

# SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

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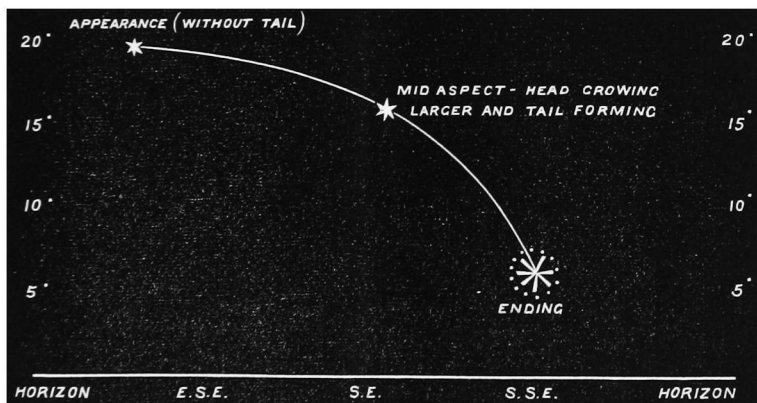
MAY, 1894.

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## A SPLENDID FIREBALL.

*To the Editor of the Meteorological Magazine.*

SIR,—Whilst walking home last evening at 7.37 p.m., with my son and nephew, we observed a grand meteor, or fireball. It was almost light at the time, and the phenomenon appeared to last at least five seconds. It commenced with the aspect of a large planet about E.S.E., and some 20 degrees above the horizon. The head then plunged downwards, and vanished about five degrees from the horizon. The tail formed a splendid curve about 15 degrees in length, and the head increased in size during its flight, until it was vastly larger than Venus and Jupiter together, and in fact even rivalled the full moon. But after attaining its maximum it disappeared suddenly. Had it been dark, as it was an hour later, the



scene would have been magnificent indeed. What struck us chiefly about the fireball was its rapid development and apparent proximity. It seemed to stand out from the sky, and did not appear to be more than a few miles distant. I shall be curious to know if this grand display was equally favourably observed by others, and especially those who are most interested in the matter. Our position at the time was three-quarters of a mile west of Chiddingfold village, and on high ground.—Yours faithfully,

Chiddingfold, Surrey, 23rd April, 1894.

A. F. PARBURY.

The following are other notes of the same meteor :—

LONDON.—On April 22nd, 7.35 p.m., during twilight, I observed a large meteorite, or fireball about  $70^{\circ}$  above the horizon, and travelling downwards towards the eastern horizon near to where the sun rises. It was in view for about five seconds, was pear-shaped and of a pale green colour, followed by a train of sparks. No stars were visible in the vicinity. If the sky had been dark and cloudless it would probably have been a conspicuous object in the heavens.—C. PHILLIPS, 125, Ossulton-street, Euston-road.—*English Mechanic*.

REDHILL, SURREY.—This evening, when my wife and I were out walking near Redhill, we saw a remarkable meteor. Appearing near the meridian, it descended vertically towards the south-western horizon. At first of a brilliant white, it gradually changed to a pale green colour, and finally, when near the earth—apparently, it dispersed into several fragments, each of a bright red. The duration of the phenomenon was about four seconds, and the time 7.35 p.m.—D. W. B., April 22nd.—*Standard*.

GUILDFORD, SURREY.—A brilliant sight was observed here to-day. In bright daylight at 7.35, I saw a very large meteor fall in the east of the heavens in direct line to the earth, leaving behind a magnificent train of blue. After travelling to within apparently a very short distance of the earth, it broke into three pieces, something like the bursting of a sky-rocket, the lower portion being about the size of a breakfast cup. The sight was the more remarkable there being no other star visible in the clear light of the day.—ARTHUR ALLEN.—*Surrey Times*.

HASLEMERE, SURREY.—Yesterday evening, Sunday, April 22nd, a very fine meteor was seen to traverse the sky from near the zenith to near the horizon, in an easterly or south-easterly direction. It is reported to me as having appeared about 7.25 p.m., when twilight was strong, and before any stars had come out. It threw off sparks like a rocket, and was followed by a bright train. No noise was heard after the explosion.—ROLLO RUSSELL.—*Nature*.

RAMSGATE, KENT.—A very brilliant meteor was seen here about 7.20 p.m., April 22nd. It was of considerable size, much larger than Venus at her brightest, having the appearance of a very large rocket. Its colour was of a brilliant white at first, afterwards changing to blue and violet. It left a slight trail, which did not last. Time about three seconds. There was not the slightest noise. It appeared to come from the North-West.—DEIMOS.—*English Mechanic*.

WARMINSTER, WILTSHIRE.—I was fortunate enough to witness the splendid meteor of Sunday, about which your correspondents at Southampton and Guildford have written. I was driving back to Warminster from a neighbouring village church, when in full daylight, in a sky of the clearest blue, the meteor appeared, like an immense rocket. The direction seemed to be north-west to south-east, and the large star-shaped body, brilliant as the electric light,

slowly descended and disappeared without a sound. It must have been a powerful celestial phenomenon to be seen under the conditions prevailing. The time was 7.34 p.m.—J. F. WELSH, April 24th.

We have received letters from correspondents at Hampstead, Lee, Southend, Gravesend and Horsham, which describe the brilliant meteor on Sunday night. In all these places it was seen at the same time (7.35), and with the same effects.—*Daily News*.

[We have not yet seen any calculation of the path of this meteor, but apparently it was passing from N. to S., over the southern portion of the North Sea, or perhaps over Belgium.—ED. M.M.]

## ROYAL METEOROLOGICAL SOCIETY.

(Continued from page 43.)

The momentum of the plate itself, probably often adds 30 to 50 per cent. to the real pressure, and the sudden jerk transmitted through the chain or wire, often brings the pen or pencil another 50 per cent. above its proper place. Mr. Ellis has told us how substituting a flexible chain for a wire reduced the Greenwich pressure, and it is not unreasonable to suppose that if the chain also had been done away with, and the clock and drum placed close behind the plate, a still greater reduction might have been produced.

The pressure plate is a useful anemometer and gives very interesting results, including a perfectly accurate mean pressure. If it were provided with a rack and catch, so that it could not oscillate, and once driven back by the wind could not return until set by the observer, the record of the mean would be lost, but the record of the maximum would be reliable.

