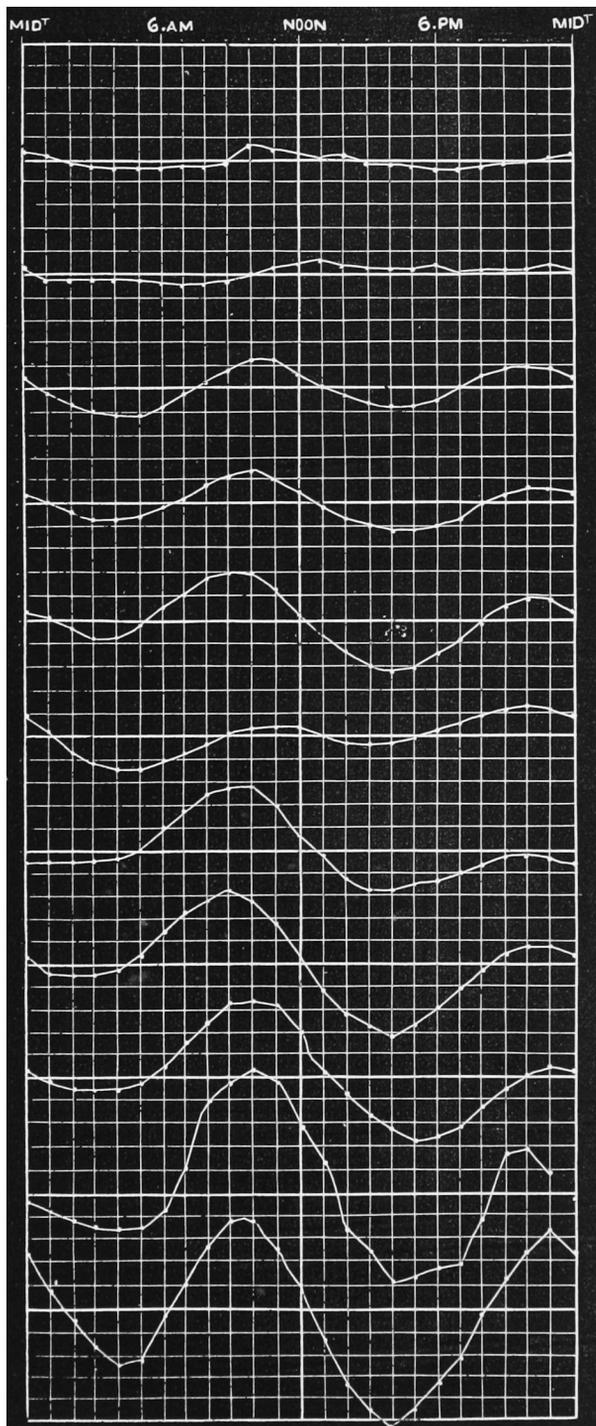


DIURNAL OSCILLATION OF THE BAROMETER IN VARIOUS LATITUDES.



Sitka	57° 0'
St. Petersburg.	59° 56'
Greenwich	51° 28'
Halle	51° 28'
Geneva.....	46° 13'
Grt. St. Bernard	45° 50'
Toronto	43° 38'
Philadelphia ...	39° 56'
San Francisco...	37° 48'
Calcutta	22° 35'
Cumana	10° 27'

NOTE.—The distance between each two horizontal lines represents 0.01 inch, thus at Sitka the reading at 10 a.m. is 0.002 inch above the mean.

S Y M O N S ' S
M O N T H L Y
M E T E O R O L O G I C A L M A G A Z I N E .

LXXVI.]

MAY, 1872.

[PRICE FOURPENCE,
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ANOTHER METEOROLOGICAL CONGRESS.

(Continued from page 40.)

RESUMING our notice of Dr. Ballot's excellent *Suggestions*, which we hope by this time is in the hands of all our readers, we have to consider the section devoted to Barometer Readings. Here again the doctor states that the combination of observations made at 6 a.m., 2 p.m., and 10 p.m., "is acceptable, for it gives very nearly the afternoon minimum and evening maximum, though 8 a.m., 4 p.m., and midnight would in this case certainly be better. From both the average of the day is nearly known, but with respect to the barometer, it is not for this reason that I propose such a combination." He then goes on to state his objections to the publication of mean daily values with a copiousness and energy with which we cordially sympathize.

It is possible that some of our readers are not familiar with the amount and period of the daily barometric oscillation to which reference is above made, in the terms "afternoon minimum and evening maximum." We, therefore, before proceeding further, interpose a few remarks upon the subject. We think that many writers have attached undue importance to the daily oscillation of the barometer. There are certain special enquiries, such for instance as barometric determination of heights, in which even these small oscillations are of importance, and singularly enough they are precisely the enquiries in which hitherto daily oscillation has been entirely ignored, while in starting observations for the determination of the great laws of atmospheric movement, daily oscillation is constantly referred to, although in that case we are not dealing with small distances, but with areas of thousands of miles in extent, we are not dealing with differences of barometric readings of 1000ths of an inch, but with inches, or at least with tenths. For such enquiries, what can be the importance of a possible error of, in these latitudes, about one-hundredth of an inch, or the equivalent of a barometer being removed one story higher or lower in the observer's house. Far be it from us to encourage carelessness or slippery work, but on the other hand let us not by striving after theoretical perfection, run the risk of disheartening observers, and losing them altogether by imposing hours of observation irksome or inconvenient,

when other hours would give information as precise as we can ever utilize. The plate which forms the frontispiece to this number, shows the character of this daily oscillation in various latitudes, both in the Old and New Worlds, from Cumana on the north coast of South America, to Sitka on the north-west of North America, and from Calcutta to St. Petersburg. There is one fact connected with the plate to which the strongest attention must be drawn—the real amount of oscillation is so small, that it has been necessary, in order to render its details visible, to represent it *ten times greater than it really is*. It will be seen that although the amplitude of the oscillation varies greatly, from about 0·010 at Sitka to nearly 0·100 at Cumana, its epochs of max. and min. are similar at all the stations quoted except two—St. Petersburg and at the Monastery on the Great St. Bernard. The oscillation at St. Petersburg is so very small, never amounting to 0·010 either plus or minus, that its departure from the normal form is not perhaps to be wondered at. The changed form at St. Bernard arises from its great altitude (8,127 ft.), for a similar curve with only one maximum and one minimum in each twenty-four hours has been observed at the more lofty stations in Central Asia (*e.g.*, at Leh, 11,532 ft. above sea level, and at Fütüt, 11,838 ft.) The times of maximum and minimum are easily remembered, they may be taken as 10 and 4, *i.e.*, 10 a.m. and 10 p.m. for the two maxima, and 4 a.m. and 4 p.m. for the two minima, the actual time being rather before those hours in the morning and after them in the afternoon.

