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EASTER AT SORBONNE.

ACCORDING to our custom, we give a brief note of the papers upon Meteorology read at the annual *Réunion des Sociétés Savantes;* and as we like to be systematic, we report them in alphabetical order. It would conduce to the comfort and greater instruction of the delegates if some approximation to system, order, or sequence prevailed in the reading of the papers. At present the only way of being sure to hear any particular paper is to attend every meeting continuously, from the moment of its opening to its close. And after all one may find, as this year, that a communication which is down on the list is not read at all, either because the author is not present when called upon, or because he has not come to Paris, but has sent the memoir to the Secretary, to whom it evidently is far too great a labour to read other persons' communications.

Prof. ALLUARD (of Clermont Ferrand). *New mode of graduating Hygrometers.*—The author proposes placing in a glazed chamber one of his condensing hygrometers, and in the same vessel a Saussure's hair hygrometer. By passing into the vessel successive quantities of moist or dry air, any desired range of humidity can be produced in it. The Alluard hygrometer will show precisely the dew-point temperature in the vessel, and the Saussure's hygrometer being read off at the same time, the errors of various portions of its scale can be accurately determined.

Prof. ALLUARD. *On the Wind at Mountain Observatories.*—The author said that in order to become acquainted with the velocity, direction and rotation of the winds in a large country like central France, it was better to study the observations made at a great height in the atmosphere, far from any disturbing cause, as on the summit of the Puy de Dôme, than nearer to the earth, where variations in the configuration of the country have a marked influence and render the anemometrical results complicated. Hence it is that the records from the observatory on the Puy de Dôme (4813 ft.) have a special interest. During 1880 it was found that the vane made 32 complete *direct* rotations (=N.E.S.W.N.), and only 6 retrograde ones

(=N.W.S.E.N.), 17 direct rotations embracing 270° of the compass, and 7 retrograde, and, lastly, 34 direct semi-rotations and 17 retrograde semi-rotations.

M. C. BALTET. *On the effects of the Frost of* 1879–80, on vegetables, fruit, ornamental, and forest trees.—He considered that the plants had all been in a state ill adapted to resist the frost which came so early, that the sap had not gone down. He also suggested that the portions above the snow not only suffered from radiation cold, but from the joint heat of the direct rays of the sun and of their reflection from the snow. He mentioned the extreme cold of the valleys, in one case, —22° F. in the valley, while it was +9° F. on the adjacent hill. He admitted that there were some cases, both of injury and of escape, which he could not explain; but he urged, in conclusion, that the experience lately gained should be turned to profit by planting specially those varieties which had best resisted the rigours of the recent winters.

M. GARBAN (of Clermont Ferrand). *On the Rate of Evaporation.*—This was an account of experiments made with a series of vessels filled with various earths and regularly weighed. The author found the evaporation from chalk less than that from sand; in fact, the latter appeared to collect most dew and vapour, and also to yield its vapour more readily than any other variety of earth.

M. HEBERT (of Allier), who had not undertaken to prepare a paper, gave a *vivâ voce* account of the results at which he has arrived respecting the *great movements of the atmosphere*, and the movement of *cyclonic depressions* as explained in the work which will shortly be published by the *Société Météorologique de France*. M. Hébert considers that the Foehn and sirocco are produced when under the influence of a great Atlantic storm, a current of warm humid air moving rapidly impinges on a chain of mountains, which compels it to dilate and to become cooler, and therefore to produce a large fall of rain. When the air reaches the top of the mountain it contains only the quantity of vapour necessary to saturate it at the low temperature to which it fell during its ascent, and falling down the other slope with a circular or spiral motion, it becomes warmed by the compression, and as much drier as it is warmer. When the point of this system reaches the plain, the gyratory descending motion, and the centrifugal force jointly, produce a diminution of pressure which gives rise to an internal gyratory ascending current of considerable force, which produces the low pressure found in the centre of a storm. This phenomenon is very comparable with the reflections of sonorous waves by a fixed obstacle. A complete storm thus consists of two parts—an interior region of low pressure, where the air is ascending in conical spirals, and an external area of high pressure and descending spirals. The air in the cyclones becomes rapidly more damp, and thus while commencing with a very dry air, they finish with violent winds and torrential rains.