For obtaining information as to the duration of gusts the tube anemometer was used.

Two similar glass tubes were obtained and bent to exactly the same curve. They were partly filled with coloured paraffin oil and fixed on a frame side by side touching each other, with a velocity scale underneath. The ends of the tubes being connected with the head of the anemometer, the two columns of oil moved up and down together, registering exactly the same maximum velocity for each gust of wind. A piece of tube of  $\frac{1}{32}$  in. bore and about 3 inches long was then inserted between one tube and the head, the other being left as before. The maximum velocities recorded for the same gust by these two tubes were given in a table.

The average difference is 4 miles per hour, the greatest 10 miles at a velocity of 43 miles per hour, and the least difference 0 mile, the higher velocity of course being recorded by the free tube.

It was found by experiment that the sudden application of a pressure corresponding to 40 miles per hour, the tubes then indicating zero velocity, produced the following effects:—

The liquid in the open tube rose to 43—44, owing chiefly to its momentum, but partly because some little of it remained sticking to

the glass, there not being time for it to settle to its true level. The liquid in the contracted tube rose steadily, it never exceeded the 40 miles per hour, but took from 5 to 6 seconds to reach that value.

We do not know how the gusts rise, so we cannot immitate them artificially, but during a gale in which the maximum velocity, as registered by the open tube, is about 60, the minimum will not as a rule fall below 20.

It appears that the extreme force of the wind is hardly ever maintained steadily for five seconds. If it were the two tubes would give maxima much nearer together. Also, since the contracted tube never falls so low as the other, it has not so far to rise, and would not take nearly five seconds to reach its maximum; hence it appears that a gust seldom maintains its full force for more than one or two seconds.

The same two glass indicating tubes were used to determine as far as possible the lateral extent of gusts. Neither of them was contracted, and they were connected with two separate but exactly similar anemometers, placed at the same height, viz. 18 ft. above the top of the house, but 11 ft. apart.

Even at so short a distance the extreme force is sometimes very different, and during a storm the liquid in one tube may be seen rising while that in the other is falling. One anemometer is S.E. of the other, and with a S.E. wind the two columns of liquid often move together as though rigidly connected. From this it appears that the extreme velocity mostly occurs in lines roughly parallel to the direction of the wind.

Mr. Airy, C.E., agreed that it is hopeless to get the maximum and mean by the same instrument, and that the Osler anemometer gives too high a maximum, though the mean may be correct, but to engineers the maximum is the more important value. A pressure plate kept face to the wind by a vane, when struck by a gust swings away and oscillates so that it never faces the wind.

At the Forth bridge in addition to an ordinary free pressure plate a second plate was fixed facing the direction of the frequent S.W. gales, and this gave a higher maximum than the free plate, owing to the oscillation referred to. A large plate 20 ft. by 15 ft. was also erected and gave results one third lower than the small plate. He considered that the duration of the extreme velocity in gusts was less than one second. In reply to Mr. Munro he said that the weight per square foot was much greater in the large plate than in the small one but he could not give the values.

Mr. R. H. Curtis remarked that the smaller pressure on a large plate was born out by experiments which he had made and communicated to the society some years since. He thought that the results as to the extension of squalls were affected by the inland position, and by the proximity of the house and of trees. The duration of squalls also was at times greater than that given in the paper as he had records of the extreme velocity lasting four seconds.

Mr. Dines, in reply, said that a plate which oscillates would never give the true maximum, but he had shown in a paper read before the Royal Society that the pressure on a plate might be greater when it was not at right angles to the wind. The experiments bore out his statement that gusts do not as a rule last one second, but that they did sometimes last as much as 4 seconds as mentioned by Mr. Curtis.

Mr. R. H. Scott, F.R.S., exhibited a diagram showing some remarkably sudden changes of the barometer in the Hebrides on February 23rd, 1894. At 8 a.m. the reading at Stornoway was 29·39 ins., being a fall of 0·73 in. since the previous day, and at 6 p.m. the reading was 28·58 ins. From the trace of the self-recording aneroid it appears that the minimum, 28·50 ins. occurred about 5.30 p.m., and that the fall during the half-hour preceding the minimum was nearly 0·20 in., the rise after the minimum being nearly as rapid.

The other paper read was "On the Calculation of Photographic Cloud Measurements," by Dr. K. G. Olsson.

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At the meeting of this Society held on Wednesday evening, April 18th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. Richard Inwards, F.R.A.S., the President, delivered an address on some phenomena of the upper air. He said that there are three principal ways in which the higher atmosphere may be studied. First, by living in it on some of the great mountain chains which pierce many miles into the air in various parts of the globe; second, by ascending into it by means of balloons; and third, by the study of the upper currents as shown to our sight by the movements of the clouds.

After describing the effects of rarefied air on animal life and natural phenomena, Mr. Inwards proceeded to give an account of various balloon ascents which had been undertaken with the object of making meteorological observations. In 1850 Messrs. Barral and Bixio, when they had ascended to 20,000 feet, found the temperature had sunk to 15° Fahr., but this was in a cloud, and on emerging from this, 3,000 feet higher, the temperature fell as low as —38°, or 70° below freezing point. In 1862 Mr. Glaisher and Mr. Coxwell made their famous ascent, when they reached an altitude of about seven miles from the earth. A short time ago a balloon without an aeronaut, but having a set of self-recording instruments attached, was sent up in France, and from the records obtained it is shown that a height of about ten miles was attained and that the temperature fell to —104° Fahr. (136° below freezing point).

Clouds are simply a form of water made visible by the cooling of the air, which previously held the water in the form of invisible vapour. Cumulus clouds may be regarded as the tops of invisible warm columns or currents thrusting their way into a colder body of air.

After referring to the various classifications and nomenclatures of clouds, of which that proposed by Luke Howard in 1803 is still in general use. Mr. Inwards said that whatever system of naming and classifying clouds be adopted, it should depend on the heights of the various clouds in the air, and he gave a few rough rules by which the comparative altitudes of the clouds may be judged when there is no time or opportunity to make exact measurements. Among the indications by which a cloud's height may be gathered are its form and outline, its shade or shadow, its apparent size and movement, its perspective effect, and the length of time it remains directly illuminated after sunset. By the last method some clouds have been estimated to have been at least ten miles above the surface of the earth. The cloud velocities at high altitudes have been carefully noted at the Blue Hill Observatory, Mass., U.S.A., and show practically that at about five miles height the movement is three times as fast in the summer and six times in the winter as compared with the currents on the earth's surface.

