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DESTRUCTIVE THUNDERSTORM ON APRIL 14TH.

ACCURATE knowledge of the path and progress of thunderstorms seems as far off as ever. That on the 14th ult. was, as may be seen from the following list of accidents, very severe, yet the reports we have received are so few, that it is impossible to sketch its progress with any accuracy. It seems to have been felt much earlier in the west than in the east, but there is no proof of motion from W. to E. One fact alone is certain, viz., that at 7 p.m. on that day, thunder and lightning were audible and visible at Sheffield, Hull and York, in Fifeshire, and in Aberdeenshire.

ISLE OF MAN.

DOUGLAS.—A thunderstorm of tremendous violence swept over the the Isle of Man on Wednesday. In the morning the thunder could be heard rumbling at a great distance off, but at three o'clock in the afternoon the storm had moved immediately over Douglas, when crash after crash followed each other with terrific violence. This lasted about half an hour, and caused great alarm on account of its propinquity. It was followed by a heavy fall of rain, the drops of which were fully the size of shilling pieces.

ANGLESEA.

To the Editor of the Meteorological Magazine.

SIR,—I send you the following notice of a dangerous thunderstorm which took place here on Wednesday last:—

A thunderstorm of dangerous character passed over this place on Wednesday, April 14th. Beyond a slight fall in the barometer, there were, at 9 a.m., no indications of its approach. After a few distant rumblings, beginning at 12.30 p.m., the storm rapidly increased in intensity, and was at its height from 1 to 2 p.m., continuing more or less until 4 p.m. It appeared to travel first from S. to N. with the wind, then back again from N. to S., finally dying out towards N.N.E. The lightning was remarkably vivid, and was followed on several occasions instantaneously by the thunder, which sounded like the irregular rattling off of a chain-cable through a ship's hawse-hole, and ended in a sudden explosion. In a grass field on the farm of Rhyddgaer, a mile W.N.W. from here, the lightning tore two holes in the ground,

bearing N. and S., 20 yards apart, the largest being a square of about 2 ft., the other somewhat smaller. The turf was loosened all around, and clods as big as a man's fist were scattered in all directions, and to a distance of many yards. A thin narrow line, scraping the earth as though a single tooth of a harrow had been dragged over it, extended for 8 yards in an easterly direction from the largest hole. There are numerous reports of accidents, but the only instances I can authenticate are these following: — Three or four persons struck near Llanerch-y-medd, 14 miles off, and two women struck at a place near Llanyefni, 8 miles distant. The rainfall here amounted to no more than ·01, but within 2 or 3 miles there was a deluge of mingled rain and hail.—I remain, dear Sir, yours truly,

W. WYNN WILLIAMS.

Menaifron, near Carnarvon (Station No. 23) April 17th, 1869.

LANCASHIRE.

LYTHAM.—A man named John Moore, aged 57, was struck dead by lightning about four o'clock on Wednesday afternoon, during the thunderstorm, while working in the garden of Mr. Cornelius Fisher, at Warton, near Lytham.

PRESTON.—A horse and cart were being driven along Deepdale Road by a man named Thomas Hall, when the animal took fright at a flash of lightning, and started off at a gallop. Hall, who was riding in the cart, was thrown to the ground, and sustained injuries that caused his death on Thursday morning. During the severe thunderstorm which occurred on Wednesday evening, a young man, engaged in field operations with three horses, in Euxton, near Chorley, was struck by the lightning, which caused the total loss of the use of his left arm. Two of the horses were also partially disabled.

STAFFORDSHIRE.

WOLVERHAMPTON.—Here the lightning fused two gaspipes, one at Messrs. Bradshaw's Flour Mills, Horseley Fields, and the other at the residence, at Goldthorn Hill, of Mr. Lloyd. Only in the first case, however, was there any ignition. There the lighted gas set fire to the roof of the mill, but the fire was soon put out.

WALSALL.—A house in Rowley Street was struck by the electric fluid, the chimney being overturned, a part of the roof displaced, and one of the windows broken. In Tantarra Street a house was likewise injured, the chimney being overturned and one of the windows forced out. At Holloway Bank, Hilltop, the chimney of a house in the occupation of Mr. Partridge, brass dresser, was struck by the electric fluid and overturned, the roof and one of the windows being also damaged.

CUMBERLAND.

CARLISLE.—At Parham Beck a chimney was struck by the lightning during the storm and fell with a great crash. In the same neighbourhood the electric fluid played some strange vagaries with a clock, twisting the chain and injuring the works. At Little Corby, near this

city, an old oak tree, well known in the neighbourhood as "the boggle tree," was struck by the lightning. The electric fluid entered the trunk about 20 feet from the ground, and tore a strip down to the bottom. Some of the shattered pieces of oak were found nearly 100 yards away. A young man, who witnesssed the occurrence as he was returning home from ploughing, describes it as something terrible. Dust and smoke and splinters were flying in all directions. Fortunately the man and his horses escaped unhurt, although within 50 yards of the tree at the time it was struck.

BRAMPTON.—A little girl was standing at her father's shop door, when a flash of lightning crossed her eyes and rendered her totally blind. Under careful treatment she recovered the sight of one eye during the night, but the other is so much injured that it is feared she will not be able to see with it again.

PENRITH.—In a house in Duke Street the lightning took a very eccentric course. It appears to have disarranged the fire-irons in the drawing room, leaving distinct traces of the direction it had taken in its course; and it then struck the steel pin upon the dial of an American timepiece. The rim of the dial, composed of steel encased in brass, was severed from its hinges, and fell to the ground, breaking the glass into many fragments. The works of the clock stopped simultaneously with the action of the shock.

YORKSHIRE.

SITWELL.—A valuable horse belonging to Mr. W. Salmons, farmer, was struck by lightning whilst grazing in a field near the farm, and killed instantly. Whilst Mr. Henry Salmons, Sitwell, was returning home from Geedingwell in a gig, a flash of lightning caused the horse to take fright. Mr. Salmons and his wife, who accompanied him, were thrown out, but were not seriously injured.