In the second part M. Hébert examines these phenomena as they occur in N. America. The sirocco is produced all along the chain of mountains which fringe the western side of the United States, and it gives rise to numerous cyclones which present precisely the features above described, and cross the States from S.W. to N.E. preparatory to their passage over the Atlantic.

Lastly, in the third part, the author applies a similar investigation to the records from the Continent of Asia and the surrounding seas, and finds that there also similar phenomena occur; and that the cyclones of the Bay of Bengal, the typhoons of the China Seas, and the tempests of the Pacific are identical with those of the Atlantic. He also finds a similar obedience to the general formation above described in the storms which, coming from the north-west, cross Siberia and Central Asia.

M. MASURE (of Orléans). *New Researches on the Evaporation of Water and on the Transpiration of Plants.*—This author supplied to the Secretary, as an abstract, the following remarks; as it is entirely different from what he *said*, we give first his abstract and then an epitome of our notes :—

"M. Masure, of the Agricultural Society of Orleans, explained the result of his researches on the influence of the arable lands on the evaporation of the water which they contain. It is to the manure contained in the soil that most of this influence is due, it is the compost in the arable lands which renders them more porous, more ærated, more hygroscopic and therefore better adapted to retain the rain water in the soil among the roots and thus feed them with carbonic acid, oxygen and ammonia. Manure is not merely manure, it is also a powerful physical agent in the fertilisation of arable land." Thus far M. Masure's *précis;* now for our notes.

The author began by stating that the amount of evaporation could be determined by a formula containing values for, (*a*) temp. of the water, (*b*) temp. of the air, (*c*) temp. of solar radiation, (*d*) humidity of the air, (*e*) velocity of the wind. He then exhibited one of a series of 51 charts, on each of which he had placed curves giving hourly observations of all the meteorological instruments which he possessed. The air temperature was taken by a *thermomètre fronde*, and the same thermometer was subsequently used to ascertain the temperature of the water in the evaporator. His observations were made in a garden rather full of plants. He found the temperature of the water at sunrise always below that of the air. He considered that the temperature of stagnant water was different from that in a river, where it was tossed about. During the early morning hours he not infrequently found that instead of evaporating, condensation had taken place on the surface of the water in his evaporator. He found the range in the temperature of the water in one day as much as from 49° F. to 85° F., or 36° F. He had also made experiments as to the amount of evaporation from a tobacco plant, and found that the hourly amount passing off was markedly less when the sky was

overcast; the life and breathing of the plant were, in fact, checked by want of sunshine, the influence of which was greater even than that of heat. He stated the amount evaporated, but as that would be useless without knowing the size of the plant, we need only quote his concluding remark, that tobacco plants evaporate freely, and that their capacity in that respect being known it is evidently possible to determine what amount of subterranean water the soil must contain if they are to reach their perfect development.

M. Hébert presented, on behalf of M. POINCARRE, the first part of a *Manual of Weather Forecasts*, founded upon the observations and experience of the 16 years, 1864–1880, at Bar-le-Duc, and requested the criticism of the members upon it.

M. LEON VIDAL (of Marseilles). *On a Photometer for recording continuously the Amount of Daylight.*—The author said that the records hitherto made were records of the amount of actinic energy and not of light. He had studied the experiments of Werner Siemens, Hittorf, Adams, and others, and believed that by the use of selenium, a galvanometer, and one or, at the most, two Daniell's cells, he should be able to complete a recording apparatus well adapted for meteorological observatories.

THE METEOROLOGICAL SOCIETY.

THE usual Monthly Meeting of this Society was held on Wednesday, April 20th, at the Institution of Civil Engineers; Mr. C. Greaves, F.G.S., Vice-President, in the chair. W. H. Goss, F.G.S., and Admiral T. L. Massie were balloted for and duly elected Fellows of this Society. The following papers were read:—(1) "On the Frequency and Duration of Rain," by Dr. Wladimir Köppen, of Hamburg; (2) "Results of Experiments made at the Kew Observatory with Bogen's and George's Barometers," by G. M. Whipple, B.Sc., F.R.A.S.; (3) "On a Discussion of Mr. Eaton's Table of the Barometric Height at London with regard to Periodicity," by G. M. Whipple, B.Sc., F.R.A.S.