After showing a number of lantern slides illustrating the various types and forms of clouds, the Aurora Borealis, and rainbow, Mr. Inwards concluded his address by urging the desirability of establishing a good cloud observatory somewhere in the British Isles.

At the close of the meeting the Fellows and their friends inspected the exhibition of instruments, photographs, and drawings relating to the representation and measurement of clouds, which had been arranged in the rooms of the Institution. A lantern display of slides showing cloud effects and other meteorological phenomena was also given.

The number of entries in the catalogue was 135, but as many of the entries included groups of objects, the total number of photographs and pieces of apparatus must have exceeded 500. We can, therefore, mention only a small proportion of the exhibits.

Among the apparatus were various patterns of cloud mirrors, nephoscopes, theodolites, and cameras, for ascertaining the direction in which clouds move, their velocity, and their altitude.

The photographs of clouds were indisputably finer and more numerous than had ever before been gathered under one roof, as will be readily proved by the following list of exhibitors :—

Acres, B.	Gaster, F.	Saunders, Col.
Angot, A.	Hall, A. D.	Singer, K.
Clayden, A. W.	Maclear, Adm.	Smart, F. G.
Cohen, L.	Manucci, Sig.	Sprung, A.
Davis, H. E.	Raymond, G.	Stroh, A.
Drewitt, F.	Riggenbach, A.	White, T. C.
Garnier, P.	Russell, H. C.	Wilson-Barker, Capt.

The exhibit which excited the greatest interest was a portrait of Luke Howard, taken about 1843, when the Father of English Meteorology was slightly over 70, and two original sketches of

clouds drawn by him, all lent by Mr. W. Dillworth Howard. There were copies of all the editions of Howard's "Essay on Clouds," including (very appropriately) Prof. Hellmann's reprint of the rare first edition, which was published only a few days before the exhibition; and there was a large (but not perfect) collection of engravings of clouds in various publications dating from 1722 to the present year.

The "Miscellaneous" and "New Instruments" exhibits included barometers, thermometers, anemometers, and sketches and photographs of Mr. Rotch's Pole Star recorder, of lightning, solar halos, hoar frost and auroræ, of damage by hail and by waterspouts.

On the whole, the Society is to be congratulated on an excellent exhibition, and on the good catalogue, which was ready on the opening day and distributed gratuitously to every visitor.

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## A BOLIDE OVER CENTRAL ENGLAND.

*To the Editor of the Meteorological Magazine.*

SIR,—With reference to the correspondence on the above subject, which appeared in the *Met. Mag.*, vol. xxii., pp. 161, 177, it may interest your readers to know of a paper by Prof. Tomlinson, F.R.S., on "Aerolites and Bolides," and of discussion thereon, in *Notes and Queries*, October 22nd, November 26th, December 24th, 1892, pp. 321, 438, 512. —Yours truly,

FRED. COVENTRY.

*The Holmes, Ketton, Stamford, April 21st, 1894.*

[We wrote the head-line of the above letter as it now stands; the printer sent the proof headed "A BOLIS;" we reverted to Bolide, never having seen or heard of a Bolis. The printer referred us to the Dictionary, and there we are astonished to find:—

"BOLIS. A fireball darting through the air, followed by a train of light or sparks."

"BOLIDES. Plural of Bolis."

There is no doubt that the printer and the dictionary are right, because on turning to the origin, it is the Greek *Bolis*, a missile weapon, and in the plural *Bolides*, used occasionally to express *flashes of lightning*. Can any one quote even one passage containing the words "A Bolis?" We could quote many with a "A Bolide."—  
ED. M.M.]

## RAINFALL IN NATAL.

IN recent numbers we have been able to give some information as to the rainfall of the colony of Natal; and we have just received a number of the *Natal Farmer*, which contains a rainfall table for January, 1894, so good, that we reprint it as an indication of the organization now existing in the Colony, and in the hope that we may obtain full particulars both for the past and the future. It is curious that the table bears no signature.

*Weather Reports.—January.*

	Rainfall in inches.	No. of days Rain fell.	Heaviest Rainfall in one day.	Temperature.	
				Max.	Min.
Underberg.....	7.79	11	Jan. 5 ... 2.01 in.	°	°
Ladysmith.....	5.86	15	... ..	...	...
Dundee.....	7.38	12	„ 2, 3 ...	91	60
Estcourt.....	7.81	14	„ 18 ... 2.18	87	56
Little Tugela.....	...	...	...	...	...
Mooi River.....	8.08	12	„ 2 ... 1.64	84	52
Gourton.....	9.98	13	„ 10 ... 2.05	95	63
Karkloof.....	10.08	14	„ 31 ... 1.70	90	56
Balgowan.....	7.11	16	„ 31 ... 1.35	80	50
Howick (Everdon).....	5.73	18	„ 2 ... 1.46	88	52
Adamshurst.....	6.72	17	„ 3, 31 ... 1.32	90	55
Hilton.....	5.78	15	„ 2 ... 1.6	88	51
Newcastle.....	5.09	6	„ 21, 25 ... 2.50	...	...
Botanic Gardens, Pietermaritzburg	8.87	12	„ 25 ... 1.86	91	55
Town Bush Valley.....	8.70	16	„ 2 ... 1.79	...	...
Boston.....	13.14	17	„ 2 ... 8.02	83	42
Byrne.....	6.21	17	„ 21 ... 1.38	98	50
Richmond Village.....	4.16	18	„ 24 ... 1.42	90	51
Richmond.....	3.10	10	„ 2 ... .62	91	53
Umzinto.....	2.86	9	„ 25 ... 1.96	95	61
Ifafa.....	...	...	...	...	...
Lower Umcomas.....	1.82	5	„ 24 ... 1.23	...	...
Bellair.....	1.76	...	...	...	...
Malvern.....	2.34	12	„ 25 ... .90	...	...
Umbilo Water Works.....	2.45	9	„ 20 ... .55	92	64
Durban Observatory.....	1.72	11	...	...	...
Verulam, Redcliffe.....	3.75	7	„ 25 ... 1.43	97	64
Verulam Village.....	1.64	7	„ 25 ... .67	97	61
Tonga Mouth.....	2.39	7	„ 25 ... .75	92	66
Nonoti (Sea).....	2.36	7	„ 24, 25 ... 1.06	...	...
„ (Clifton).....	...	...	...	...	...
Ottawa.....	1.41	7	„ 3 ... .39	...	...
Stanger.....	2.03	4	„ 25 ... 1.27	106	58
Port Shepstone.....	3.17	9	„ 23 ... 2.35	87	61
Ixopo.....	3.90	10	„ 24 ... 1.12	88	52
Greytown.....	7.03	...	„ 19 ... 1.07	86	56
Umzinto.....	3.21	9	„ 25 ... 2.03	...	...
Clairmont.....	1.73	8	„ 27 ... .60	...	...
Equeefa.....	3.43	9	„ 24 ... 2.26	...	...
Mount Edgecombe.....	1.80	8	„ 24 ... .45	91	63
Vaal River.....	2.51	9	...	...	...
Polela.....	12.68	17	„ 2 ... 2.63	90	45