SHEFFIELD.—The lightning struck the spire of Stannington Church, partially knocked it down, and dislodged some large stones, which fell upon the roof and inflicted considerable damage. No one was hurt. —A couple of semi-detached houses, occupied by Mr. Ellison and Mr. Dearden, at Ranmoor, Yorkshire, were struck by lightning. The electric fluid seems to have passed down the bell-rope, which was either molten or snapped asunder. Mr. Ellison was standing close by the door watching the storm at the time, and near him was a metal fall pipe. Whether he touched it or not is not certain, but about the same time that the lightning passed down the bell rope, Mr. Ellison received a severe shock upon his arm nearest the pipe. Immediately afterwards he felt this arm beginning to swell rapidly, and prompt restorative measures had to be taken. He is still suffering from the injury. Mr. Dearden's servant man was still more severely hurt, and was for some time unconscious after the shock.

MALTON.—A violent storm swept over this district on Wednesday, April 14th, its chief force being expended in the vicinity of the village of Scagglethorpe. The storm just missed the village, but on the farm of Mr. Lamb, in a grass field (near the centre) a two years old grey

hunting filly by Malpas—a valuable animal—was seen to leap high in the air, and fall dead. Beside her are two large holes in the ground, and at some yards distant two other large holes, from which masses of earth have been hurled to a distance of forty yards. The mare is literally singed. About a quarter of a mile distant a large elm tree was shivered, and its roots torn out of the stiff clay for a great depth. Here, too, are large holes in the ground, and masses of clay, and portions of root are found seventy yards away. The hedgerow is also torn up for some distance. In the next field an ash tree was struck with similar results. A cast iron roller in a lower field was split into a thousand fragments. In the village two women and a man were slightly affected, and on the low road a man was run over, the lightning startled his horse, he falling from the conveyance. None are much worse. Although no rain fell at Scagglethorpe—the eastern edge of the storm area—at Norton and Malton there was rain, and during the storm a shower of hail as large as nuts.

BURTON SALMON (*between Leeds and York.*)—Some houses, belonging to Mr. Sharp, joiner, of that village, were struck by the lightning. The roof of one of them was greatly damaged, and several windows were broken.

TODMORDEN.—Three houses at Cross Stone were struck by the lightning. The one most damaged was struck at the roof near the chimney at the gable. The thunderbolt penetrated the slate, passed through the bedroom floor, into the house, and through two walls into the third house. In its course a case clock which was in the bedroom of the first house, was smashed to pieces, and part of the ceiling removed from the top of the house. Mrs. Barker, who lived in the house, had her shoe soles nearly torn off, and one stocking and one foot much burnt; she was struck deaf, and so far paralysed that she could not walk. One of the inmates of the middle house was struck blind, but only remained so a short time. Most of the windows of Barker's house were blown out. Some of the slates were carried a distance of 20 yards by the force of the stroke.

PICKERING.—At Shaw End, near Leatholm Bridge, a house was literally blown up and torn from its foundations; two of the inmates were burnt to ashes, and only a child escaped.

HOLMFIRTH.—A cow, belonging to Isaac Sykes, farmer, was struck by a flash of lightning, and died almost instantaneously. A girl, who had been milking the cow, was also struck by the electric fluid. She was deprived of the power of speech, and still remains dumb.

THURSTONLAND.—The lightning descended the chimney of a house occupied by Mr. Lancaster, and greatly alarmed the inmates. The children were knocked about, and the occupants nearly smothered with soot.

HUTTON (4 *miles west of Malton.*)—Large angular pieces of ice, some 1½ inches in diameter, fell. In places crops are cut, and fruit trees in bloom on south walls have suffered heavily.

PATELEY BRIDGE, LIMLEY.—The lightning struck a barn in the

occupation of Mr. G. Rhodes, and in a very short period the whole structure was completely gutted. A large quantity of hay and a number of farming implements and machinery were also consumed. Two cows were with difficulty saved.

WHITBY.—The lightning struck a window of Mr. Kipling's house at Barnby Sleights, about eight p.m. on Wednesday evening, and the flame was so powerful that the curtains, wood-work, &c., were entirely consumed before it could be extinguished. The occupants were greatly alarmed, but no other mischief was done. A little later on the same night a servant girl named Colburn, living with Mr. Harforth, farmer, Lyth, was knocked down by the lightning, and remained quite insensible until about four o'clock on Thursday morning, when she partially recovered, and is now doing well. She is suffering, however, from a painful obliquity of vision, in consequence of the accident.

ABERDEENSHIRE.

HUNTLY.—The storm here was the most severe that had occurred since 1846. The lightning flashes were forked, and were frightfully vivid and alarming, the crashes of thunder being also terribly distinct. People ran from their houses in alarm after one flash, which was followed by a dreadful crash; and it was soon found that a house in M'Veagh Street had been struck, several stones dislodged from the wall, and the plaster torn from the inside walls. The house is presently undergoing alteration with the view of enlargement, so that, fortunately there was no one living in it. We hear of several other cases of damage done in our neighbourhood. During the storm the rain fell like "whole water," and large hailstones accompanied the showers. At Loanhead the family residing in Charlotte Villa were much alarmed by a loud crash, the lightning having struck the top of the chimney. The family had just finished tea, when in a moment they were all covered with soot, which spread over the floor. A piece of an arm-chair on which Mr. Gray was sitting was wrenched off, and the top of the vent is much shattered. Fortunately none of the family were injured.—*Scotsman.*

THE METEOROLOGICAL OFFICE.