THE SNOW STORM OF MARCH 4TH & 5TH.

To the Editor of the Meteorological Magazine.

SIR,—There are still extensive snow-drifts on the N.W. slope of Pensher Hill, five miles off the sea, and 360 ft. in altitude, in hollows of what seems to be an old quarry, now a wood. One drift is over 100 feet long, and one is 7 feet deep, where deepest! They are chiefly the result of the unprecedented snow-storm of March 4th and 5th —unprecedented, at least, in the memory of any one I have come across; but beneath this there remain the drifts either of January 18th and 19th, or of February 7th, or of both.—Yours truly,

T. W. BACKHOUSE.

Sunderland, 26th April, 1881.

THE ORGANISATION OF THE METEOROLOGICAL SERVICE IN SOME OF THE PRINCIPAL COUNTRIES OF EUROPE.

IV.—RUSSIA.*

THE following article, like the preceding ones, has been prepared from Dr. Gustav Hellmann's very able reports to the Prussian Minister of Public Instruction, this being the first of a *second* series, published in the *Zeitschrift* of the Prussian Statistical Office for the year 1880.

1. *The Central Physical Observatory of St. Petersburg.* In tracing the history of the development of systematic observations in Russia, it is easily perceived that the Observatory and the extensive meteorological system of that country owe their origin to the great impulse given to researches in Terrestrial Magnetism by Baron A. von Humboldt and Prof. K. F. Gauss in Germany some 50 years since. The simultaneous magnetic observations agreed upon by Arago, of Paris, and by Kupffer, of Kasan, in the years 1825-6, were followed at the instigation of von Humboldt by the establishment of several small observatories in Russia and Siberia in 1830. These observations were continued for three years, and were published in detail by Kupffer in one volume (St. Petersburg, 1837).

The reforms introduced by Gauss in the methods of magnetic observations and the reorganization of the Magnetic Union gave Kupffer the desired opportunity of advocating and effecting the firmer establishment of a system of magnetic and meteorological observations; a normal observatory was established at St. Petersburg in 1840, and was charged, in addition to the superintendence of the regular magnetic and meteorological observations at the various stations, with the undertaking of physical observations and researches in the strict sense of the word. The meteorological and magnetic observations collected at the observatory were published *in extenso* in the *Annales de l'observatoire physique central*, 1847–64, and mean values and other meteorological communications were published in the *Correspondance Météorologique*, 1850-64. In addition, the *Comptes-rendus annuels*, 1850-64, contain evidence of the activity of the observatory by various communications, both meteorological and magnetical. In 1849, according to a report presented by Kupffer to the Academy of Sciences, the Russian system consisted of 8 stations of the First Order and 48 stations of the Second Order, and the cost of publication of the observations was borne by the Administration of Mines.

On the death of Kupffer, in the beginning of 1865, Prof. Kämtz, an eminent meteorologist of Dorpat, was appointed director of the service, and on his decease, in December, 1867, the present able director, Dr. H. Wild, of Berne, was selected by the Academy of Sciences to fill this important position. Under his energetic superintendence the quality of the observations has greatly improved. He

* Continued from *Meteorological Magazine* for April.

found that for 20 years the stations had not been inspected; the observations had simply been printed without checking, and contained numerous press errors. As far as relates to the barometer, the errors for the years 1842-55 have been corrected in Rykatchew's *Marche diurne du Baromètre en Russie* (St. Petersburg, 1879), and they occupy 36 4to pages with double columns! Scarcely anything was known as to the quality, exposure, and the errors of the instruments, and the number of stations had decreased more than 50 per cent.

The observatory, as at present constituted, is not merely a central station, but, as before stated, a Physical Observatory. Our article deals specially with the *meteorological* branch, and the system of observing stations as they existed in the year 1879. The Central Physical Observatory lies on the southern edge of the large island Wassili-Ostrow, and is nearly a mile from the sea, in a south-westerly direction.