It will be noticed that Umzinto appears twice in the above table, as the 20th and as the 37th station. The differences and yet general accord induces the belief that there are two stations in the town, but if so, we do not understand why the entries are so far apart.

## THE OAK AND THE ASH.

In the *Meteorological Magazine* for August and September, 1889, there were two long notes upon the old proverbs indicating the character of the season as shown by the priority of leafing of the oak and of the ash. The subject seems to have been again discussed in some of the daily newspapers, and the following note which we reprint from the *Journal of Horticulture*, may, perhaps, be accepted as a last word. The letter might have been more tersely expressed, but evidently the writer (like several of those in our previous numbers) lays great stress on the fact that inferences must not be based upon the leafage or non-leafage of single trees:—

OAK v. ASH SINCE THE BATTLE OF WATERLOO.—Mr. J. Roger Dutton, Reading, writes as follows in reference to the controversy regarding the Oak v. Ash which has been going on in the daily press:—"Now that the Oak and Ash are both out (although it will be fully ten days before an Ash attains that stage) we have the record of another spring to add to bygone years, and I think that I am in a position to answer the various points mooted during the past few weeks with reference to 'Oak and Ash.' I have before me a record as to both of these trees (applicable to several counties) for seventy-nine years—i.e., since the Battle of Waterloo—the first fifty-six obtained from one who 'faithfully annotated' during the time, the last twenty-three carefully entered each year by myself. From this it appears that since the Battle of Waterloo the Ash has been out before the Oak only twelve times, and that 1859, or thirty-five years ago, was the last occasion. As I can confidently assert that the Oak has had priority ever since I kept a record, I am almost rash enough to question even the twelve years referred to, and for this reason. Some days ago I saw my first Ash in leaf. In the same hedgerow were two Oaks not yet out, and a casual observer of these would confidently assert that 'in 1894 the Ash was out before the Oak,' whereas the fact is that the Oak was out ten days previously, as on April 14th I wore in my hat a sprig with leaves fully expanded, taken by myself from a full grown Oak. This is the earliest year for the Oak, and the earliest but one for the Ash, in my record. We forget that there are early and late Oaks and Ashes, as there are early and late potatoes; and though it is possible occasionally, but very seldom, to find an early Ash out before a late Oak, I contend that in the same year there has been an early Oak out before the earliest Ash. If, however, in our forefathers' time it was not uncommon to see the Ash out before the Oak (and the old adage seems to assure us of this), may not the extensive drainage and culture of the last sixty years have had some effect in retarding the Ash or in advancing the Oak? As the Oak has undoubtedly been out first for at least thirty-five years, and we have had seasons of 'soak,' as well as of 'splash' only, I contend that the old adage is now valueless."—*Journal of Horticulture*, May 3rd, 1894.

## REVIEWS.

*Neudrucke von Schriften und Karten ueber Meteorologie und Erdmagnetismus herausgegeben von PROF. DR. HELLMANN.*

No. 3. LUKE HOWARD.—*On the Modifications of Clouds.* London, 1803. Berlin [and London], A. Asher & Co., 1894, 4to., ix.—32 pages, three plates.

In our number for June, 1893, we reported under the heading, "New Issue of Old Meteorological Books," the publication of Nos. 1 and 2 of Dr. Hellmann's reprints. We have now the pleasure of announcing the receipt of No. 3, which in all respects maintains the excellencies of its precursors; in type, in plates, in paper, and in printing nothing could be better.

This leaves only two points open to consideration (1) the desirability of the reproduction, (2) the scientific and bibliographical value of the introductory notes.

Howard's system of cloud classification was first placed before the world in the *Philosophical Magazine* for July, September and October, 1803, and in a few copies of the three papers which Luke Howard had separately printed for private distribution. These separate copies form the first edition of his essay, "On the Modifications of Clouds," and are excessively scarce. We know of only two. Howard's system is the only one universally known to meteorologists, and even if a new classification ever be agreed to, we feel sure that Nimbus and Cumulus will survive, and will not improbably last as long as there are any clouds to be seen, or human beings to see them.

As regards Dr. Hellmann's notes, they are worthy of him, which is saying enough, for it proves that they are clear, to the point, and accurate. Those who can read German will find all attainable information respecting the work, and all who can read English can have for a few shillings that which pounds would not otherwise procure, a verbatim and facsimile reproduction of the first edition of Howard's clouds.

*Elementary Meteorology*, by WILLIAM MORRIS DAVIS, Professor of Physical Geography in Harvard College, Boston (U.S.A.) Ginn and Co, 1894; large 8vo., xii.—355 pages, 108 engravings and 6 charts.

It is impossible to give in a limited space full notice of this important work. If asked to define by a single word its leading characteristic, we should say "solidity"; it bears on almost every page indication of its having been written with great care by a physicist and a teacher, and *per contra* there are several statements and omissions which lead us to think that Prof. Davis is not in the habit of personally making or reducing meteorological observations.