Having refreshed our readers' memories with these facts, let us now return to Dr. Ballot's remarks.

It is quite true that observations at 6 a.m., 2 p.m., and 10 p.m., give very nearly the true mean of the day; they do so within 0·001 in., and it is equally true that 8 a.m., 4 p.m., and midnight are better, for they give it within 0·0002 in., only that no barometer will show so small a quantity,—but for *all* purposes one plan is as good as the other. We submit that the extent of oscillation is so small, its amount so well known, and if not, so easily ascertained by Col. Williamson's method, that it should be excluded from consideration when deciding upon hours of observation.

We heartily agree with Dr. Ballot in his onslaught upon the publication of the "Mean daily height of the Barometer," to the exclusion of its observed height at definite hours. The former is absolutely useless for chartographic meteorology, while the latter is its most essential requirement. Although we could add much to what Dr. Ballot has so well written upon this point, we scarcely think it can be necessary, especially as the faulty method has but few supporters.

The next branch of the subject is commenced with the following words, which puzzle us :—

"Some may be inclined to reduce the observations not only [for temperature,¹] and [rectify certain known faults in the instrument,² for capacity and capillarity], but likewise for [the height at which it is placed above the sea.]³ The first is necessary, the second is of no moment, the last is not allowable."

We have inserted the brackets and numerals in order to guard against mistake, and we hope that we have placed them where the author himself would have done. If so, we are forced to the conclusion that Dr. Ballot considers corrections for instrumental errors, for capacity and capillarity, of no moment. Surely this cannot be. The aggregate amount of these errors (all of which can be accurately determined) may be fifty-fold that produceable by daily oscillation, and should therefore apparently receive fifty-fold as much consideration. And even supposing that the expression refers to the utilization of the observations for publication as departures, there remains this difficulty, that the amount of departure depends upon the capacity correction of the barometer. We cannot understand how useful results are to be obtained from barometers requiring correction for capacity until that correction has been applied. We are glad to remark that in our own country that construction of barometer has long been abandoned. The third point, correction for height above sea level, is a difficult one—too complex for discussion here. Dr. Ballot has evidently given considerable attention to the subject, and says in the most decided manner that correction for this disturbing cause is not allowable. Our own opinion on this point is different, but not having the large experience of Dr. Ballot, we have no desire to press it; but we certainly should like to see the evidence which has led him to the conclusion, and we think that before it is accepted it would be desirable to ascertain the opinion of men accustomed to the use of the barometer for surveying purposes. No one has carried this branch of investigation to such a degree of perfection as Colonel Williamson, his opinion would therefore be most valuable; while among others specially qualified to guide us in this matter we should at once name Prof. A. D. Bache, Prof. Arnold Guyot, and among our own countrymen, Messrs. A. J. Ellis and F. F. Tuckett.

Dr. Ballot concludes his remarks on Barometric Readings with the suggestion that the alteration in gravity (due to the difference between the polar and equatorial diameter of the earth), should be taken into account. This is very easily done, but we should have thought it would be sufficient to apply it finally to mean results, instead of primarily along with the temperature correction.

ACCIDENTS FROM LIGHTNING.

THE thunderstorms of the last week in April and the early part of May appear to have been unusually destructive. Several instances will be found in the remarks of our regular correspondents, and the following are others. We wish our readers more generally recognised the importance of collecting such notices, and forwarding them to us. We believe that there is much to be learned from the geographical distribution of thunderstorms, and the *locale* as well as the character of the mechanical effects of lightning.

YORKSHIRE.—*To the Editor of the Times.* Sir,—Nostell Priory is a large house, the residence of Mr. Charles Winn. The house is five miles from Wakefield.

On Wednesday last, the 17th of April, at about 6 p.m., a stack of chimneys was struck by lightning. The stack is built of extremely strong stone work, the top of it being more than 50 feet from the ground. The lightning seems to have entered two contiguous chimneys, divided by a thin partition. This thin partition was untouched, but the stone work of each chimney, nearly a foot in thickness, was completely shattered and blown out, leaving a hole in each chimney nearly big enough for a wheelbarrow to enter. Stones bigger than a man's head were blown out horizontally, first over 25 feet of roof, and then over a flight of steps extending more than 20 feet from the wall of the house. Thus, they were thrown nearly 50 feet from the chimney into the carriage road below. A thunder-clap was heard at the same moment, like the report of a cannon. No trace of the electric fluid can be observed lower down in the chimney than the fracture I have described. I read in the newspapers that almost at the same hour of the same day injury was done at Leeds by lightning.

I am, Sir, your obedient servant,
Nostell Priory, April 21.

H. STRICKLAND CONSTABLE.

LANCASHIRE.—The storms of Wednesday and Thursday, the 24th and 25th April, seem to have been very severe in many parts of the north of England. At Upholland Moss, near Wigan, a woman, about 39 years of age, named Moss, was killed instantaneously while she was walking on the highway. At Pemberton the lightning did considerable damage to a long row of cottages known as Victoria-street. It would appear that, having struck one of the houses, it ran to the end of the street, where it threw down a stack of chimneys, and then entering a cottage it forced out the windows of the rooms at the front and made sad havoc with the furniture. At Adlington the lightning struck a stone cross on the top of St. Joseph's Roman Catholic Chapel, hurling large blocks of stone to the ground and on to the adjoining building, in which about 12 masons had taken shelter. One stone, weighing about two hundredweight, penetrated the slates and hung suspended above the heads of the men. Mr. Simmons, contractor, of Chorley, who was close by, giving orders, experienced a severe electric shock. The cross and saddle stone, weighing about five hundredweight fell through the roof of the entrance porch to the chapel. A cottage in the yard of the Adlington Gas Company was also struck by lightning and much damaged. Several houses in Hulme-street, Bolton, were also struck. In one, the tenants, John Noble and his wife, were both stunned, while the woman was blinded for a short time. A woman named Maria Compton, was also struck on the arm, but was not much hurt. During the thunderstorm of Thursday the ship *Faillie*, lying in the Alfred Dock, Birkenhead, was struck by lightning, the mainmast head being snapped off at the rigging. In the Nelson Dock, Liverpool, the *King of the Belgians*, screw steamer, was also struck by lightning, and splinters of the masthead spar were scattered about the deck of the vessel.

