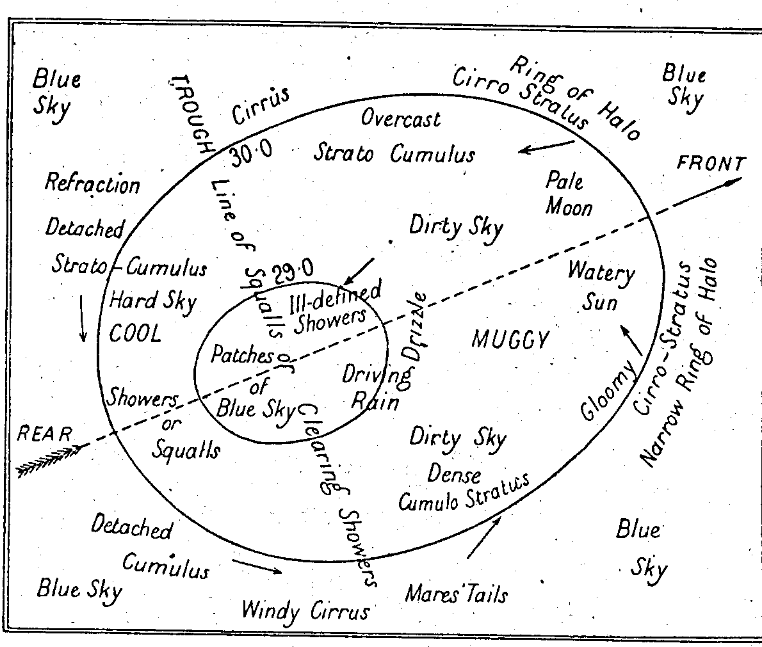
TYPICAL SHAPES OF ISOBARS.

A cursory glance at a number of maps shows that there is nearly always present either an area of low pressure, called a "cyclone," usually having an approximately circular form, and as a rule moving in an Easterly or North-easterly direction; or an area of high barometric pressure, called an "anticyclone," also nearly circular in form, but almost stationary in position. The wind in all cases also blows in a direction nearly parallel with the isobars or lines of equal pressure, having the region of lowest pressure on the left hand. This relation is expressed in Buys-Ballot's law for the Northern Hemisphere, viz.:—

"Stand with your back to the wind, and the barometer will be lower on your left hand than on your right."

The weather in the various parts of a typical cyclone and also of an anticyclone is shown in the accompanying figures.

In the extreme front of a cyclone there is a blue sky; then, as the barometer begins to fall, cirro-stratus cloud, with probably a halo, makes its appearance, which gradually becomes lower and denser, and forms an overcast sky. The temperature rises, and the air feels muggy and close. As the centre of the depression

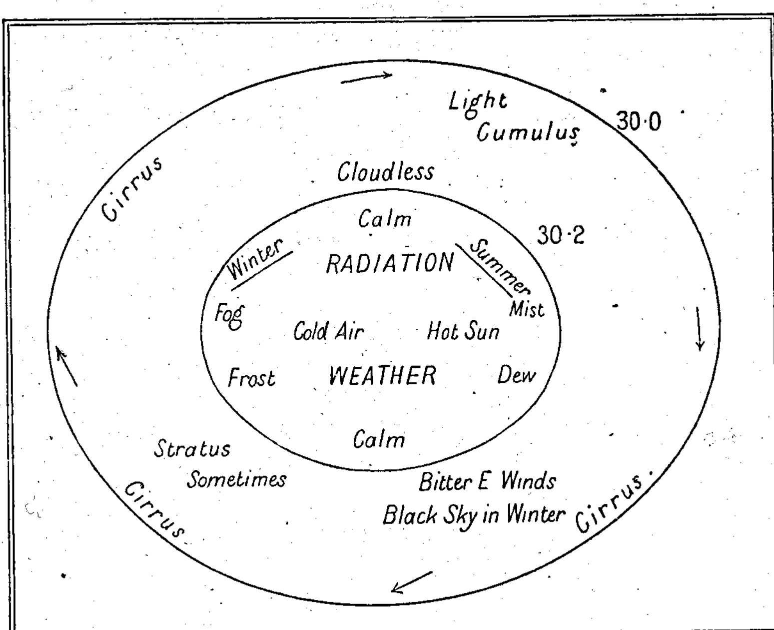


Weather in a Cyclone.

approaches, rain sets in and continues till the barometer turns to rise. The passage of the trough is often associated with a squall or heavy shower, commonly known as a "clearing shower." Immediately the air becomes cooler, losing the former muggy sensation, and soon patches of blue sky appear.