We are not sure of the appropriateness of the word "elementary"; of course it is merely a matter of opinion, and by calling it "elementary," it may be lifted beyond criticism, and all who cannot understand every sentence, must consider themselves unable to learn even the rudiments of meteorology. The book is intended for use in "the later years of a high-school course, or in the earlier years of college study," and we at once admit the soundness of the lessons it contains, but it seems to us written in a needlessly formal manner. Here for example are the opening sentences of

"197. *Decreased rate of adiabatic change of temperature in cloudy air.*—We must return now to examine the effect of the liberation of latent heat in ascending currents of air when cloud-making has begun, and of the reverse process in descending cloudy currents.

"The retardation of nocturnal cooling when latent heat is liberated in the formation of dew or frost has been explained in section 182. In that case the liberated energy passed away as terrestrial radiation into space, without doing any work on the earth. In the problem now before us, the liberated latent heat of an ascending, expanding current is applied to aiding in the work of pushing away the surrounding air; the heat of the ascending current is therefore drawn upon more slowly to do its share in this work, and hence the fall of temperature in the ascending air is retarded. This process is of wide application, and must be carefully considered."

It is characteristic of this work—strong in theory, weak as to instruments, that the above reference to terrestrial radiation induced us to search for the description of a "grass minimum" or of its precursor the "min. in focus of a parabolic reflector," and we can find neither. So again with solar radiation, we have the description of the "black bulb" in vacuo, but no reference to its companion "bright bulb" in vacuo.

We mention the point with reluctance, because we know that Professor Davis has the advancement of meteorology at heart, and because it is evident that both he and his publishers have taken great pains to produce a first-class text book—and we do not say that they have not succeeded—the work indisputably contains a vast amount of information given in clear and unmistakeable language. It has an accurate and copious index (probably more than 1,000 entries), and while we demur to its being an elementary book, we think that (except as to instruments) there is no one book in the English language which would be more useful for reference in case of any dispute as to the accepted causes and rationale of meteorological phenomena.

## CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1893.

STATIONS.  (Those in italics are South of the Equator.)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	
	Temp.	Date.	Temp.	Date.									
	°		°		°	°	°	0-100	°	°	inches		
England, London .....	59·8	3	27·8	1	47·9	36·0	37·5	85	83·0	24·4	2·17	15	7·3
Malta.....	80·0	1	53·0	26	71·5	61·0	56·1	74	127·2	48·1	3·37	9	6·5
Cape of Good Hope ...	89·2	25	45·2	1	74·1	55·9	58·2	82	...	...	·23	2	3·6
Mauritius.....	80·5	4, 30	63·2	11	78·7	66·9	61·2	70	137·6	52·8	1·78	17	5·6
Calcutta .....	84·0	1	58·7	30	80·5	65·6	65·4	79	143·4	50·6	·03	1	2·9
Bombay.....	90·8	2	69·9	23	86·9	74·3	71·0	74	139·3	62·3	1·63	5	2·3
Ceylon, Colombo ...	87·7	17	71·6	26	84·8	73·2	71·0	81	153·0	68·0	18·10	27	7·5
Melbourne.....	88·4	16	44·8	22	68·6	52·1	51·3	74	139·7	38·8	2·38	11	6·6
Adelaide .....	90·5	17	47·0	28	75·7	55·0	49·4	56	153·3	40·5	1·48	6	5·0
Sydney .....	86·8	4	55·6	29	73·9	60·6	58·5	70	151·8	43·6	4·05	21	5·8
Wellington .....	...	...	...	...	...	...	...	...	...	...	1·28	13	...
Auckland .....	81·0	24	51·0	18	72·0	58·4	57·0	80	146·0	49·0	7·17	17	5·2
Jamaica, Kingston.....	90·8	26	64·9	18	86·1	70·8	71·2	86	...	...	3·57	12	5·6
Trinidad .....	91·0	3, 4	67·0	23	88·0	69·5	72·6	82	169·0	65·0	7·84	15	...
Toronto .....	58·1	2	21·4	25	43·3	31·3	31·6	77	...	16·0	2·99	20	6·9
New Brunswick, Fredericton .....	62·7	3	9·2	27	41·1	23·1	27·8	77	...	...	1·86	10	5·2
Manitoba, Winnipeg ...	49·9	9	—30·3	29	23·9	5·5	...	...	...	...	2·34	12	7·2
British Columbia, Esquimalt .....	50·5	7	27·2	1	44·5	35·5	38·6	93	...	...	10·43	19	7·4

## REMARKS.

MALTA.—Adopted mean temp.  $64^{\circ}\cdot 8$ ; hourly velocity of wind 10·2 miles. Thunderstorms on 3 days; lightning on 8 days. J. F. DOBSON.

Mauritius.—Mean temp. of air  $2^{\circ}\cdot 2$  below, dew point  $2^{\circ}\cdot 9$  below, and rainfall 0·15 in. below, their respective averages. Mean hourly velocity of wind 10·6 miles, or 0·3 mile below average; extremes, 28·7 on 20th, and 0·0 on 3rd; prevailing direction, S.E. to E. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on 8 days, and lightning was seen on 3 other days. D. G. MANTELL.

Melbourne.—Lightning on 3 days; thunder and lightning on 12th; dust storm and smart squalls at 2.35 p.m. on 3rd. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean temp.  $1^{\circ}\cdot 5$  below the average of 36 years. Rainfall 47 in. above the average. C. TODD, F.R.S.

Sydney.—Temperature  $0^{\circ}\cdot 8$  above, and rainfall 80 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Auckland.—An exceptionally wet and warm month, the rain being accompanied by much thunder, but little wind. Total rainfall the greatest yet recorded for the month, and two and a-half times more than the average. Mean temperature  $5^{\circ}$  above the average. T. F. CHEESEMAN.

JAMAICA.—Rain in the first half of the month, with light thunderstorms; fair afterwards. Mean hourly velocity of wind 2·3 miles. The Kingston rainfall was half as much again as the average, while the Island rainfall was double the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 98 in. above the 30 years' average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL,  
 APRIL, 1894.