On Friday, April 30th, Mr. R. H. Scott, the director of the Meteorological Office, delivered a lecture at the Royal Institution on the past and present work of that office. He stated that the primary object for which the office was established was the acceleration of ocean routes for vessels by the investigation of winds and currents, a work in which Maury has taken so prominent a part. The first impulse to the present work was given by Sir J. Burgoyne in 1852, and after that, at the Brussels Conference in the following year, a scheme of international co-operation in the investigation of marine meteorology was resolved upon. Mr. Cardwell founded a Meteorological Department of the Board of Trade in 1855, and placed Admiral Fitzroy at its head. Allusion was then made to the other nations which are working on the same subject. The system of the office has been to lend instru-

ments, verified at Kew Observatory, to captains in the mercantile navy, and to receive on their return from the voyage the observations made during that period. The subjects of inquiry to which the office directed its attention were laid down by the Royal Society in a letter to the Government in 1855. Materials accumulated faster than they could be dealt with, and as Admiral Fitzroy's own attention was diverted in 1861 to the subject of storm warnings, the marine work did not go on so briskly as it might have done, and at his death not very much had been published of the work which he had commenced. At this period a committee was appointed, at the request of the Board of Trade, to inquire into the office, and these gentlemen presented a report to Parliament in 1866, in which they recommended that the study of marine meteorology should be diligently pursued, and that the entire management should be handed over to a scientific committee, to secure that no portion of the work should be neglected. The Royal Society were again consulted by Government, and agreed to appoint a committee to superintend the office. The Royal Society itself has nothing to do with the office or its funds, it only appoints the committee. This body entered on their duties in January, 1867, and in order to secure the sea work being properly done, appointed Captain H. Toynbee, of the Mercantile Marine, to assist the director by taking charge of that Department. The work left unfinished by Admiral Fitzroy is being completed, and either published independently or sent to the Admiralty to be embodied in the new pilot charts for the oceans. As new work, the region of the Atlantic Doldrums, lying between 20° N. and 10° S., is being closely examined. It is a remarkable coincidence that this is the very region the investigation of which, on the identical plan now followed out, was urged by Mr. Marsden and Mr. Dalrymple at the Admiralty at the beginning of this century. Marine meteorology is and will be the main subject to which the attention of the office will be directed, although other branches of investigation may appear more attractive, and be more generally popular.

Weather Intelligence.—In 1859 the British Association at Aberdeen sanctioned the appointment of a committee, who suggested a system of storm warnings; in fact, the telegraphy of the fact of the existence of a storm from one place to another. Admiral Fitzroy instituted storm warnings in February, 1861, and began to foretell, or rather "forecast" the weather for three days in advance. This system, though distrusted by some authorities, went on for five years On his death, the Committee of Inquiry reported against the system as carried on, and the Royal Society declined to undertake it. The warnings were suspended in December, 1866, by the Government, but remonstrances began soon to come in, and the matter was urged in Parliament. Ultimately, in June, 1867, the committee, at the request of the Board of Trade, consented to issue telegraphic information of facts, virtually the plan proposed eight years before at Aberdeen, and this system was set on foot at the end of the year. Now the drum signal is hoisted at 100 stations,

and intelligence is sent to the adjacent coasts of the Continent. The reporting stations have been inspected, and much improvement has been observable in the reports received from them. Most cordial co-operation in the work is afforded by the French authorities, especially by M. Le Verrier and the Ministère de la Marine. The difficulties in the way of carrying out storm warnings were illustrated by the storm of August 22nd, 1868, which came on very suddenly, and did a great deal of damage; but it was shown that as a general rule storms travel from west to east, and out of 37 storms of which intelligence was sent to Hamburg during the past year, 19 reached that port, while only 3, and those easterly storms, were felt there before the telegram arrived. The method of weather study followed in the office was described, and some encouraging results of the work were communicated, and rendered intelligible by means of diagrams. The first of these was the confirmation of the law laid down by Professor Buys Ballot, of Utrecht,—namely, that the barometer is lower on the left-hand side of a current of air than on the right. It was shown that this principle is true for our storms, and that it enables us to tell with some certainty for 24 hours in advance the wind which is going to be felt on any line of coast. The account of this inquiry has been privately printed by the committee.* The second principle is one urged by Mr. Meldrum, of the Mauritius, which, however, had been independently arrived at in the Meteorological Office here — viz., that whenever the polar and equatorial currents are observed at the earth's surface, the former lying to the northward of the latter, a serious southerly gale is nearly sure to follow within two or three days. This was the history of the hurricane in Edinburgh on January 24th, 1868, and also of the storm which occurred at the time of the Naval Review, July 16, 1867. It was also stated that evidence was being accumulated of the recurrence of types of weather, a subject which cannot fail to yield useful results.

Self-recording Observatories.—Lastly, the system proposed by the Royal Society in 1865, for the study of British meteorology by means of self-recording instruments, was described. This system is now in operation, and is managed principally by Dr. Balfour Stewart at the Observatory, Kew, under whose superintendence is the central and normal station. The observatories are distributed over the British islands. In addition to Kew, two are in England, at Falmouth and Stonyhurst; two in Ireland, at Armagh and Valentia; and two in Scotland, at Glasgow and Aberdeen. The instruments in use were described, and an anemograph and a barograph were exhibited by the kindness of Messrs. Beck. A complete account of these instruments is to be found in the committee's report for 1867. The observatories were started in the beginning of 1868, and some months were expended in getting the entire system into thorough working order. This, it is hoped, has now been effected, and the attention of the committee is

* See *Meteorological Magazine*, Vol. III., p. 157.

being directed to the discussion of the results yielded by the instruments. Some of the curves were exhibited, and diagrams were shown exhibiting the passage of barometrical changes as recorded at each station, but it was stated that matters were not yet ripe for a complete account of the work done with these new instruments. In conclusion, Mr. Scott stated that he hoped the audience would see that the work was a strictly national one, and one which must be carried on, if at all, at public expense. All other European countries, almost without exception, have established meteorological offices, and the science is more important to us than to any other nation. The grant made for it is not made to the Royal Society in any sense; that body were requested to take the management of a Government Office, the sphere of whose action extended equally to the whole United Kingdom, and this they consented to do, and have done it in the way described in the lecture.—*The Times.*

MIGRATORY BIRDS.