The shift of the wind is different in the right-hand portion of the depression from what it is in the left-hand portion. In the former, on its first approach the wind "backs" to South or South-east; and as the depression passes along the wind gradually "veers" to South-west and West, with increasing force. In the left-hand side of the depression the wind "backs" right round from South to South-east, and then on to East, North-east, North, and finally North-west, when it gradually abates and the weather becomes fine. The direction of the wind and consequently the accompanying weather depend upon whether the depression passes to the north or south of us.

In an anticyclone the weather is almost the opposite of that in a cyclone; that in the latter being wet and unsettled, while



WEATHER IN AN ANTICYCLONE.

that in the former is usually settled and fine. Another great difference is that while cyclones are generally rapid in their movements, anticyclones are nearly stationary. In the area of highest pressure the sky is generally clear and the air calm, and consequently the temperature is high in the day and low at night; but in winter there is often frost, accompanied frequently by fog. The wind blows in the direction of motion of the hands of a watch, but slightly outwards; and, as the anticyclone is nearly always stationary, the wind blows from the same quarter for several days together.

There is sometimes a ridge of high pressure between two cyclones; and when this occurs there is usually a short spell of very bright weather. The sun is hot by day, and there is great radiation at night, and distant objects are very clearly visible. This weather, in fact, may be termed "foxy," for it only lasts a comparatively few hours.

In 1861 Admiral FitzRoy first issued storm-warnings, in order to give fishermen and others indications of the approach of storms. These have been continued by the Meteorological Office up to the present time. The signal indicating the approach of a gale from the Southward or Westward is a cone pointing downward; while the signal indicating the approach of a gale from the Northward or Eastward is a cone pointing upward. As these signals cannot be seen at night, three lights in the form of a triangle are used instead of the cones.

The Meteorological Office prepares daily weather maps, and issues forecasts of the probable weather for a period of 24 hours in advance, based on the daily synoptic weather charts. The forecasts are for the districts shown in the accompanying map.

METEOROLOGICAL OFFICE FORECAST DISTRICTS.

These forecasts, as a rule, are successful. Occasionally, however, they are not correct. This is often due to a cyclonic system not taking the path expected, and instances now and then occur in which a depression pursues a most erratic course.

As cyclones usually approach the British Isles from the west, it is important to have information as to the wind and the height of the barometer from the Atlantic Ocean. This is now received daily by cable from Iceland and the Azores, and by wireless telegraphy from steamers at sea.

Vegetation.

The effect of climate on the relative forwardness of vegetation in various districts may be gathered from the average dates of flowering of certain plants. From Mr. E. Mawley's "Reports on the Phenological Observations," it appears that the average date of the first flowering of 13 selected plants for the British Isles for the past 18 years is May 22, and that the differences from this date in the various districts are as follows:—

England, S.W.	7 days early	Ireland, N.	4 days late
Ireland, S.	10 ,,	Scotland, W.	7 ,,
England, S.	6 ,,	England, N.E.	6 ,,
England, Midland	2 ,,	Scotland, E.	9 ,,
England, E.	5 ,,	Scotland, N.	7 ,,
England, N.W.	2 days late		

There is thus a difference of nearly three weeks between the most forward and the most backward districts.

Dr. W. N. Shaw, F.R.S., has recently pointed out a relationship between the autumn rainfall and the subsequent yield of wheat. It appears that the yield of wheat is greater when the rainfall of the autumn months September, October, and November is below the average; and that the yield is less when the rainfall is above the average.