[For the Counties, Latitudes, and Longitudes of most of these Stations,  
 see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			
II.	Dorking, Abinger Hall.	2.76	XI.	Rhayader, Nantgwillt..	2.50
„	Birchington, Thor .....	2.14	„	Lake Vyrnwy .....	2.49
„	Hailsham .....	2.41	„	Corwen, Rhug .....	1.76
„	Ryde, Thornbrough .....	2.07	„	Carnarvon, Cocksida ...	1.85
„	Emsworth, Redlands ...	2.35	„	I. of Man, Douglas .....	2.32
„	Alton, Ashdell .....	2.21	XII.	Stoneykirk, Ardwell Ho.	1.98
III.	Oxford, Magdalen Col...	1.76	„	New Galloway, Glenlee	2.72
„	Banbury, Bloxham .....	1.83	„	Melrose, Abbey Gate...	1.05
„	Northampton, Sedgebrook	1.74	XIII.	N. Esk Res. [Penicuik]	1.70
„	Alconbury .....	1.04	„	Edinburgh, Blacket Pl.	1.75
„	Wisbech, Bank House..	1.33	XIV.	Glasgow, Queen's Park.	1.91
IV.	Southend .....	1.91	XV.	Inverary, Newtown .....	1.94
„	Harlow, Sheering .....	1.40	„	Islay, Gruinart School..	.44
„	Colchester, Lexden.....	1.64	XVI.	Dollar .....	.91
„	Rendlesham Hall .....	2.28	„	Balquhider, Stronvar..	2.27
„	Diss .....	2.15	„	Ballinluig .....	1.77
„	Swaffham .....	1.98	„	Dalnaspidal H.R.S. ...	2.36
V.	Salisbury, Alderbury...	2.51	XVII.	Keith H.R.S. ....	1.03
„	Bishop's Cannings .....	...	„	Forres H.R.S. ....	.53
„	Blandford, Whatcombe.	2.39	XVIII.	Fearn, Lower Pitkerrie.	.71
„	Ashburton, Holne Vic....	4.40	„	Loch Shiel, Glenaladale	...
„	Okehampton, Oaklands.	2.79	„	N. Uist. Loch Maddy ...	1.06
„	Hartland Abbey .....	2.10	„	Invergarry .....	1.18
„	Lynmouth, Glenthorpe.	1.79	„	Aviemore H.R.S. ....	.78
„	Probus, Lamellyn .....	4.13	„	Loch Ness, Drumnadrochit	.41
„	Wellington, Sunnyside..	2.50	XIX.	Invershin .....	.07
„	Wincanton, Stowell Rec.	2.37	„	Scourie .....	.70
VI.	Clifton, Pembroke Road	2.73	„	Watten H.R.S. ....	.51
„	Ross, The Graig .....	2.16	XX.	Dunmanway, Coolkelure	7.41
„	Wem, Clive Vicarage ...	1.79	„	Fermoy, Gas Works ...	5.86
„	Cheadle, The Heath Ho.	1.64	„	Killarney, Woodlawn ...	7.12
„	Worcester, Diglis Lock	1.23	„	Tipperary, Henry Street	6.36
„	Coventry, Coundon .....	1.91	„	Limerick, Kilcornan ...	2.98
VII.	Ketton Hall [Stamford]	1.21	„	Ennis .....	3.67
„	Grantham, Stainby .....	1.65	„	Miltown Malbay .....	3.93
„	Horncastle, Bucknall ...	2.08	XXI.	Gorey, Courtown House	3.75
„	Workshop, Hodsck Priory	2.45	„	Athlone, Twyford .....	4.49
VIII.	Neston, Hinderton .....	2.26	„	Mullingar, Belvedere...	4.29
„	Lancaster, Rose Bank...	1.57	„	Llongford, Currygrane...	4.15
„	Broughton-in-Furness..	1.41	XXII.	Galway, Queen's Coll...	3.76
IX.	Ripon, Mickley .....	3.17	„	Crossmolina, Enniscoe..	3.84
„	Scarborough, South Cliff	1.41	„	Collooney, Markree Obs.	4.12
„	East Layton [Darlington]	2.03	„	Ballinamore, Lawderdale	5.45
„	Middleton, Mickleton..	1.79	XXIII.	Lough Sheelin, Arley ..	4.05
X.	Haltwhistle, Unthank..	1.16	„	Warrenpoint .....	3.06
„	Bamburgh .....	1.00	„	Seaforde .....	2.27
„	Keswick, The Beeches...	2.39	„	Belfast, Springfield .....	1.96
XI.	Llanfrechfa Grange .....	2.13	„	Bushmills, Dundarave...	1.60
„	Llandovery .....	2.12	„	Stewartstown .....	2.76
„	Castle Malgwyn .....	2.71	„	Buncrana .....	2.36
„	Builth, Abergwessin Vic.	2.54	„	Lough Swilly, Carrablagh	2.49