Cuckoo first heard at Hillingdon, Linton, Killingholme, and Dumfries, on the 10th; at Selborne, Banbury and Boston, 11th; Orleton and Derby, 13th; Bridport, 14th; Rhayader, 15th; Llandudno, 18th; Shiffnal, 20th; and Logierait, 27th.

Swallows seen at Killingholme, on 8th; Bridport, 9th; Llandudno, 13th; Hillingdon, 14th; Shiffnal, 15th; Boston, 25th; Hawick, 26th; Dumfries, (building), 11th.

Nightingale heard at Hillingdon and Banbury on 12th.

LUNAR AND SOLAR INFLUENCE ON THE WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—In the *Meteorological Magazine* for August, 1868, I stated "that the perigee and apogee positions of the moon with regard to our meridian, as well as perigee of the sun, have an extremely important influence on the rainfall." I will now endeavour to prove this statement, and, at the same time, show that the moon's position in the equator with regard to our meridian exercises an equally important influence on rainfall, or rather I should say on drought, for the laws I am about to give are of a negative rather than of a positive character. They refer to the moon's influence in preventing rain, and therefore only indirectly to her power as regards producing it. The laws relative to the lunar positions that appear to cause rain I will, with your permission, discuss in a future letter.

1. When on any day between the middle of March and the middle of September the moon reaches perigee or apogee in the afternoon, within about an hour (say seventy minutes) of the time that she comes to our meridian, (and here I may say that the southing must occur in the afternoon, or at any rate at not more than 20 minutes after midnight), a long period of deficient rainfall will occur about that time, or set in a few days afterwards.

2. In any year when lunar perigee occurs entirely or very frequently

in south declination, if the moon crosses the equator on some day between March and October within 15 minutes of her southing, a long period of drought will set in, (if it has not already commenced), shortly after the day when these latter phenomena occur. The following table contains *all* the instances that have occurred since 1833 relative to these two laws. The descriptions of the weather are chiefly taken from Mr. Whistlecraft's notes.

Date.	Time of Lunar Apogee or Perigee.	Moon Souths.	Time of Moon's crossing Equator.	The Weather in the Metropolitan and Eastern Counties.
1834, March 24	12.0 aft.	12.0 aft.	...	A sharp drought all March, April & May.
1835, July 7	8.37 ,,	9.43 ,,	...	At Thwaite, in Suffolk, no rain whatever fell from July 14th to Aug. 25th.
1837, March 16	9.22 ,,	8.16 ,,	...	The whole of March was very dry.
1837, April 18	..	10.36 ,,	10.25 aft.	Very dry weather from the end of April to the end of July.
1838, June 28	6.0 ,,	5.53 ,,	...	In July the hay harvest was favoured by fine weather for the greater part.
1838, August 9	...	3.42 mng.	3.45 mg.	August was very fine after the 9th, and Sept. was a very fine harvest month.
1839, May 24	10.14 ,,	9.16 aft.	...	May was very dry, and the rainfall was below the average to the 21st of June.
1840, April 4	2.26 ,,	1.38 ,,	...	Very dry all April, first rain fell on May 7.
1840, June 13	10.48 ,,	11.0 ,,	...	Very dry in June and July ; the rainfall was nearly an inch and a half below the average.
1840, August 7	7.43 ,,	7.43 ,,	...	A very dry and hot August, and fine weather continued till the 13th Sept.
1842, March 24	10.42 ,,	10.36 ,,	...	April was a very dry month.
1842, April 21	10.16 ,,	9.17 ,,	...	May was fine and very dry, almost without rain in the Eastern Counties.
1842, August 7	0.43 ,,	1.0 ,,	...	The whole of August was severe drought and most extreme heat.
1843, April 13	10.36 ,,	11.19 ,,	...	April 8th to May 2nd the rainfall was more than an inch below the average ; very warm weather also occurred at this time.
1844, April 14	...	10.19 mg.	10.10 mg.	A quarter of an inch of rain during the 12th and 13th April, but from the 14th of that month to the 24th of June there was a most extraordinary drought, scarcely any rain at all for 71 days.
1844, August 29	...	1.24 ,,	1.15 ,,	The latter part of August was very dry, and only half the usual rainfall in Sept.
1845, August 15	10.0 ,,	10.28 aft.	..	From the 21st August to 14th September, the weather was very fine.
1846, Sept. 4	11.0 ,,	11.21 ,,	...	The first 22 days of September were extremely droughty.
1847, Sept. 11	0.52 ,,	1.11 ,,	...	Rainfall of September considerably below the average, and but little rain in October, except on 7th, 9th, and 23rd.
1848, Sept. 3	4.37 ,,	4.12 ,,	...	September was chiefly fine till the equinox.
1854, April 4	4.30 ,,	5.30 ,,	...	A very dry April.
1854, May 22	...	9.25 mg.	9.30 mg.	Very dry weather, 31st May to 26th June.
1857, July 29	7.26 ,,	6.20 aft.	...	Unusually bright and hot weather from 10th July to end of August, with heavy thunderstorms at times.

Date.	Time of Lunar Apogee or Perigee.	Moon Souths.	Time of Moon's crossing Equator.	The weather in the Metropolitan and Eastern Counties.
1861, March 26	11.31 ,,	12.19 nt.	...	A very dry April.
1861, August 10	2.36 ,,	3.20 aft.	...	A very fine, dry, and hot August, and a dry September.
1863, June 18	1.30 ,,	1.44 ,,	...	Remarkably dry weather from June 20th to August 7th.
1864, July 9	...	4·5 ,,	4.19 aft.	Remarkably dry from the 4th of July to the 9th August, after which the great drought went on to the 2nd September.
1865, August 25	3·20 ,,	2·58 ,,	...	A very great drought from August 29th to October 8th; in many places not a drop of rain fell during that time.
1868, July 20	0·45 ,,	0·40 ,,	...	Very great drought all the summer to the 18th of September.
1869, May 21	9·39 ,,	8·46 ;,	...	
1869, August 9	1·2 ,,	1·37 ,,	...	
1871, March 26	4·26 ,,	4·8 ,,	...	
1872, June 9	3·20 ,,	2·46 ,,	...	
1872, August 17	11·0 ,,	11·18 ,,	...	