LONDON.—Yesterday, about noon, May 7th, a short but severe thunderstorm broke over the metropolis. The lightning did some mischief to the telegraph wires; in Fleet-street one was cut in two. The bells of the fire brigade telegraphs, too, constantly rang, to the annoyance of the firemen. The wind was so high that even the above-bridge steamboats had great difficulty in making way against the tide. At Deptford the lightning struck a house in Seymour-place, dislodging a portion of the roof, entering a back room, breaking a mirror, and nearly injuring a mother and child.

NORFOLK.—On Tuesday last, May 7th, a violent thunderstorm occurred at Wymondham. The electric fluid passed down the chimney of Superintendent Barrett's house, and ignited some sacking placed there to prevent soot from falling into the room. The superintendent's family were absent from home, and a person sitting in the magistrates' room opposite, fortunately noticed a cloud of smoke issuing from the house. Mr. Barrett, with the assistance of Wm. Bunn, soon succeeded in extinguishing the fire, but had it not been discovered, in a few minutes some woodwork in the vicinity would have spread the fire, and the damage resulting must have been serious.

ESSEX.—The parish church of Mashbury, Essex, has been struck by lightning and set on fire. The spire and belfry, which were of wood, soon succumbed to the flames, which, fanned by a strong wind, travelled eastward along the roof

of the nave, feeding on the timbers between the plastering and the tiles. A messenger was despatched to Chelmsford for the Essex and Suffolk Equitable fire-engine, which was got to the scene of the disaster as quickly as possible. An opening in the plaster work was made, and the fire was beaten back, so as to preserve the chancel (the only portion insured) intact. The roof of the nave is destroyed, and some of the fittings damaged by falling *débris*, the damage being estimated at about £200.

LINCOLNSHIRE.—A terrific thunderstorm passed over Great Grimsby and its vicinity on Wednesday afternoon, May 8th. At Great Coates, Robert Webster, aged 30, a farm labourer, in the employ of Mr. John Garniss, was killed by the lightning. He was engaged at the time in harrowing with a three-horse team. All the horses were knocked down and the centre horse was killed. Deceased's left arm and neck were broken, and his body fearfully lacerated and burnt. His clothes were ripped off, and bits were picked up twelve yards away. The shock was felt by other men working in the field, and a horse belonging to a second team was also struck down. The harrows appear to have attracted the lightning, which during its greatest intensity was unaccompanied by rain. During the time the storm lasted—namely, for nearly an hour—everything was shrouded in comparative darkness.

DEVON.—A tremendous storm passed over Bampton yesterday, accompanied with hail. At 12.35 the lightning struck the spire of the parish church, where five iron clamps are fixed, which is about 180 feet high. The fluid displaced 10 courses of stonework on the northern side, or about 15 feet; it also split the spire on the south side. The fluid apparently passed over the bells, destroying the wires connecting the chimes with the clock. It is supposed about 40 feet will have to be rebuilt. Several trees in the neighbourhood have been struck.

SURREY.—*To the Editor of the Times.* Sir,—As I was walking across Wimbledon common this afternoon at 20 minutes past 5 o'clock, in the midst of a deluge of rain, I suddenly received an electric shock in the left temple. I was carrying overhead an umbrella with an iron frame and wooden handle. A ring of sparks crackled from the extremities of the iron spokes, while almost instantaneously there broke immediately above a terrific peal of thunder. These facts may be of interest to some students of electricity.

GEORGE WYLD, M.D.

12, Great Cumberland-place, May 9.

OZONE.

To the Editor of the Meteorological Magazine.

SIR,—In the *Annalen der Chemie und Pharmacie*, for February and March, 1872, is an able paper by Dr. E. von Gorup-Besanez, on the Ozone Reaction of the Air in the neighbourhood of the Gradirhäuser, at Kissingen.

The author shows that the air near these places is popularly likened to sea air from its peculiar fresh smell, and finds this confirmed by ozone papers, which there gave higher numbers than similar ones exposed near his house at Kissingen. He gives careful chemical proof that ozone alone caused the colouration of the papers, and infers that this was due to the effect on the air of the finely-divided water spray with which these houses are filled. Further, the salt is not in question in the reaction, as similar results were obtained in experiments on finely-divided water spray in the Botanic Gardens.—Yours, truly,

W. D. HOWARD.

Tottenham.

DECREASE OF RAIN WITH ELEVATION.

To the Editor of the Meteorological Magazine.

SIR,—Mr. Crallan has called the attention of your correspondents to a theory advanced by Mr. Parnell, in the December number of the *Meteorological Magazine*, in explanation of altitude-difference of rainfall. Mr. Parnell states that altitude-difference of rainfall *must* result in the case of a shower driven by a north wind passing, in its descent, into a N.E. current: that the most easterly layer of drops is influenced by the N.E. wind to a *greater* extent than each more westerly layer. I cannot see any ground for this assumption, since each layer of drops, from the east to the west edge of the shower, falls into the N.E. current at the same moment, and the wind is blowing with the same force at the westerly as at the easterly edge; consequently, all the layers of drops are influenced in exactly the same degree: indeed, should a shower in its descent pass successively into four different currents of wind—north, south, east, and west—I see no reason why the *position* of the drops, *inter se*, in a horizontal plane should be altered. The path of any drop (the density of all being supposed equal) would be curved, and its direction altered, in a line exactly parallel with the path of its neighbours. I do not find in Mr. Parnell's theory, the explanation of this most puzzling feature of rainfall.—Yours truly,

G. WARREN.

Merton Villa, Cambridge, April 26th, 1872.

 REVIEWS.

Stonyhurst College Observatory. Results of Meteorological and Magnetical Observations, 1871. By REV. S. J. PERRY. Preston: J. Robinson. Small 8vo., 41 pp.