APRIL, 1894.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					TEMPERATURE.				No. of Nights below 32°	
		Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours		Days on which -01 or more fell.	Max.		Min.			
				Dpth	Date		Deg.	Date	Deg.	Date.		
											inches.	inches.
I.	London (Camden Square) ...	1.74	.00	.59	24	14	73.3	8	34.5	22	0	8
II.	Maidstone (Hunton Court)...	1.81	+ .16	.56	24	15	...	...	...	...	...	...
III.	Strathfield Turgiss .....	2.09	+ .49	.48	16	16	70.4	10	31.1	22	1	10
IV.	Hitchin .....	1.49	— .30	.32	18	14	72.0	8, 11	32.0	21 <sup>a</sup>	2	...
V.	Winslow (Addington) .....	1.59	— .33	.39	11	13	72.0	11	31.0	22 <sup>b</sup>	2	10
VI.	Bury St. Edmunds (Westley)	1.27	— .39	.35	24	16	69.0	8	34.0	22	0	...
VII.	Norwich (Brundall) .....	2.08	...	.49	24	15	70.8	8	32.8	23	0	9
VIII.	Weymouth (Langton Herring)	2.50	+ .62	.35	10	18	64.0	7	38.0	13 <sup>c</sup>	0	...
IX.	Torquay (Cary Green) .....	2.39	...	.44	22	17	61.3	29	38.0	13	0	0
X.	Polapit Tamar [Launceston]..	2.01	— .21	.32	25	16	67.0	1, 3	37.5	1	0	6
XI.	Stroud (Upfield) .....	2.44	+ .29	.75	25	16	69.0	11	39.0	17 <sup>f</sup>	0	...
XII.	Church Stretton (Woolstaston)	2.32	— .02	.47	24	17	72.0	11	36.0	20 <sup>f</sup>	0	7
XIII.	Tenbury (Orleton) .....	1.25	— .83	.18	23	15	71.2	11	30.2	20	4	10
XIV.	Leicester (Barkby) .....	1.67	— .43	.46	25	16	76.0	11	24.0	20	7	13
XV.	Boston .....	.89	— .82	.30	12	11	74.0	10	30.0	21	1	...
XVI.	Hesley Hall [Tickhill] .....	2.86	+ 1.15	.75	18	15	74.0	11	29.0	21	2	...
XVII.	Manchester (Plymouth Grove)	1.55	— .16	.34	16	16	74.0	11	34.0	19 <sup>g</sup>	0	3
XVIII.	Wetherby (Ribston Hall) ..	1.94	+ .09	.62	13	14	...	...	...	...	...	...
XIX.	Skipton (Arncliffe) .....	2.55	— .88	.47	16	17	...	...	...	...	...	...
XX.	Hull (Pearson Park) .....	1.16	— .76	.23	13	11	67.0	10	27.0	21	2	9
XXI.	Newcastle (Town Moor) .....	1.18	— .65	.39	26	13	...	...	...	...	...	...
XXII.	Borrowdale (Seathwaite) .....	4.29	— 2.85	.80	27	21	...	...	...	...	...	...
XXIII.	Cardiff (Ely) .....	2.22	— .19	.45	23	17	...	...	...	...	...	...
XXIV.	Haverfordwest .....	2.46	— .17	.57	24	16	64.9	12	31.9	1	2	11
XXV.	Aberystwith, Gogerddan .....	1.69	— .87	.27	11	11	71.0	2	28.0	21 <sup>h</sup>	8	...
XXVI.	Llandudno .....	1.59	— .22	.27	11	16	...	...	...	...	...	...
XXVII.	Cargen [Dumfries] .....	1.90	— .33	.49	12	11	68.0	11	31.6	1	2	...
XXVIII.	Jedburgh (Sunnyside) .....	1.38	— .32	.32	7	12	71.0	11	31.0	14 <sup>g</sup>	6	...
XXIX.	Colmonell .....	1.70	...	.52	11	12	68.0	2	33.0	1, 20	0	...
XXX.	Lochgilthead (Kilmory) .....	2.43	— .38	.59	10	19	...	...	32.0	19	1	...
XXXI.	Mull (Quinish) .....	1.75	— 1.23	.25	10 <sup>a</sup>	18	...	...	...	...	...	...
XXXII.	Loch Leven Sluices .....	.70	— 1.52	.20	8 <sup>h</sup>	5	...	...	...	...	...	...
XXXIII.	Dundee (Eastern Necropolis)	1.45	— .60	.25	17 <sup>b</sup>	16	65.9	29	34.6	1	0	...
XXXIV.	Braemar .....	1.63	— .79	.45	17	17	60.2	28	26.2	2	8	17
XXXV.	Aberdeen (Cranford) .....	1.15	...	.42	16	16	60.0	11	32.0	1	1	...
XXXVI.	Strathconan [Beaul] .....	.63	— 2.18	.18	17 <sup>c</sup>	7	...	...	...	...	...	...
XXXVII.	Glencarron Lodge .....	1.20	...	.36	17	13	66.5	11	31.9	29	1	...
XXXVIII.	Cawdor [Nairn] .....	1.08	— .44	.44	16	8	...	...	...	...	...	...
XXXIX.	Dunrobin .....	...	...	...	...	...	...	...	...	...	...	...
XL.	S. Ronaldsay (Roeberry) .....	.49	— 1.12	.12	23	10	59.0	28	38.0	1	0	...
XLI.	Darrynane Abbey .....	4.55	...	.80	13	22	...	...	...	...	...	...
XLII.	Waterford (Brook Lodge) ...	4.32	+ 1.85	.86	15	20	63.0	4, 28	33.0	17	0	...
XLIII.	O'Briensbridge (Ross) .....	2.86	...	.57	11	21	...	...	...	...	...	...
XLIV.	Carlow (Browne's Hill) .....	4.09	+ 1.81	.62	15	21	...	...	...	...	...	...
XLV.	Dublin (Fitz William Square)	3.12	+ 1.00	.56	13	20	62.7	8	38.0	1	0	1
XLVI.	Ballinasloe .....	4.19	+ 1.85	.70	11	22	63.0	4	39.0	19	0	...
XLVII.	Clifden (Kylemore) .....	8.98	...	1.34	14	20	...	...	...	...	...	...
XLVIII.	Waringstown .....	2.04	— .38	.31	16	21	67.0	11	33.0	25	0	2
XLIX.	Londonderry (Creggan Res.) ..	2.47	+ .23	.70	11	18	...	...	...	...	...	...
L.	Omagh (Edenfel) .....	2.83	+ .60	.49	11	19	60.0	2, 20	34.0	18	0	3

<sup>a</sup> And 14. <sup>b</sup> And 29. <sup>c</sup> And 18. <sup>d</sup> And 22. <sup>e</sup> And 20, 22. <sup>f</sup> And 21. <sup>g</sup> And 20. <sup>h</sup> And 30.

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

# METEOROLOGICAL NOTES ON APRIL, 1894.

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

## ENGLAND.

STRATHFIELD TURGINS.—A fine month for all vegetable and agricultural growth; fine at the commencement, showery and mild in the middle and at the end; vegetation very forward. Honey bee seen on 12th. Horse chestnut in leaf on 14th. Young rooks seen on 21st.

HITCHIN.—A very early season. Chestnut in bloom on 14th, hawthorn on 16th. A wasp's nest found on 30th.

ADDINGTON.—A fine open month; vegetation of all kinds in a very advanced state, and some hawthorn bushes well in flower in the last week. The cuckoo and swallow were with us on the 9th. A sharp TS occurred on the 11th at 2 p.m., and another on the 26th, on which day a very heavy H storm swept along, a mile to the N. of us, doing much damage to growing crops, and breaking a quantity of glass at Adstock, but no H fell here.

BURY ST. EDMUNDS.—R fell in small quantities on 16 days. Between Bury St. Edmunds and Cambridge much less R fell than in the surrounding districts. Vegetation very forward. Asparagus cut on the 4th. Foreign birds not much earlier than usual. Cuckoo on the 8th, nightingale on the 11th, swallow on the 24th.