When the sun reaches perigee within 40 minutes of noon or midnight, the succeeding summer has always several months of very dry weather, and the rainfall of the period from March to September inclusive is always below the average. The drought is usually accompanied by very great heat. The following are all the instances since 1833 :—

Date.	Time of Solar Perigee.	Remarks on the Weather.	Diff. of rainfall of Mar. to Sept. fromGreenwich average of 54 years.
1836, Dec. 30	11.29 noon	Very dry in May, June, and July of 1837; rainfall at Greenwich 21 in. for the year.	—3·8 in.
1847, Jan. 1	Noon.	The summer of 1847 was very dry; only 17·8 inches of rain for the whole year at Greenwich; max. temp. at Chiswick, 93°	—5·9 in.
1849, Dec. 31	0.25 noon	June, August and September of 1850 were very dry; only 19·7 inches in the whole year at Greenwich.	—2·9 in.
1855, Dec. 31	0.32 noon	Very dry in June and July, 1856; max. temp. at Greenwich, nearly 90°	—0·3 in.
1857, Dec. 31	11.23 mid.	Very dry in June, August, and September, 1858; rainfall at Greenwich only 17·8 in. for the whole year; max. temp. 97° at Chiswick.	—3·2 in.
1865, Jan. 1	midnight	Extremely dry weather in April, June, and September, 1865. The summer was one of the hottest and finest on record.	—0·3 in.

The foregoing meteorological rules appear to be infallible. Certainly they have never failed since 1833. This is very satisfactory, for, as

these laws depend upon positions of the sun and moon, which can be calculated many years before they occur, it is evident that the periods of drought and fine weather which they cause may also be predicted many years before they happen.

In conclusion, I will say a few words with regard to the application of these laws to the weather of the coming summer. On the 9th of August, 1869, the moon will reach perigee at two minutes after one in the afternoon, and will reach the meridian of Greenwich 35 minutes afterwards. Therefore, according to the law I have given, fine weather for harvest must set in (if it has not already set in) a few days after the 9th of August, and for a long period the weather should be chiefly dry in these parts. It appears also that a long period (that is nearly a month or more) of deficient rainfall should commence, if it has not already commenced, in the latter part of May of the present year.—(See Table I.)

The second of the above rules does not at all apply to the present year, as the time of solar perigee was 10h. 17m. a.m.——Yours, &c.,

Barnsbury. G. D. BRUMHAM.

METEOROLOGY AT HAMBURG.

Meteorology makes progress. The Chamber of Commerce at Hamburg have published a quarto pamphlet, "Jahres-Bericht der Norddeutschen Seewarte für das Jahr 1868" ("Annual Report of the North German Sea Observatory for 1868"), under the direction of W. von Freeden, formerly Rector of the School of Navigation at Elsfleth. This Report will be welcomed by all who take an interest in the subject of which it treats: it contains the history of the foundation and development of the Nautical-Meteorological Institute, including the observatory above referred to, and an account of their proceedings. From these we learn that the objects of the Institute are to make navigation safe, to shorten sea voyages, and as a means thereto to collect systematic meteorological observations, give storm-warnings, and to establish as speedily as possible uniformity in the instruments employed in the observations. In the carrying out of these objects some hundreds of Weather Books and Sailing Directions have been distributed to vessels sailing from ports embraced in the scheme of the Hamburg Seewarte. A considerable number of the former have been returned, filled with observations of wind and weather; and by tabulation and comparison they will be made to reveal whatever is important to navigation. Records of the quickest voyages will be kept, together with the particulars showing how the quickness was achieved. In this way the Hamburg Sea Observatory will co-operate with other similar establishments, in discovering the shortest and safest ship-routes across the great ocean, and in ascertaining what winds and weather may be expected to prevail in any part of the route in any month. As we lately remarked, our own Admiralty has done excellent work of this sort; and with the principal seafaring nations of the world engaged therein, important results, whether for commerce or science, cannot fail to accrue.—*Athenæum.*