THIS useful annual, in addition to the ordinary matter which we have often described, contains several extra details of general interest. The first, is the following complete account of the earthquake of March 17th, 1871:—

“On the 17th, a shock of earthquake was felt throughout the whole country around. It was more severe than any that had been experienced for many years past in this part of England. Slight shocks appear to have been noticed here at about 6.30 and 10.30 p.m., but the greatest disturbance occurred between 11.5 and 11.10 p.m. The sound preceding the undulatory motion is described by most as resembling that of a strong wind, followed immediately by a noise like that caused by the passage of an express train over a wooden bridge. Then a very distinct rocking of the furniture, beds, and walls took place; the floors seemed to rise; and the rooms swayed backwards and forwards several times. The motion was violent enough to awaken many from their first sleep. Some thought that part of the building had fallen in, and others that something heavy had been upset in a room overhead. The rushing sound and crash was followed by a rumbling noise. The motion appeared to begin suddenly, to grow stronger for a time, and then to die away. It was more regular and powerful than the shaking from a heavy wagon in the houses of an old street. The disturbance was, however, insufficient to produce any decided irregularity in our photographic traces of the barometer, thermometer, or suspended magnets, except perhaps a very slight movement of the declination magnet. But in any case the duration of the whole phenomenon,

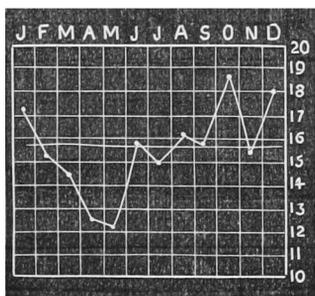
which must have occupied far less than half a minute, could easily have caused a slight blur in the photographic curve. Between 11 and 11.15 p.m., the sky, which both before and after the earthquake was completely overcast, suddenly cleared up for a very short time, and there was a decided rise of the temperature. The direction of the earthwave was generally supposed to be from E. to W., the wind blowing at the time from W.S.W."

The next special feature is a table showing the number of days in each month from 1848 to 1871, both inclusive, on which the fall of rain was at least 0.01 inch. Instead of transferring the table to our pages, we have drawn up the following abstract:—

Days on which 0.01 in. or more of Rain fell.

	Mean.	Max.	Min.		Mean.	Max.	Min.
January.....	17.3	27	7	July	15.0	26	8
February ...	15.2	23	4	August ...	16.1	26	7
March	14.4	26	2	September...	15.7	26	5
April	12.8	22	3	October	18.6	25	4
May	12.3	21	4	November...	15.4	26	6
June	15.8	25	4	December ...	18.0	27	7

These mean values are shown in the following diagram, whence the



lateness of the minimum, occurring in May, is very evident. The curve also shows that at Stonyhurst the frequency curve is very similar to that which Mr. Gaster's investigations would lead us to assume must be the quantity curve. The total number of days per annum ranges from 134 in 1855 to 234 in 1863, and averages 187, or, to put it shortly, it usually rains at Stonyhurst on half the days in the year.

The third extra article is on the comparison of the two sets of thermometric observations during the years 1868–1871. It is not a comparison of thermometer stands, *per se*, but of the ultimate result of two methods of observation. It is a comparison between the *mean daily temperature* as deduced from (1) a dry bulb thermometer on a Glaisher stand, read at 9 a.m. and 9 p.m., corrected for daily range by Glaisher's tables, and of the maximum and minimum thermometers, also corrected by the same tables, and (2) the mean of 24 hourly measures per diem of the thermograms, recording photographically the temperature, in a modified Kew thermometer stand.

Correcting an obvious misprint of 46°68 for the mean temperature of 1871 to 46°88, its proper value, we have for the mean of the four years by the first, or ordinary method, 47°55, and by the second, or

photographic, 47°·34. The difference (only two-tenths of a degree) is so small as to be very possibly due to shifting of the zero point in the older thermometers. Nothing is said about index error, but we think it possible that the corrections originally supplied with the instruments may have been used, and, if so, that on re-comparison with a standard it may be found that the index errors have altered. If this explanation is inadmissible, we should look for the source of this trifling difference in the fact that the thermograph bulbs are only 2 ft. 3 in. from the wall of the observatory, and that possibly warmth from the building, or from the lamps required to obtain their indications, reaches the bulbs. At any rate, it is satisfactory to find so small a difference, and to learn that two good eye observations per diem will give the mean annual temperature almost as accurately as a thermograph costing a hundred times as much money, and requiring mechanical skill in manipulation, photographic skill in preparing and developing the thermograms, and mental skill in reading off the curves and tabulating the results.

Sixth Annual Report on the Sanitary Condition of Merthyr-Tydfil.

BY T. J. DYKE, F.R.C.S., &c. Merthyr: Farrant and Frost. 8vo., 38 pp.

WE are glad to find Mr. Dyke continuing his reports, and keeping them up to the high level of completeness and accuracy which we have had to notice on previous occasions. One very important subject seems to have accidentally escaped recognition this year—the quantity and quality of the water supply. The meteorological notes possess their usual completeness, but we should like a few tabular values: as Mr. Dyke evidently takes his observations with regularity, a brief tabular summary could easily be compiled, and would be a welcome addition.

Jahrbucher der K. K. Central-Anstalt für Meteorologie und Erdmagnetismus. VON CARL JELINEK und CARL FRITSCH. Neue folge VI. Band Jahrgang, 1869. Vienna, 1871. Wilhelm Braumüller. Quarto. 278 pp., one plate.

THIS excellent publication maintains its character for completeness and efficiency, but we regret to see that no great progress has yet been made towards ensuring synchronous observations among the 163 contributors of observations. The most usual hours seem to be six or seven a.m., two p.m., and nine or ten p.m., but not only are these hours not universal, but many of the observers vary them according to the season of the year.

In the introduction, very full information is given as to the various changes in the stations and observers, as to determination of their heights above sea-level, and as to the errors of the various barometers. The usual Austrian daily weather reports occupy the first 96 pages, and are followed by the abstracts of temperature, mean max, and min. With respect to the two latter elements setting an example,

which (although adopted in our own pages) we venture to assert the Meteorological Societies of this country would do well to follow. The Austrians not only give the extremes of temperature but also the *dates on which they occur*.

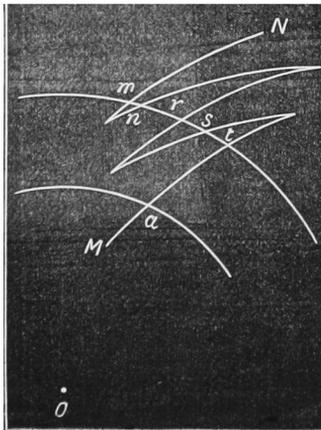
As to pressure we almost wish that the tables were given in duplicate, the sea-level equivalents being tabulated for each station. The rainfall and amount of cloud tables call for no special comment, but the excellent plan of giving *not* the number of observations, but the *per centage of frequency* of each wind at each station in each month is another point worth copying.