Since the year 1878 the observing department of the Observatory has been principally transferred to the Meteorological and Magnetical Observatory at Pawlowsk (referred to subsequently), so that the observations at the St. Petersburg Observatory are now only those of a very complete station of the Second Order, with the addition of such special observations as may be from time to time required. Self-recording and other instruments for all elements are, however, in use; but the observations, except for the anemograph, are not regularly discussed, as the Pawlowsk Observatory is only about four miles distant. We quote a few particulars respecting the various instruments:—

(1) *Barometers.*—In addition to self-registering barometers, Turettini's cistern-syphon barometers and Naudet's aneroid are read at 7h. a.m., 1h. and 9h p.m. (2) *Thermometers.*—These are exposed in a cylindrical zinc screen. Full details respecting the results obtained by this method of exposure are given by Prof. Wild in *Repertorium f. Met.* Bd. vi. No. 9 (St. Petersburg, 1879). Earth thermometers are read at various depths; much attention is paid to this subject, and full particulars respecting the observations, of which there are several series, are given by Prof. Wild in his *Repert. f. Met.* Bd. vi. No. 4. (3) *Raingauges* are erected at heights of 1, 2, 3, 4, and 5 metres, (3 to 16 ft.), they all have a receiving area of 1-20th sq. metre = ·54 sq. ft., and are painted white. There is also a self-registering gauge by Salleron, which is, however, generally out of action during the severe winter weather. (4) *Evaporation.*—Wild's balance-atmometer is observed daily at 1h. p.m., and gives a direct measurement of the evaporation. (5) *Anemometers* of various kinds are in use, viz., Beckley's, Wild-Haslar's, Breguet's, and Casella's small instrument. The anemometrical observations are discussed in the appendix to the Annals of the Observatory and, since 1878, are published in a separate part of the same. Hourly observations of clouds between 6h. a.m. and 10h. p.m. were made during the years 1876-7, and pub-

lished in the Annals for those years; various experimental researches also have been made and published in the *Repert. f. Meteorologie.*

Meteorological Stations.—The Russian system of observing stations is the most extensive on the globe; its area embraces 170° of longitude, and 30° of latitude, and is situated entirely within the north temperature and frigid zones. The Annals for the year 1877 contain the observations of 104 stations; for 73 stations they are given *in extenso*, and for 31 stations monthly *résumés* are given. Observations were also taken at other stations, but not published owing to imperfections. In 1878 the observatory received observations from 133 places. All the stations receive instructions and verified instruments from the Central Observatory, and all the observers are volunteers, excepting at the coast stations, where the observers, if they are not attached to the Navy, receive a remuneration of £28 a year. Copies of the printed observations and the annual reports are presented to all observers. Observers of long standing receive the honorary title of "Correspondent of the Central Physical Observatory," and occasionally receive presents, such as brilliant rings, orders, &c. Some copies of Capt. Hoffmeyer's synoptic charts have also been presented to observers interested in the subject.

Most of the stations have a syphon or cistern barometer, and the new stations have also a Naudet or a Goldschmid Aneroid, to be used as a check instrument. The very remote stations have only an Aneroid. Particulars of these instruments are given in Wild's *Repert. f. Met.* Bd. iv., in a paper entitled *Uber die Bestimmung des Luftdruckes.* The thermometers are in zinc screens erected outside a window with a north aspect, or in an open space, sheltered by large louvred screens. For further particulars see *Repert. f. Met.*, Bd. vi., No 9. Two rain-gauges are supplied to each station, and the more recently-established stations are provided with Wild's simple pendulum or swinging-plate wind-gauge (see *Bulln. Acad. Sc. de St. Petersb.* T. xxi). Observations are made at 7h. a.m., 1h. and 9h. p.m., local time, and are sent to the Observatory monthly, where they are subjected to regular supervision, and a proof of each printed sheet is submitted to the observers for any remarks or further corrections which may be necessary. We must express our approval of this method of distribution of responsibility as tending to secure perfect accuracy, and increasing the interest of the observers in their own work. Since 1871 about 70 stations in European and Asiatic Russia have been *once or twice* inspected, but many remote stations still remain uninspected. The reports of the Inspectors are printed *in extenso* in the annual reports.