APRIL, 1869.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. of nights below 32° on grass
			inches	inches.	in.							
I.	ENGLAND.	Camden Town	1·28	+ ·15	·41	23	8	78·0	14	28·6	22	5
II.		Staplehurst (Linton Park)	1·33	+ ·11	·46	4	13	78·0	12†	31·0	19	4
,,		Selborne (The Wakes)	1·26	— ·24	·35	23	8	71·0	14	29·0	19	6
III.		Hitchen	1·74	+ ·74	·66	23	9	71·0	14	30·0	1	1
,,		Banbury	1·33	+ ·17	·30	23	11	74·0	14	30·0	19	5
IV.		Bury St. Edmunds (Culford)	1·23	+ ·48	·45	23	10	73·0	11‡	22·0	1	7
V.		Bridport	1·11	— ·37	·20	3	13	73·0	27	31·0	5	1
,,		Barnstaple	1·89	— ·12	·38	6	12	76·0	12	35·5	2, 19	...
,,		Bodmin	1·51	— ·19	·29	15	13	74·0	28	36·0	2, 5	0
VI.		Cirencester	1·42	+ ·13	·33	6	9	...	...	...	...	...
,,		Shifnall (Haughton Hall)	1·78	+ ·63	·60	20	13	71·0	11	28·0	19	4
,,		Tenbury (Orleton)	1·47	— ·07	·45	20	12	75·2	11†	29·2	19	2
VII.		Leicester (Wigston)	2·65	+ 1·30	1·05	14	10	78·0	11	33·0	1, 3¶	...
,,		Boston	1·91	+ ·94	·44	16	14	75·5	11	31·8	2	1
,,		Grimsby (Killingholme)	2·18	..	·67	20	13	70·0	11†	32·0	2	...
,,		Derby	1·48	+ ·05	·40	20	12	75·0	11†	34 0	2, 19	...
VIII.		Manchester	2·10	+ ·34	·38	2	12	78·5	14	32·0	1**	...
IX.		York	2·17	+ 1·07	·71	16	12	76·0	14	30·0	1	1
,,		Skipton (Arncliffe)	3·95	+ ·91	1·07	2	14	72·0	26§	32·0	1	...
X.		North Shields	1·76	+ ·45	·67	14	10	72·5	11	32·2	4	0
,,		Borrowdale (Seathwaite)	10·26	+ 3·36	2·75	7	17	...	...	...	...	...
XI.	WALES.	Cardiff (Town Hall)	1·82	...	·36	20*	11	...	...	...	...	..
,,		Haverfordwest	2·99	+ 1·13	·55	7	10	71·6	28	32·5	2	...
,,		Rhayader (Cefnfaes)	2·77	+ ·88	·50	6, 17	14	75·0	25	30·0	13	...
,,		Llandudno	2·17	+ ·67	·45	9	11	70·8	14	32·0	1	...
XII.	SCOTLAND.	Dumfries	1·42	— ·25	·31	9	17	73·0	26‖	29·5	9	1
,,		Hawick (Silverbut Hall)	1·32	...	·29	2	9	...	...	...	...	...
XIV.		Ayr (Auchendrane House)	2·00	— ·22	·49	9	13	70·0	27	28·0	1, 9	2
XV.		Castle Toward	2·03	— ·47	·67	9	11	74·0	27	26·0	2	9
XVI.		Leven (Nookton)	1·64	+ ·39	·51	15	10	69·0	14	24·0	9	3
,,		Stirling (Deanston)	1·42	— ·33	·31	15*	12	71·0	26‖	21·3	9	3
,,		Logierait	1·30	...	·81	15	10	...	...	...	...	..
XVII.		Ballater	2·56	...	·75	16	9	71·3	26	22·0	9	7
,,		Aberdeen	2·43	...	·57	3	13	70·4	12	28·1	9	9
XVIII		Inverness (Culloden)	1·48	...	...	...	...	66·4	13	30·6	9	1
,,		Fort William	...	...	...	...	...	...	...	...	...	...
,,		Portree	4·26	— 1·01	·89	2	19	...	...	...	..	...
,,		Loch Broom	2·41	...	1·00	3	19	...	...	...	...	...
XIX.		Helmsdale	3·43	...	1·10	4	16	...	...	...	...	...
,,		Sandwick	3·75	+ 2·01	1·55	2	18	62·8	26	26·0	9	1
XX.	IRELAND.	Cork	2·58	...	·70	7	15	...	...	...	...	...
,,		Waterford	2·00	— ·23	·36	8	20	62·0	28	37·0	1	...
,,		Killaloe	3·89	+ 1·76	·75	15	18	72·0	28	32·0	1	...
XXI.		Portarlington	1·82	— ·20	·42	16	25	67·0	10	33·0	1	...
,,		Monkstown	1·43	— ·21	·30	16	15	72·0	12	33·0	4	...
XXII.		Galway	3·41	...	·76	19	19	70·0	30	37·0	6	...
,,		Bunninadden (Doo Castle)	3·34	...	·66	19	13	66·0	26	28·0	1	1
XXIII		Bawnboy (Owendoon)	3·54	...	·61	19	20	73·0	27	32·0	3	1
,,		Waringstown	2·42	...	·46	15	14	75·0	25	29·0	2	2
,,		Strabane (Leckpatrick)	3·01	..	·68	19	17	71·0	26‖	27·0	1	5

* And 19th. † And 14th. ‡ And 12th. § And 28th. ‖ And 27th. ¶ And 18th.
** And 2nd & 19th.

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

METEOROLOGICAL NOTES ON THE MONTH.

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

ENGLAND.

CAMDEN TOWN.—Very warm from the 11th to 14th; splendid weather during the last week.

LINTON PARK.—A dry, favourable month; very hot from 10th to 14th; cuckoo heard on 10th; hawthorn in bloom on 25th, both earlier than I have ever known. Dry, cold, N.E. winds, with bright sun towards the end. Vegetation in a general way more forward than usual.

SELBORNE.—Dense fog on 10th, wind S.E.; fog on 22nd, and again on 26th, wind N.E.; aurora on 17th; martin first seen on 9th; cuckoo heard on 11th; max. on 22nd, 62°·0, min. 32°·0, range 30°.

HITCHIN.—T on 14th.

BANBURY.—High wind, S, R, H and L on 2nd; cuckoo on 11th; nightingale and swallow on 12th; T S on 14th; high wind and splendid aurora on 15th; apple in bloom on 25th.

CULFORD.—A month of very pleasant spring-like weather, without the usual frequency of April showers; T on 14th.

BRIDPORT.—Fine month, with much easterly wind; swallows seen on 9th, cuckoo heard on 14th; horse-chesnuts in leaf on 16th; silver poplar in leaf and double cherry in blossom on 18th; elm in leaf on 24th, lilac in blossom on 23rd, and May on 26th; several wasps about on 25th.

BODMIN.—Mean temp. 53°, or 3° above the average; difference between wet and dry bulb on 27th, 13°, the greatest I have ever registered.

CIRENCESTER.—A fine and very early spring month; lilacs, laburnam, and even a free blossoming of hawthorn out, and much grass.

SHIFFNAL.—Great changes of temp.; cold at the beginning, with sleet on 3rd; much warmer on 5th, and on 11th perfect summer, oppressively hot, 71° in shade, and 97° in sun; white frosts and strong E. winds, with bright sun, at the latter part of the month, prevailing winds previously N.W. and W. Blackthorn in blossom on 7th, damson on 18th, peas and beans on 22nd; oaks and ash here and there in leaf on 24th, and hawthorn in blossom on 28th; sulphur butterfly and large humble bee first seen on 11th; swallows (H rustica) on 15th, and orange-tipped butterfly on 27th; chiffchaff first heard on 14th, and cuckoo on 20th.