Records of Phenomena.

A book devoted to meteorological notes should be kept. On the occurrence of any exceptional phenomena — such as floods, whirlwinds, showers of dust, damage by lightning, hail, etc.—steps should at once be taken to gather accurate information respecting the same, and to write an account of them or procure photographs. In the case of floods an effort should be made to have a permanent mark cut in a wall, or on the pier of a bridge, recording the height and date of the flood.

It is desirable that photographs of meteorological phenomena should be taken whenever possible, and copies of these should be forwarded to the Royal Meteorological Society, 70 Victoria Street, London, for preservation as a permanent record.

Books and Publications on Meteorology.

The following is a brief list of works on meteorological subjects published in this country which may be consulted with advantage by any one who wishes for further information :—

ABERCROMBY, Hon. R.—Weather. A Popular Exposition of the Nature of Weather Changes from Day to Day. 8vo. 1887. 5s.
Barometer Manual for use of Seamen. Published by the Meteorological Office. 8vo. 5th Edition. 1905. 3d.
BARTHOLOMEW's Atlas of Meteorology. Folio. 1899. 52s. 6d.
CLAYDEN, A. W.—Cloud Studies. 8vo. 1905. 12s.
Daily Weather Reports of the Meteorological Office. 4to. Subscription, 5s. per quarter.
DICKSON, H. N.—Meteorology. The Elements of Weather and Climate. 8vo. 1893. 2s. 6d.
HANN, J.—Handbook of Climatology. Translated by R. de C. Ward. 8vo. 1903. 12s. 6d.
INWARDS, R.—Weather Lore. A Collection of Proverbs, Sayings, and Rules concerning the Weather. 8vo. 3rd edition. 1898. 7s. 6d.
Journal of the Scottish Meteorological Society. 8vo. Published annually. 12s. 6d.
LEY, Rev. W. CLEMENT.—Cloudland. A Study on the Structure and Characters of Clouds. 8vo. 1894. 7s. 6d.
MARRIOTT, W.—Hints to Meteorological Observers. 8vo. 6th edition, 1906. 1s. 6d.
Meteorological Office. The Observer's Handbook. 8vo. 1908. 3s.
Meteorological Record. Monthly Results of Observations made at the Stations of the Royal Meteorological Society. 8vo. Published quarterly. 1s. 6d.
MILL, H. R.—British Rainfall. 8vo. Published annually. 10s.
Monthly Weather Reports of the Meteorological Office. 4to. 6d. monthly.
MOORE, Sir J. W.—Meteorology, Practical and Applied. 8vo. 1894. 6s.
Quarterly Journal of the Royal Meteorological Society. 8vo. 5s.
SCOTT, R. H.—Elementary Meteorology. 8vo. 6th edition. 1893. 5s.
Symons's Meteorological Magazine, edited by Dr. H. R. Mill. 8vo. Published monthly. 4d.
WARD, R. de C.—Climate considered especially in relation to Man. 8vo. 1908. 6s.
Weekly Weather Reports of the Meteorological Office. 4to. Annual subscription, 30s.

Royal Meteorological Society.

THE Society was founded for the promotion of the Science of Meteorology in all its branches on April 3, 1850, under the title of "The British Meteorological Society." On its incorporation by Royal Charter on January 27, 1866, the name was altered to "The Meteorological Society"; and in 1883, by permission of Her late Majesty Queen Victoria, it became "THE ROYAL METEOROLOGICAL SOCIETY."

In 1904 His Royal Highness the Prince of Wales honoured the Society by becoming its Patron.

Meetings are held on the third Wednesday in each month from November to June inclusive—those in the evening being usually (by permission) at the Institution of Civil Engineers, and those in the afternoon in May and June at the Society's Rooms, 70 Victoria Street. These occasions afford an opportunity for social intercourse between those interested in meteorology, tea being served after the evening meetings or before the meetings in the afternoon.