The remainder of the volume is principally devoted to results of ground thermometers, magnetic observations, and a very complete and well-arranged Natural History calendar,—not only superior to anything carried out in this country, but even to anything attempted. We commend this indisputable fact to the consideration of British naturalists.

Deschanel's Natural Philosophy. By Prof. EVERETT, D.C.L., F.R.S.E., Part III., Electricity and Magnetism. Large 8vo, 278 pp., one plate, and 241 engravings. Blackie and Sons.

THE general excellence of this translation is fully maintained in this third part, perhaps slightly increased by the translator's own researches in several branches of the subjects discussed. This is especially the case with respect to the amount and character of annual and diurnal variations, in atmospheric electricity, of the results of which Professor Everett gives a very able summary. We only notice one paragraph which we do not consider altogether satisfactory, namely, the following:—

“ 476. THUNDER.—Thunder frequently consists of a number of reports heard in succession. This can be explained by supposing that (as in the experiment of the spangled tube, § 440), discharge occurs at several places at once. The reports of these explosions will be heard in the order of their distance from the observer. If, for example, the lines of discharge form the zig-zag *m n* (fig. 404), an observer at *o* will hear first the explosion at *a*, then, a little later, the five explosions at *m, n, r, s, t*; he will consequently observe an increase in the intensity of the sound.”



Without entering on the question of the reality or otherwise of such zig-zag flashes as the one here figured, we think it rather strange that the influence of clouds and hills in producing the reverberation of thunder is wholly ignored. Those who have been close to objects struck by lightning are familiar with the fact that in such cases the thunder is not a peal but a single bang. Those resident in hilly districts, or who have been caught in thunderstorms on the Alps, or in other mountain chains, are equally aware how the thunder echoes and re-echoes from side to side, until the reverberation of one peal is merged in its successor. And, lastly, we think it is matter of experience with most meteorologists, that a single straight downstroke of lightning is often followed by a peal of thunder of greater length than a flash of more sinuous character. As to a zig-zag, such as is shown in the engraving, never having seen such a flash, we have no knowledge of what kind of thunder might follow.

As we have already said, we highly approve of the work ; we believe that it is destined to take a permanent place as an English textbook, and we have no doubt that now that Prof. Everett's attention has been directed to this single paragraph, he will, in the next edition, make it more worthy of the context, and of the trustworthy and well got-up work in which it appears.

The Normal Winds of Bombay. BY C. CHAMBERS, F.R.S., Superintendent, Government Observatory, Colaba. Small folio, 9 pp., 10 plates. [Extract from the *Bombay Builder*, June and August, 1869.]

THESE articles well merited republication in the separate form in which they are now before us. The instrument (the Beckley-Robinson anemograph) is fully described, with a few words as to certain modifications adopted at Colaba. After explaining that the observations are resolved into their N.—S. and E.—W. components, Mr. Chambers proceeds to explain the large series of diagrams with which the paper terminates, most of which are on an ingenious plan which is new to us, and for the explanation and illustration of which we refer our readers to the paper itself. The following paragraph puts the relative arguments for the publication of velocity and of pressure so clearly, that we transfer it *in extenso* :—

“The force of this wind has been measured by its velocity rather than by its pressure, because, to the meteorologist, the chief significance of wind lies in the interchange of meteorological conditions that result from the transfer of bodies of air from districts in certain conditions to other districts where the conditions are different ; and the quantity or extent of motion of the air bodily is the proper measure of this transfer, the same bodily motion of the atmosphere, carrying as part of it the vitiated air of populous towns and districts and supplying its place by fresh air, pure or impure, according to the influences to which it has been subjected in its previous course, is also the relation in which the wind affects sanitation. To the engineer or builder, however, who would regulate the strength of an elevated structure to the force of the winds that would strike it, the *maximum* pressure of the wind is the proper measure. The pressure is also proportional to the effectiveness of the wind in driving a ship through the sea, and is, therefore, the mariner's natural measure. The pressure is proportional to the square of the

velocity, and, therefore, an average pressure will not be exactly the same as the pressure which corresponds to the average velocity of the same winds, but somewhat greater. Neither can one be exactly calculated from the other, but they approach nearer to each other in value the more nearly the individual winds are of equal strength. And as regards the normal winds herein treated, the pressure corresponding to the velocities may be safely used as close approximations for nautical purposes. The formula for reducing velocities (V) in miles per hour to pressure (P) in pounds on the square foot, is— $P = \frac{V^2}{200}$

Meteorological Observations. Climate of Brighton. A series of articles published in the *Brighton Daily News*, from September to December, 1871, by F. E. SAWYER, F.M.S. 4to., 12 pp.

The Climate of Brighton, being a Summary of Meteorological Observations made in the Town, to the end of 1870, by SAMUEL BARKER, M.D., F.M.S.; EDWIN ROWLEY, F.M.S., and FREDERICK ERNEST SAWYER, F.M.S. [Reprinted, with additions, from the *Brighton Daily News*, June, 1871.] Small 8vo., 8 pp.

Brighton Rainfall. By F. E. SAWYER, F.M.S. [From the *Brighton Herald*, of September 30th, 1871.] Small 8vo., 6 pp.

HASTINGS used to possess a local Meteorological Society, but we believe it has faded away; Bournemouth has one at the present time, but the largest of our English watering places has not. And so long as the local observers co-operate as they are now doing their incorporation as a society is immaterial—it would be little more than a change of name. The three papers now before us are mainly the work of Mr. Sawyer, and afford abundant proof of his zeal and perseverance; and the first-mentioned is in all respects (except paper and type) a good model for a treatise on local climate. It commences with notices of the physical geography of the district, its altitude, configuration and geology. The two following chapters are devoted to temperature, mean, seasonal, and extremes. The winds come next, and are treated in a very clear manner. The sea breezes are thus referred to:—

“At Brighton the most marked of the land and sea breezes are the easterly. The land breeze, N. E. or E., blows until about 11 a.m., when the sea breeze, S. E. or S. sets in until sunset, or sometimes until midnight, when the land breezes begin again. When the breezes are westerly the land breeze is from the N. W. or W. and the sea breeze from the S. W. or S., occasionally S. E. Sometimes the land breeze begins in N. E., is followed by S. or S. W. sea breeze, and then a N. W. or N. land breeze again, or the reverse way, but this is not often.”