ORLETON.—T showers in afternoon of 14th, and T S in N. at night.

WIGSTON.—The temp. of the month has been 3° above the mean of the month of April for many years. Although during the last 10 or 12 years there has been an average of *six frosty nights* during this month, I have not had to record one night under 33°, 4 ft. above the ground. On the evening of the 14th a terrific storm of H and R, accompanied by heavy T; more than an inch of R fell in less than one hour.

BOSTON.—The month was ushered in by very cold weather, but a very sudden and remarkable rise in the temp. took place on the 11th; on that day the max. temp. was 75°·5 in shade, and the black bulb *in vacuo* on the grass stood at 123°·5, the mean temp. of the 11th being 60°·1; during the three following days the heat (73°·8 on 12th, 69°·8 on 13th, and 74°·0 on the 14th) was almost without parallel. The field elm, lime, and horse-chesnut were in leaf on the 20th; the wych elm, sycamore, and hawthorn on 22nd, and the poplar on 24th. The cuckoo was first heard on the 11th, and the swallows appeared on the 25th; T S on14th; H on 2nd and 3rd, and fog on the 8th.

KILLINGHOLME.—Vegetation progressed slowly, except during the warm weather from the 10th to the 16th. Wheat on strong lands looks healthy, and promises a good crop; T S on night of 1st; swallow seen on 8th; cuckoo heard on 10th, willow warbler on 15th, lesser whitethroat on 22nd, garden warbler on 26th; cowslips, peas and cherry in flower on 18th.

DERBY.—The month was remarkably fine, and the temp. unusually high,

having reached 75° on two days, being 2° higher than has been recorded here in April for the last 25 years ; a severe T S (the second during the month) on the 14th ; cuckoo heard on 13th ; migratory birds somewhat earlier than usual. N.E. winds prevailed towards the end of the month.

YORK.—T S at 7 p.m. on 14th.

NORTH SHIELDS.—Solar halos seen on 4th and 10th ; lunar halos on 22nd and 25th ; H on 9th ; L on 11th ; T S and whirlwind of dust on 14th ; very bright meteor on 12th from W. to S.W. ; pear in blossom on 10th.

WALES.

HAVERFORDWEST.—The month commenced cold and wet, H showers mixed with cold R ; L all night of the 2nd ; very warm on the 10th and 11th ; stormy on 15th and 16th, when the bar. fell from 29·67 to 29·12, and rather wet ; the rest of the month fine and spring-like ; the last week very warm, but accompanied by a scorching E. wind and a cloudless sky ; very little grass ; rain much wanted ; winds chiefly W.N.W and S.E. ; last four days from N.E.

CEFNFAES.—The month has been dry and fine ; nights more or less frosty ; hot with unclouded sunshine during the last few days ; wind generally S.E. and N.E. Vegetation forward ; cuckoo heard on 15th, and corncrake soon after.

SCOTLAND.

DUMFRIES.—The first week showery, with some S on the 3rd ; the third week sunshine and showers ; the last week fine, with high temp. ; T on the 14th ; cuckoo heard on 10th, swallows seen building on 11th ; vegetation made great progress during the month ; fruit trees blossoming well ; temp. above the average.

HAWICK.—Keen frosty nights up to the 8th ; hills white with S on the 2nd and 3rd ; ice full half an inch thick on the drinking troughs, &c., on the 5th, 6th, 7th and 8th ; violent T S on the afternoon of the 14th, L of the forked and ball kind most vivid, damaging some fine trees. Intensely hot and sultry on 26th and 27th ; cold, with E. winds, on 28th and 29th ; R very much needed. Swallows first seen on 26th.

AUCHENDRANE.—The barometer, both as to pressure and range, may be said to have given forth indications quite in harmony with the fine seasonable weather which has characterized this April throughout, and especially towards its close ; the mean temp. has been rather high, and the solar radiation strong, owing to the small amount of cloud, complete saturation having taken place only 11 times, and 9 of these were in the evening. April is our driest month, and this April the rainfall is below the average, but not in the number of days on which it fell, as in that it coincides with the mean ; Moreover, the evaporation has exceeded the rainfall by more than an inch. The mean force of the wind has been moderate ; calms have been 8, and equatorial winds to polar as 14 to 8. The northerly gales of the 3rd and 28th, and the gale from the S. on the 22nd, were not of long duration.

CASTLE TOWARD.—The first few days cold and stormy, but has been since a mild dry month. Some very warm days (about 11th and 27th) for the season, which burst many of the deciduous trees into full leaf in a few days ; banks of blue hyacinths and many of the horse-chesnuts are in flower. A hive of bees swarmed on the 27th, and another on the 30th. Grass abundant and stock healthy ; braird promising ; all kinds of fruit trees and shrubs have flowered most profusely, owing no doubt to the fine autumn. Distant T on 14th

NOOKTON.—On 14th, T between 1 and 2 p.m., and between 6 and 7 p.m.

DEANSTON.—First part of the month showery, windy and frosty at night ; very warm on 11th, 26th and 27th ; latter part of month dry, with much sun, but cool easterly winds and frosty nights. Vegetation far advanced ; horse-chestnut, plane, and beech trees in full leaf, hawthorn blossom, however, not yet out on the 30th.

LOGIERAIT.—The early part of the month partook of the ungenial character of March ; the latter part has been unusually favourable ; high temp. and much sunshine ; vegetation very forward ; cuckoo heard on 27th.

BALLATER.—Hills white with S on 2nd and 8th ; aurora on 2nd ; T S with heavy H and R at 6.30 p.m. on 14th. The past month has been remarkable for the

sudden fluctuations of its temp., it having been 22° on 9th, and 70° on the 11th, the highest ever recorded here at the same period of the year; red butterfly and a bat seen on the 11th, and white butterfly on the 28th; blossoms on fruit and forest trees very rich; grass healthy. Bar. very high (30·020 at 660 ft. above sea) on 28th.