LANGTON HERRING.—Rain has fallen on no less than 71 days in the four months January to April, 16 more than the average, and the greatest number in any year from 1879 to 1893. The mean temp. at 9 a.m. ( $50^{\circ}\cdot7$ ) is  $3^{\circ}\cdot5$  above the average, but  $1^{\circ}\cdot5$  below that of April, 1893. Hawthorn in blossom on the 18th, on the same day of the month as in 1893. Grass crop very promising. Lunar halo on the 14th. Solar halos on 17th, 25th, and 26th. TSS on the 18th and 28th.

TORQUAY, CARY GREEN.—Rainfall  $\cdot42$  in. less than, and rainy days one more than, the average. Mean temp.  $4^{\circ}\cdot3$  above the average. Amount of sunshine at Chapel Hill, 166 hours 30 mins., being 28 hours below the average.

POLAPIT TAMAR.—A very seasonable month altogether, the rainfall being slightly less than the average of 13 years. TS on 19th; distant T on 28th; thick fog on 20th.

STROUD, UPFIELD.—L on 2nd; T and L at night on 10th; TSS on the 11th, 18th, and 25th; on the latter day, very heavy H fell at Chalford, near Stroud.

WOOLSTASON.—A pleasant and very growing month, though the nights were cold. There was a violent storm of T and L on the 11th, after an intensely close afternoon. T and L on the 2nd and 8th. The cuckoo was first heard on the 12th, and the swallow seen on the same day. Mean temp.  $50^{\circ}\cdot4$ .

LEICESTER, BARKBY.—The country was lovely with the abundance of plum, pear, and apple blossom. First cuckoo on the 10th; first swallow on the 11th; first nightingale on the 27th. T and L on 8 days; H on 2 days. Mean temp.  $49^{\circ}\cdot7$ . A fine, but occasionally very cold, month.

## WALES.

HAVERFORDWEST.—The drought, which set in on March 15th, was absolute up to April 6th; fine bright days, with sharp night frosts, continuing up to that date, the lowest grass reading being  $26^{\circ}\cdot5$  on 2nd. Broken weather then prevailed to the 18th, although many of the days were fine, R falling at night. From the 19th to the 23rd fine bright days with night frost occurred, and the temp. was cooler as the month advanced. Oak and ash both in leaf on the 25th, white thorn on the 28th; lilac in bloom in the 3rd week; rhododendrons in full bloom on the 25th. Grass abundant, with every indication of a good hay crop; everything as early as last year, but the max. temp. in shade  $11^{\circ}\cdot1$  lower. Prevailing winds, S.W. and N.N.W.

GOGERDDAN.—Beautiful growing weather throughout the month. Such good weather throughout April not remembered for more than 20 years.

## SCOTLAND.

**CARGEN.**—A fine month generally speaking. The mean temp. was  $2^{\circ}7$  above the average, and there were unusually few frosty nights. The R was a little below the average. E. winds prevailed for 19 days. Vegetation progressed rapidly during the month, and is much more advanced than usual at this time of the year. Many trees are in full leaf, and hawthorn, lilacs, and laburnums are in flower; pasture lands unusually luxuriant. TSS on the 2nd, 3rd, 24th, and 27th.

**JEDBURGH.**—For the period of the year the weather was unusually fine, and the cereal and potato crops were got in in fine condition. Vegetation generally was in an advanced stage, and the hedges had been in full bloom for ten days at the close. The bush and tree fruit crop had the appearance of being a very heavy crop, if not checked by bad weather.

**COLMONELL.**—The mean temp. of the month ( $49^{\circ}3$ ) was  $5^{\circ}1$  above the average of 18 years, and the highest in any of them except 1893, which was  $2^{\circ}$  higher. The max. temp. in 1886, 1892, and 1893 were all higher than this year,  $71^{\circ}$ ,  $75^{\circ}$ , and  $78^{\circ}$  respectively. The min. temp. this year is the highest in April for 19 years. The average number of days with frost in April is 11, and till this year none has had less than three. T and L on 11th. Strong winds on 14th, 24th, 25th, and 26th, approaching to a gale only on 24th.

**BRAEMAR.**—Vegetation unusually forward. Sunshine 139 hours 40 minutes. T and L on the 25th, and T on 27th and 29th.

**ROEBERRY.**—A very dry month, the driest recorded since 1878. Mean temp.  $45^{\circ}2$ .

## IRELAND.

**DARRYNANE ABBEY.**—The first few days were fine and warm; the rest of the month was wet, cold, and stormy, with a few warm days. Very strong gale at night on 22nd and all day on 23rd. Heavy T from midnight to 2 a.m. on the 14th.

**WATERFORD, BROOK LODGE.**—T from 2 to 3 p.m. on the 4th. Heavy H on 24th. Cuckoo heard on 17th. Swallows seen on 25th.

**O'BRIENSBRIDGE, ROSS.**—Plenty of R. T on 2nd. Strong S.E. gale, with H showers and T, on 15th. Foliage of trees earlier even than last year. Beech, lime, sycamore, and horse-chestnut in full leaf on 19th. Oak also very forward, but leaf not so fully developed. Fine bloom on fruit trees.

**CARLOW, BROWNE'S HILL.**—More rain fell this April than has fallen in any corresponding month since 1877.

**DUBLIN.**—Like April, 1893, this was a mild month, and led to a forward spring. Unlike that month, however, the amount of cloud was large, particularly in the mornings, and R fell frequently and heavily. The prevalent winds were from S.E. and S. Under these several circumstances vegetation made rapid progress, and by the end of the month most of the forest trees were in full foliage, and the hawthorn, lilac, and laburnum were fast coming into blossom. The mean temp. was  $49^{\circ}6$ , or  $2^{\circ}2$  above the average. Lunar halos on the 15th and 17th. Fog on 8 days. High winds on 5 days, reaching the force of a gale on 22nd and 24th. H fell on 13th and 24th. *Aurora borealis* on the evening of the 5th.

**EDENFEL.**—A moderate month, without any extremes; the R and temp., however, were both somewhat above the average, and unqualified by any appreciable frost. Vegetation of all kinds is early and luxuriant. The bursting into leaf of the oak simultaneously with the beech, instead of with the ash (which gives no sign), is very unusual. Swallows 10 days earlier than the average time; other migrants about the average.