Publications.—The *Annales de l' observatoire physique central de Russie*, 1865–9, are similar in form and contents to those previously published by Kupffer; from the year 1870 they take a different form with the German title, *Annalen des physikalischen Centralobservatoriums*, 1870–8. With the year 1878 the Annals begin to appear in two parts; the first part contains the hourly observations of Pawlowsk Observatory, and other supplementary observations; the second con-

tains the observations of the stations of the second order, according to the international form of publications. The central observatory has undertaken the discussion of the older (as well as the recent) materials. Thus M. Wesselowsky was entrusted with a comprehensive work, entitled, *Ueber das Klima von Russland* which was published in Russian in the year 1857. Several articles of this valuable work were reprinted by Kupffer in his *Correspondance Météorologique*, and a tolerably detailed analysis of the work was given by Wojeikoff in the Report of the Smithsonian Institution, 1872, entitled *Meteorology in Russia*. Kämtz commenced a *Repertorium für Meteorologie* which has been continued by Professor Wild. This work, which has been frequently referred to above, is in French or German (chiefly the latter), and contains a wealth of information, which, as far as our country is concerned, is buried, for the work is very scarce, and the general title gives no clue to the contents. We have, therefore, thought it expedient to give a list of the *principal meteorological* articles, which will be useful for reference. It may be well to mention that the Repertorium and many other important works are printed by the Imperial Academy of Sciences.

KÄMTZ: REPERTORIUM, DORPAT, large 4to.

Vol. I., 1862, 424 *pp.*

L. F. Kämtz.—Meteorological Instructions and Tables. 58 pp.
,, Temperature of Arkangel. 26 pp.
,, Deduction of mean results from Meteorological Observations, 28 pp. and Tables. (Translated in Quarterly Journal of the Meteorological Society for July, 1876,)
,, Climate of the S. Russian Steppes (2 papers). 56 pp. and 53 pp.

Vol. II., 1862, 424 pp.

L. F. Kämtz.—Barometric Windrose at Dorpat. 31 pp.
C. Kreil.—Contribution to the Climatology of Central Africa. 24 pp.
L. F. Kämtz.—Climate of the S. Russian Steppes (2 papers). 69 pp. and 24 pp.
,, Remarks on Hygrometry. 20 pp.
,, Temperature and Winds of Mitau. 32 pp.

Vol. III. (*no date*), 286 pp.

L. F. Kämtz.—On the "*Buran*," or Hot Wind of the Russian Steppes. 18 pp.
,, Psychrometer Tables (2 papers). 51 pp. and 65 pp.
,, Climate of the S. Russian Steppes. 46 pp.
,, Climate of Astrabad. 20 pp.

WILD'S REPERTORIUM. ST. PETERSBURG, large 4to.

Vol. I., 1870. 417 pp.

H. Wild.—Meteorological Instructions and Tables (2 papers). 93 pp.
W. Köppen.—Wind and Rainfall of Taurida (S.W. Russia). 72 pp.
M. Rykatchew.—Daily Range of Temperature at Barnaoul and Nertchinsk. 24 pp.
J. Pernet.—Yearly Range of Temperature at St. Petersburg. 52 pp.
A. Wojeikoff.—Distribution of Rain in Russia. 26 pp.

Vol. II., 1872. 364 *pp.*

H. Wild.—Meteorological Instructions and Tables (2 papers). 44 pp.
H. Fritsche.—Earth Temperature at Peking. 20 pp.
J. Pernet.—Determination of Earth temperatures with Thermopiles. 24 pp.
W. Köppen.—On succession of non-periodic changes of Weather. 52 pp.

H. Wild.—On the amount of Cloud in Russia. 28 pp.
F. Clawer.—Catalogue of published meteorological observations in the Russian Empire. 36 pp.

Vol. III., 1874. 427 *pp.*
H. Wild.—On Meteorological Instruments and methods of observation (3 plates), 145pp.
F. Dohrandt.—Ditto ditto. 16 pp.
M. Rykatchew.—Range of Temperature at St. Petersburg on clear and on cloudy days. 16 pp.
W. Köppen.—Tables for the deduction of mean temperature from 2 or 3 observations daily. 40 pp.

Vol. IV., 1875. 511 *pp.*
F. Dohrandt.—Determination of Anemometer Constants. 60 pp.
M. Rykatchew.—Distribution of pressure in European Russia. 60 pp.
H. Wild.—Daily and yearly range of Humidity in Russia. 90 pp.
M. Thiesen.—Theory of the wind force plate (1 plate). 73 pp.