ABERDEEN.—T and L at 6.30 p.m. on 14th, and again at a distance at 9 p.m. on 27th; estimated wind pressure half-pound less than the average; winds from N.W. double the average. A remarkably warm fine month, notwithstanding the excess, ·42, in R; the crops at the end of the month beginning to suffer from drought. Mean temp. 4°·4 above the average.

PORTREE.—A strong gale from S.W. to N.W. from 5 a.m. to 11 p.m. on 3rd; on the whole the month has been very favourable for out-door labour; the seeds have been got into the ground in good condition.

LOCHBROOM.—With the exception of Saturday, the 3rd, which was wild and stormy, this month on the whole has been finest for the time of year ever known here, but rather too dry for the country.

SANDWICK.—The first part of the month cold, with some S storms; some days in the middle fine and warm, but towards the close cold again, with dry N. winds. Splendid aurora at zenith and S. hemisphere on 15th; auroræ also on 7th and 8th.

IRELAND.

DOO CASTLE.—Temp. of the month high; last week we have had dry parching winds from the E., which were injurious to the corn, and retarded the growth of grass, it was otherwise favourable for farming operations.

OWENDOON.—Swallow first seen on 13th, cuckoo on 21st, and corncrake on the 25th.

WARINGSTOWN.—Fine and seasonable, labour well forward, and crops generally looking better than I ever saw them; abundance of luxuriant grass; foliage early.

REVIEWS.

Note on the Determination of Heights, chiefly in the interior of Continents from Observations of Atmospheric Pressure. By ALEXANDER BUCHAN, M.A.—[Proceedings Royal Society, Edin.] 8 pages, 8vo.

A NATURAL sequel to Mr. Buchan's paper on "The Mean Atmospheric Pressure over the Surface of the Globe," and another illustration of the practical importance of a branch of investigation which some might think by no means promising of useful results. The author points out the error necessarily resulting from the adoption of 29·9 in. or 30·0 in. as the constant sea level pressure, and the difference therefrom at any observed altitude as the measure of that altitude. He points out the necessity for giving with greater detail observations intended as accurate measures of height, and shows that by noting the year, month, day, and hour of observation with the latitude and longitude of the place, and the general character of the weather during preceding and following days, a practiced meteorologist may approximate very closely to the truth, even from one observation, while on the other hand, many published heights may be, in fact probably are, in error from 500 to 1000 ft. The cause of this is very obvious. Let us conclude with an example from Mr. Buchan's paper:—

"From my paper, read before this Society in March, 1868, on the Mean Pressure of the Atmosphere over the Globe, illustrated with three charts, showing the *Mean Isobaric Curves* for July, January, and the year, it may be seen that a pressure of from 29·9 to 30·0 inches is very near the mean annual pressure over the greater part of the globe, particularly over those portions of it explored by

travellers. But when we examine the months, it is at once apparent that 29·9 inches is very far from the mean pressure in many regions. This point will be illustrated by the pressures at Barnaul, Siberia, which on an average of 19 years are, reduced to 32° and sea-level, as follows.—

Mean atmospheric pressure at Barnaul in July, 29·536 inches.
,, ,, ,, January, 30·293 ,,
,, ,, ,, Year, 29·954 ,,

Suppose, now, it be proposed to ascertain the height of Lake Balkash on some day in July, the pressure at the time being the average of the month. Let the observed pressure be 28·8 inches reduced to 32° F., and the temperature of the air be 70°·0, then if the sea-level pressure be assumed to be 29·9 inches, it is plain that the difference due to height is 1·10 inches; in other words, the height of the lake would be, in round numbers, 1080 feet. But since the sea-level pressure of this locality, which is nearly that of Barnaul, is 29·536 inches, the difference of pressure due to height is only 0·736 inch; the height, therefore, is only about 730 feet. Again, if in January, when the barometer is the mean of the month, the pressure at Lake Balkash was observed to be 29·42 inches, and the temperature of the air 1°·0, assuming that 29·9 inches is the mean sea-level pressure of January, 0·48 inch is the difference of pressure due to height—that is, the lake is about 400 feet above the sea. But since the mean pressure is nearly 30·3 inches, 0·88 inch is the pressure due to height; the lake is therefore nearly 730 feet above the sea. Thus in July the lake would be made 350 feet too high, and in January 330 feet too low—the difference of the two observations, each being here supposed to be taken under the most favourable circumstances, and with the greatest accuracy, being 680 feet.

The fact is, if geographers wish for accurate results, they have only to acquaint themselves with what meteorologists have done, to make their observations with completeness, and work out the results with discretion.

Cardiff Naturalists' Society. [First Annual Report, 1867-8.] Cardiff: Lewis and Williams. 8vo, 86 pages and 1 plate.

A CAPITAL "first" report, containing several excellent papers, well got up, and promising to be of much benefit to the members and to the county generally. The Society is to a certain extent an offshoot of the well-known Woolhope Naturalists' Field Club, and its objects are similar. We regret to find that as the annual meeting is held in October, all the meteorological tables are arranged for twelve months ending with August. We have already protested against these irregular twelvemonth periods as incomparable and useless, and we hope this young society will abandon this bad plan. We should also be glad to see the fall of rain at Fairwater in each month, in addition to the form in which it is now given.

Abstracts of Two Papers on the Geography of Disease. By ALFRED HAVILAND, M.R.C.S., &c.—London: Kimpton. 8vo., 20 pages.

SCARCELY within our province, save that by mapping the relative prevalence of diseases in different localities, Mr. Haviland appears to have *proved* the influence of certain climatic conditions, whose effects had previously been asserted without proof. The present pamphlet gives a concise summary of the results, and is to be followed by a series of maps in the course of the present season, which we hope our medical friends will carefully consider.