The chapter on Rainfall is good, but not equal to the separate article mentioned at the head of this review. There are also notices of ozone, pressure, humidity, radiation, absence of trees, and the reason for it. Phenomena in connection with the periodical return of the seasons, weather proverbs and prognostications, including a few Sussex ones, *e.g.*,

“When Wolsonbury has a cap
Hurstpierpoint will have a drop.”

a south country modification of a common prognostic, of which perhaps a few other variations may be appropriately mentioned:—

“ If Riving Pike do wear a hood,
Be sure the day will ne'er be good.”

“ When Cheviot ye see put on his cap,
Of rain ye'll have a wee bit drap.”

“ If Roseberry Topping wears a cap,
Let Cleveland then beware a clap.”

“ When Breddon Hill puts on his hat,
Ye men of the vale beware of that.”

“ When Largo Law puts on his hat,
Let Kellie Law beware of that ;
When Kellie Law gets on his cap
Largo Law may laugh at that.”

Note—Largo Law is to the south-west of Kellie Law.

Some of these are taken from a capital collection of *Weather Lore*, by R. Inwards, which, incidentally, we recommend to our readers.

The next chapter is devoted to a chronology of remarkable phenomena from 1703 to the present time, ably compiled, and very interesting. De Foe's report on the storm of 1703, is quoted, and we repeat the quotation, as, perhaps, no greater contrast can be found than the Bighthelmstone of his day and the Brighton of our own :—

“ Bighthelmstone being an old-built and poor, tho' populous town, was most miserably torn to pieces, and made the very picture of desolation, that it lookt as if an enemy had sackt it.”

The work concludes with notices of the various observers in Brighton during the present and previous centuries, with a list of the works on the climate or meteorology of the town, and a comparison of the climate of Brighton with that of other parts of Sussex.

BOOKS RECEIVED.

Sussex County Lunatic Asylum, Hayward's Heath. Thirteenth Annual Report, being for the year 1871. 8vo.

Currents and Surface Temperature of the North Atlantic Ocean. 4to. Price 2/6.

Deschanel's Natural Philosophy. BY PROF. EVERETT. Large 8vo. Price 4/6.

A Sketch of the Geology of the Neighbourhood of Banbury. BY MR. THOMAS BEESLEY, F.C.S. Small 8vo.

Report of the Rugby School Natural History Society for 1871. 8vo.

Proceedings of the Literary and Philosophical Society, Manchester. Vol. XI., No. 11.

Meteorological Society of Mauritius. Monthly Notices, 1871.

AMERICAN WINTER.

It is stated that this year, for the first time within the memory of man, Lake Michigan has been frozen over as far as the eye can reach, the ice being from four to eight inches in thickness.

APRIL, 1872.

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 1860-5	Greatest Fall in 24 hours.		Days on which .01 or more fell.	Max.		Min.			
				Dpth.	Date.		Deg.	Date.	Deg.	Date.	In shade	On Grass.
		inches	inches.	in.								
I.	Camden Town	1.39	+ .26	.31	20	16	70.2	27	29.4	20	1	5
II.	Maidstone (Linton Park).....	1.56	+ .34	.51	21	15	71.0	12+	30.0	20	4	...
	Selborne (The Wakes).....	1.49	- .01	.41	20	14	64.5	27	26.2	7	5	9
III.	Hitchin	1.88	+ .88	.40	21	15	67.0	27	26.0	19	4	...
	Banbury	2.15	+ .99	.65	27	15	69.0	12	28.5	7	5	...
IV.	Bury St. Edmunds (Culford).....	1.86	+ 1.11	.43	20	16	71.0	12	24.0	19	6	16
V.	Bridport	2.18	+ .70	.47	22	10	63.0	8, 14	26.0	20	6	...
	Barnstaple	2.68	+ .67	.43	21*	13	67.5	12	32.0	20	...	...
	Bodmin	4.58	+ 2.88	1.20	21	14	63.0	14	34.0	6	...	5
VI.	Cirencester	2.37	+ 1.08	.65	27	12	...	...	...	...	...	...
	Shiffnal (Haughton Hall)	2.96	+ 1.81	.79	1	13	65.0	12	31.0	3, 4	6	...
	Tenbury (Orleton)	2.82	+ 1.28	.70	27	13	70.8	12	29.8	20	3	14
VII.	Leicester (Wigston)	3.03	+ 1.73	.64	28	13	75.0	12	30.0	20	3	...
	Boston	2.71	+ 1.74	1.12	2	15	73.8	12	33.8	4	...	4
	Grimsby (Killingholme)	3.07	...	1.05	21	14	68.0	12	32.0	20	...	...
	Derby.....	2.24	+ .81	.69	27	14	70.0	12	31.0	20	1	...
VIII.	Manchester	2.98	+ 1.22	.91	2	11	70.4	12	30.0	3	3	10
IX.	York	2.81	+ 1.71	.72	2	16	67.0	12	30.0	20	1	...
	Skipton (Arncliffe)	4.44	+ 1.40	1.33	22	17	...	...	...	...	...	...
	North Shields	1.94	+ .63	.88	21	13	63.6	12	33.0	19	...	3
	Borrowdale (Seathwaite).....	5.08	- 1.82	1.48	7	13	...	...	...	...	...	...
XI.	Cardiff (Ely)	1.99	+ .06	.49	28	10	...	...	...	...	...	...
	Haverfordwest	2.45	+ .59	.50	25	13	62.0	30	28.0	19	8	12
	Rhayader (Cefnfaes).....	3.63	+ 1.74	.55	25	13	65.0	...	29.0	...	...	...
	Llandudno.....	2.18	+ .68	.71	21	9	67.2	30	32.5	20	0	...
XII.	Dumfries	1.16	- .51	.35	27	9	64.0	12	30.0	3	3	6
	Hawick (Silverbut Hall).....	3.03	...	.75	21	16	...	...	...	...	...	...
XIV.	Ayr (Auchendrane House) ...	.89	- 1.33	.29	7	9	60.0	12	25.0	19	5	13
XV.	Castle Toward	1.82	- .68	.50	1	13	56.0	8	28.0	...	2	...
XVI.	Leven (Nookton)	1.75	+ .50	.40	27	11	62.0	10+	29.0	6	3	14
	Stirling (Deanston)	1.35	- .40	.32	25	16	62.7	10	21.0	27	6	9
	Logierait	1.05	...	.29	24	9	...	...	...	...	...	...
XVII.	Ballater .....	...	...	...	...	...	...	...	...	...	...	...
	Aberdeen	3.00	...	.62	27	18	59.9	14	33.8	19	0	14
XVIII.	Inverness (Culloden) .....	.92	...	.28	23	16	57.0	30	33.9	21	0	8
	Portree	5.35	+ .08	.81	30	24	...	...	...	...	...	...
	Loch Broom	2.83	...	.42	20	21	...	...	...	...	...	...
XIX.	Helmsdale.....	3.49	...	1.01	17	23	...	...	...	...	...	...
	Sandwick	2.40	+ .66	.36	7	20	60.0	30	33.0	1	...	13
XX.	Cork	1.11	...	.31	20	9	...	...	...	...	...	...
	Waterford	3.04	+ .81	.88	20	13	63.0	15	30.0	22	2	...
	Killaloe	2.46	+ .33	.46	7	14	65.0	9§	28.0	5	3	...
XXI.	Portarlinton	2.33	+ .31	.66	22	22	62.0	10	29.5	4	4	...
	Monkstown	2.97	+ 1.33	1.20	21	11	70.0	10	30.0	5	4	...
XXII.	Galway	1.70	...	.35	7	12	60.0	8, 10	30.0	4	1	...
	Bunninadden (Doo Castle) ...	1.16	...	.20	1	17	56.0	30	29.0	4	5	...
XXIII.	Bawnboy (Owendoon) .....	...	...	...	...	...	...	...	...	...	...	...
	Waringstown	3.05	...	.56	21	13	65.0	11‡	30.0	2	3	12
	Strabane (Leckpatrick)	2.89	..	.57	1	22	...	...	...	...	...	...