Exhibitions of new and of special classes of meteorological instruments, as well as of diagrams, charts, and photographs, are held from time to time. Popular lectures on meteorological subjects by eminent authorities are also arranged for on special occasions.

The Papers read at the Meetings, together with the Discussions, in which every Fellow is entitled to take part, are printed in the *Quarterly Journal*, which also contains Notes, Correspondence, Notices of Recent Publications, and the titles of such papers as appear to be of general interest bearing on Meteorology in the periodicals which are received in the Society's Library. It thus serves to keep Fellows residing at a distance from London in touch with the meteorological work of the world.

In 1874 the Society commenced the organisation of a series of "Second Order Stations," of the International classification, at which observations of pressure, temperature, humidity, rainfall and wind are made on a uniform plan, so that the results may be strictly comparable. In addition to these, another class of stations, termed "Climatological," was organised on January 1, 1880, at which the observations, although of equal accuracy, are less exacting. These stations, which number about 100, are well distributed throughout the country; they are regularly inspected on behalf of the Society, and the results of the observations are published in the *Meteorological Record.*

In 1874 a Conference on the observation of Periodical Natural Phenomena was organised, and as the result of their deliberations the Society instituted the series of "Phenological Observations" which have been continued since that time, first under the superintendence of the late Rev. T. A. Preston, and since 1888 under that of Mr. E. Mawley.

A Lightning Rod Conference was organised in 1878, which in 1882 published a valuable Report embodying a code of rules for the erection of Lightning Conductors.

The Society has initiated and carried out various scientific investigations, of which the following may be mentioned:— 1. Systematic Investigations of the Thunderstorms of 1888 and 1889, and the Classification of the various Forms of Lightning; 2. Inquiry into the Phenomenon of the Helm Wind of Crossfell, Cumberland; 3. Investigation into the Relation between Beaufort's Scale of Wind Force and the Equivalent Velocity in Miles per Hour; 4. The Investigation of the Meteorological Conditions of the Upper Air by means of Kites.

The SYMONS GOLD MEDAL, founded in 1901 in memory of the late Mr. G. J. Symons, F.R.S., is awarded biennially by the Council for distinguished work done in connection with Meteorological Science. The Medal was presented to Dr. A. Buchan, F.R.S., in 1902; to Dr. J. Hann, in 1904; to Lieut.-Gen. Sir R. Strachey, F.R.S., in 1906; and to M. L. Teisserenc de Bort in 1908.

The Society possesses a valuable Meteorological Library of about 8700 volumes, 12,000 pamphlets, 200 maps and charts, and 800 manuscripts, unequalled by any collection of works on this science in the world. It also possesses a unique Bibliography, which consists of the titles of all books, pamphlets, papers, and articles bearing on Meteorology of which any notice can be found.

In addition to these, there is a large and interesting collection of photographs and lantern slides illustrating meteorological phenomena and instruments.

With the view of advancing the general knowledge of Meteorology, promoting an intelligent public interest in the science, and making the work of the Society more widely known, a Lecturer has been appointed to act in co-operation with Scientific Societies, Institutions, and Public Schools in various parts of the country. Exhibits of selections from the collection of photographs, drawings, diagrams, and charts illustrating meteorological phenomena, and also various patterns of instruments used for observations, are shown, under the charge of a member of the staff, at gatherings of local scientific societies, or on other occasions when they are likely to prove of interest.

Candidates for the Fellowship are elected by ballot, after recommendation by three Fellows, one of whom must certify from personal knowledge. Ladies are eligible for the Fellowship.

Fellows have the privilege of attending the Meetings and introducing visitors; they have the free use of the Library and receive gratis the *Quarterly Journal*, the *Meteorological Record*, and the other publications of the Society. The Council of the Society is elected by the Fellows annually, and reports to the Fellows at the Annual General Meeting.

The Library and Offices at 70 Victoria Street, Westminster, are open daily between the hours of 10 a.m. and 5 p.m., excepting on Saturdays, when they are closed at 1 p.m. Fellows are always welcomed at the Society's rooms, and the Office staff is always ready to assist in supplying any meteorological information which is desired.

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