Vol. V., 1877. 538 *pp.*
H. Wild.—Meteorological Instructions (1 plate). 32 pp.
,, Influence of height upon temperature and humidity. 36 pp.
H. Fritsche.—On the Climate of Peking. 52 pp.
A. v. Oettingen.—On the Wind-component Integrator (4 plates) 51 pp.
M. Thiesen.—Theory of Robinson's Cup Anemometer. 31 pp.

Vol. VI., 1879. 618 pp.
H. Wild.—Underground Temperature at St. Petersburg and Nukuss. 96 pp.
F. Dohrandt.—Determination of Anemometer Constants (continued from Vol. IV). 28 pp.
E. Stelling.—Photo-chemical observations on the intensity of total Daylight at St. Petersburg (1 plate). 32 pp.
M. Rykatchew.—Winds in the Baltic (2 plates). 19 pp.
G. Hellmann.—Inter-comparisons of Normal Barometers. 50 pp.
H. Wild.—On the exposure of Thermometers (3 plates). 18 pp.
M. Rykatchew.—Diurnal Range of Barometer in Russia (4 plates). 194 pp.

Vol. VII. (*vol. not yet complete*).
M. Rykatchew.—Winds in the White Sea (2 plates). 26 pp.
E. Stelling.—Yearly range of Evaporation in Russia (1 plate). 75 pp.
E. Wahlen.—Yearly range of temperature at St. Petersburgh, from 118 years' daily means (1 plate). 119 pp.

J. S. HARDING.

[*To be continued.*]

REVIEW.

Traité elémentaire de Météorologie par J. C. HOUZEAU, *Directeur de l'Observatoire Royal de Bruxelles, et* A. LANCASTER, *Météorologiste-Inspecteur au même établissement.* Mons. H. Manceaux, 1880. Large 12 mo, 324 pages, 2 plates.

OUR space for reviews is so limited that we cannot notice a tithe of the works which we should do if time and space allowed. For the same reason it is not possible for us to give, as is the case in many reviews, a general summary of the contents of the works noticed. The work before us certainly presents no special difficulties in this respect, but it would be the reverse of complimentary to the authors to suggest that their 324 pages could be epitomized in one—the thing is impossible and therefore we do not attempt it.

The work is one of a series the *Bibliothèque Belge*, which will eventually consist of 50 volumes, whereof 23 are already published. Their object is the popularization of the Sciences and Arts, and if the whole series is equal to the volume before us we congratulate the editor upon his success.

We will first state that the work is divided into two portions, viz., Theoretical and Practical Meteorology. We do not greatly admire this classification, but the following list of the contents of the chapters will best explain the plan of the work :—Temperature, Atmospheric Pressure, Wind, Humidity, Atmospheric Electricity, Terrestrial Magnetism, and Optical phenomena form the first group. Weather charts, Depressions, Anticyclones, Local forecasts and Weather signs form the second.

Having already intimated our high opinion of the work as a whole, there is nothing inconsistent therewith in mentioning a few points to which we object.

On page 15, after having described Fahrenheit's and other thermometers, the authors say :—

"Lastly, the celebrated Linné, to whom we owe the centigrade scale, took for 0° the invariable temperature of melting ice, and for 100° the equally invariable temperature of boiling water."

The authors, as well as we trust all our readers, know that the temperature of boiling water, far from being invariable, is largely employed in determining altitudes, because it varies with every change of atmospheric pressure, about 2°·0 for every inch of barometric pressure. We have turned to the chapter upon the barometer, and finding no reference there to the thermometric determination of heights, or to the variable temperature at which water boils, we consider the above mis-statement seriously misleading.

They must have some very bad instrument makers in Belgium, for the authors state that the change of zero point in mercurial thermometers due to their being graduated too soon after being filled "is not rarely 2°," that is 2°·0 C. or 3°·6 F., rather an alarming change for anything professing to be worthy of looking at.

On page 23 the *only* maximum thermometer described is that of Rutherford!