* And 25. + And 15. ‡ And 30. § And 15, 25, 29.
 + Shows that the fall was above the average ; - that it was below it.

METEOROLOGICAL NOTES ON APRIL.

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.

LINTON PARK.—A remarkable but not unfavorable month; bright, warm, sunny weather generally prevailed, so that vegetation is more forward than has been the case for several years at the same period. T and L with a little R on two consecutive nights, 26th and 27th; high wind on night of 20th; ther. 7° or upwards on six days; bar. generally unsteady, and wind changeable.

SELBORNE.—Temp., wind and weather all variable; frequent frosts; fog on 5th, 11th, 20th, and 21st; heavy S on 21st; H and R on 25th; faint aurora on 10th and 11th.

BANBURY.—T, L, S, and heavy R on 21st; H on 23rd and 24th.

CULFORD.—Frost on the grass on 16 mornings; on the night of the 24th, the temp. fell to 24°, or 8° below the freezing point, this, as might be expected, has greatly injured the fruit crop; the max. bar. was 30·22, and the min. 28·50; polar winds prevailed on 11 days, and equatorial on 19; H on 18th and 19th.

BRIDPORT.—The first 19 days fine and genial; on 25th a sharp white frost, ice quarter of an inch thick (on tubs), cutting nearly all the potatoes; this was followed by 8 successive days of R and very cold weather; S falling on 24th; and on 25th heavy R, S and H with a strong gale; the last three days fine and genial; nearly all the apricots are cut off, peaches standing pretty well; cowslips out on 6th.

BODMIN.—Brilliant aurora in the N., at 9.30 p.m., on the 10th.

CIRENCESTER.—Aurora on 15th, from 8.15 to 9 p.m., the streamers were rose-colored and white. On the 21st S fell; and the month altogether must be considered as a cold one for April.

HAUGHTON HALL.—The month opened with a determined R for the greater part of two days; after which it continued dry to the 18th, when R again set in, and, with the addition of four hours' S on 21st, fell every day but one till the 27th, on which day it finished with a fall of ·60, nearly doubling the month's average; fog on the morning of 15th; severe TS, from 3 to 4 p.m., on 22nd, repeated at the same hour of the 24th, both from S. W.

ORLETON.—The rainy season, which set in on 17th Dec. last, ended on the 2nd of this month; thence it was fine, dry, and generally warm till the 20th, when it began to cloud over, and at sunrise on 21st fine S began to fall, increasing in density till 2 p.m., with a violent wind from the N. E., and ceasing about 3 p.m., when all the country was covered with S; the wind then veered to the E., and the temp. rose from 35°, at 3 p.m., to 45°, at 9 p.m., followed by heavy R; on 22nd, two TS with H and R commenced over us, and passed off to the N., one at 12.30, the other at 1.15 p.m.; on 24th a TS commenced about 1.15 p.m., with a loud peal in S. S. W.; an oak shivered to splinters about four miles distant, the storm then passed over to the N. N. E., and a church was struck at Kidderminster, houses at Dudley, and many trees in its course. Very rainy in heavy showers till the 28th, when there was a great fall in the night; the weather was fine thence to the end of the month; temp. of the whole month about the average.

WIGSTON.—Vegetation forward, particularly grass and wheat; apple and pear bloom promises to be abundant; temp. very variable, the range being 45°; snowed continuously for 7 hours on the 21st.

KILLINGHOLME.—Vegetation forward, and a good promise of a fruit crop; the cold and wet have caused the wheat on heavy lands to suffer greatly. Far more R has fallen in the first five months of this year than in any of the six years that I have kept a gauge; a frost doing much damage on 20th; very cold and stormy on 21st.

MANCHESTER.—S and heavy R on 2nd; fine aurora on 10th; S on 19th; T and L on 24th and 25th.

YORK.—Frost on ground on 3rd; mock sun at 6.48 p.m. on 10th; aurora on 12th, 25th and 29th; T at 2.50 p.m. on 24th, with H; T and L on 25th.

NORTH SHIELDS.—Solar halo on 6th; aurora on 15th and 28th; TS on 24th.

SEATHWAITE.—S on top of hills on 18th; H on 19th; T on 23rd.

W A L E S.

HAVERFORDWEST.—First week fine, clear and frosty ; from the 11th very cold, bleak and winterly, especially on the 21st, S covering the hills ; much cold rain till the 26th ; fine to the end ; R about the average.

CEFNFAES.—The month cold and ungenial ; wind mostly N.E. or S.E. ; vegetation forward ; heavy storm of rain, T and L, on 25th.

S C O T L A N D.

DUMFRIES.—The first two weeks dry and fine, with slight frosts on several mornings ; from 14th to 22nd the weather very cold and withering, with bitter northerly winds ; the last week showery and mild ; T on 23rd ; S on 17th ; H on 17th and 23rd. The country towards the close of the month looking beautiful with wild cherry, or gean, and the sloe clothed with masses of bloom. Mean temp. 1.86 below corresponding month last year ; mean of cold about the same, but mean of daily heat 3.73 lower ; S on the hills on 18th ; T and H on 23rd.

SILVERBUT HALL, HAWICK.—Very little sunshine, and often cold easterly winds ; frost at night on 2nd, 5th, 8th and 18th ; H and S showers on 3rd, 18th, 20th and 23rd. Very violent T S on the afternoon of 23rd, when the L damaged and set fire to the Hawick slaughter houses ; the rainfall has been pretty heavy, and the pastures in consequence are looking green and beautiful ; aurora on 15th.

AUCHENDRANE.—This April has been a month of rather low temp., slight rainfall, and somewhat small amount of cloud. The winds have been brisk but not stormy, except perhaps on the 20th and 21st, and of the 60 wind observations, 22 were N. or E., 34 S. or W., and 4 calm or variable ; there was also a great difference between the mean temp. of the air, and the temp. of condensation ; the air has been very dry throughout, and it never once reached saturation ; evaporation was consequently very strong, and the rivers have decreased greatly ; crops are looking well.

CASTLE TOWARD.—On 20th hills covered with S ; prevailing winds from N.E., and E. were bitter cold winds ; this month on the *whole* has been favourable for out-door work ; fruit trees look well, and grass growing very fast.

DEANSTON.—Cold and blowy ; but little R during the first half of the month ; very stormy and cold from 16th to 19th ; smart frosts at night on 19th and 21st, then stormy and cold, and S on the hills ; rainy from 21st to 28th ; milder on 24th, with T S and some R ; fruit tree blossoms not apparently injured.

LOGIERAIT.—Mild till the 15th ; high wind from E. on 14th, and temp. fell considerably and continued low till the 29th.

ABERDEEN.—Temp., rainfall, number of rainy days, and frequency of N. and E. winds, all above the average ; estimated pressure of wind rather below it. A wet unseasonable month ; several heavy gales ; much seed still to sow ; S and H on 19th, ground quite white ; aurora on 10th, 15th and 16th (red) ; T S from 5 to 7 p.m. on 12th, house completely wrecked by L near Old Meldrum.

CULLODEN.—Rainfall 37. below the average of 30 years ; T on 12th.

PORTREE.—A wet stormy month ; heavy gale on 16th and 17th from S.W. to W. with H showers ; fall of S on 18th, 19th and 20th ; severe frost on night of 19th, which blackened Black Italian and Aspen Poplars and most of garden shrubs ; T S on afternoon of 25th.

LOCHBROOM.—With the exception of the 19th and 20th (which were very cold and stormy with sleet and S), the month on the whole maintained the character of its predecessor for very good quality to man and beast ; never were the crops so early, nor in such good condition, committed to the ground.

SANDWICK.—The R has been rather above the average ; about the 1st and again just after the middle of the month, there were northerly winds with cold weather, but since the 23rd the winds have been southerly and the weather mild ; aurora on 3rd and 26th, and one corruscating from zenith on 10th. Wind, 40 miles an hour, from 11 a.m. to 6 p.m. on 3rd., 46 miles an hour, from 8 till 11 p.m. on 8th, and 50 miles an hour, from 6 a.m. on 16th to 5 a.m. on 17th, and continuing till 11 p.m. on 17th, at times 55 miles per hour, but on an average for the whole time 41 miles an hour.

I R E L A N D.

WATERFORD.—Aurora on 11th.

MONKSTOWN.—1.20 of R fell on 21st during the gale from N.N.E.; month cold; vegetation much injured by the gale on 21st and 22nd, especially near the sea.

DOO CASTLE.—Fine month for farming operations, very little R, but temp. low, cold N. and N.E. winds which prevented vegetation; T on 23rd and 24th; gale on the night of 21st.

WARINGSTOWN.—First fortnight cold but generally dry; second wet and cold; labour very much delayed; spring backward.

BALLATER.—We have received, with much regret, intimation of the death of our able correspondent, Mr. J. W. Paterson, of Ballater. The promptitude and punctuality with which he forwarded his reports were only surpassed by their accuracy and completeness.

NATURAL HISTORY CALENDAR.

As the notices of arrival of spring visitors are rather more numerous than usual, we have collected them in the following table:—

	Chislehurst.	Bromley.	Linton Park.	Bincombe, Berks.	Shenley, Herts.	Sandy, Beds.	York Town, Surrey	Hounslow.	Druid Ashburton.	Orleton.	Cefnfaes.	Bridport.	Bromsgrove.	Wigston.	Culford.	Grimby.	Shiffnal.	Llandudno.	Hawick.	Haverfordwest.	Dumfries.	Culloden.	
Cuckoo, first heard	10	11	12	13	13	14	...	14	15	15	15	15	16	19	22	22	23	25	...	28	28	...	
Swallow, first seen	...	14	...	...	...	...	...	14	...	...	...	13	15	26	23	14	16	...	25	...	14	20
Nightingale, first heard	10	12	8	...	...	10	11	...	...	...	...	...	...	...	20	...	...	...	...	...	...	...
Willow Wren	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	15	...	...	...	...	24
Willow Warbler	...	...	...	...	...	...	...	...	...	...	...	...	26	...	26	...	...	...	...	...	...	...
Red Start	...	...	...	...	...	...	...	...	...	16	...	...	...	...	...	...	...	...	...	...	...	...
Black Cap	...	...	...	...	...	...	...	...	...	16	...	...	...	...	...	...	14	...	...	...	...	...
White Throat	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14	...	...	...	...	...
Sand Martin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	...	...	...	...
House Martin	...	...	...	...	...	...	...	...	...	...	...	...	25	...	25	...	...	...	...	...	...	...
Tree Lark	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21	...	...	...	...	...
Spotted Flycatcher	...	...	...	...	...	...	...	...	...	...	...	...	...	28	...	28	...	...	...	...	...	...
White Butterfly, first seen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	...	...	...	...
In Blossom.	Gooseberries	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
	Blackthorn	...	...	...	...	...	...	...	...	...	...	...	...	...	6	1	4	...	...	...	...	...
	Apple	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	23	18	...	...	...	24
	Apricot	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18	...	...	...	...	...	18
	Cherry	...	...	...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	10
	Pears	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Plum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Lime	7	7	15
	Sycamore	7
	Ash	7
In Flower.	Laburnam	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	28	...	...	...	...
	Horse Chesnut	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	28	...	...	...	...
	Lilac	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
	May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	29	...	...	...	...
	Wood Anemone	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	28