On page 90 we are told that "Baudin's barometer is used at the Belgian meteorological stations," and on page 95 the statement is repeated with a description of the instrument, which seems to us either very primitive or else not fully described. It is a syphon tube, the mouth of the short leg closed with a cork through which a curved capillary tube allows the pressure to act, but very little dust to enter. The graduations are *on* the long leg and are contracted (as in the Kew pattern barometers) to correct for the change of level in the short leg. So far well, but then we are told that the readings are made by simple inspection without the use of slide or vernier. As the divisions are very close (about thirty to an inch) the vernier

may perhaps be dispensed with, but a slide to avoid parallactic errors would certainly be an improvement.

We find an absolute novelty on page 110, a novelty to us, but evidently not to the authors and possibly not to some others. They are describing Lind's anemometer and say in the quietest way possible—"This tube is filled with water or preferably with mercury, in order to avoid freezing in the winter." The specific gravity of mercury being 13½ times that of water, the variation of level will obviously be only 1-13th that which is usual, and we should have thought that the instrument would thus become deficient in sensitiveness. Possibly a contracted tube is employed, but the engraving represents one of equal bore.

On page 139 there is a statement, which we by no means impugn, but which it is of general interest to reproduce—"During a violent storm which raged upon the 11th of January, 1878, at Mount Washington, U.S.A., the anemometer indicated 83 mètres per second." That is equal to about 186 miles an hour. No wonder that aeronauts travel 60 or more miles an hour if winds of nearly 200 miles an hour prevail at high altitudes.

It is a pity that the old generalization that the rainfall increases from the poles to the equator is repeated on 171; but curiously enough a good illustration of its want of precision is given accidentally on the very next page. On page 171 we have a table which shows that while the mean fall at Calmar, in Sweden, is 325 mm. (12·8 in.) it increases with decreasing latitude until at Gibraltar it is 1201 mm. (47·2 in.) But on page 172 we have the mean fall at Bergen, in Norway, lat. 60° N. given as 2250 mm. (88·6 in.) or more than double that in lat. 36° N. As a broad generalization, the rule may not be inaccurate, but it is equally easy to bring a hundred records to prove an increase in either direction.

In conclusion, we give as a specimen of the easy style of the book a translation of the first part of the chapter on Humidity.

Humidity of Air.—*General Remarks.*

The air is never perfectly dry. It is always charged with a certain quantity of the vapour of water; the more it contains the damper it is; the less it contains the drier it is.

This charge of watery vapour has, however, a limit, and when that limit is reached we say that the air is *saturated.* Beyond that limit the vapour cannot remain in its *transparent,* or invisible state. The surplus is condensed and falls.

The saturation-charge depends upon the temperature. The hotter the air the more vapour can it hold in the transparent state; the colder it is the less can it contain.

It must not be inferred from the use of the words *transparent vapour* that its presence is therefore insensible. It is this vapour which lessens the intense blueness of the sky. The more it is present in the air, the paler is the sky and the more grey the horizon—as in

the mornings of spring. The surrounding objects seem at a great distance; the humidity of the air is considerable.

But later on in the day, the sky becomes of a deeper blue, objects seem to come nearer, one would think it easy to converse with persons far away in the fields. The air has resumed its purity; the humidity is much less.

Thus the vapour, notwithstanding its transparency, whitens the mass of air, and throws a greyish veil over the landscape. It is, however, necessary not to confound this vapour with fog or cloud. It is dissolved in the air, while fog and clouds are separate from it.

* * * * * * * * * *

EVAPORATION.

Water is constantly evaporating,* and it is this evaporation which supplies the air with moisture. At the surface of the sea the air contains all the humidity which is possible; it is saturated. But in the interior of the Continents its humidity is but partial.

When air is saturated it cannot gain more humidity, and it cannot cause evaporation from the surface of the earth. But when it is not, everything which is wet furnishes it with vapour and becomes dry. The rate of drying depends, therefore, on the dryness of the air.

Moreover, when the air is at rest, evaporation soon ceases, because the air is soon saturated. But when the air is in motion, if fresh dry air continues to arrive, evaporation goes on and the drying continues.

These considerations show us why East winds are so desirable for hay, for corn, and for some dyeing operations. They are dry winds, and consequently produce rapid evaporation.

Thus *evaporation increases in proportion to the dryness and strength* of the wind.

But evaporation produces another physical effect—cooling. Everybody knows that wet linen hung out to dry is much colder than dry objects. Cooling then accompanies evaporation.

And this explains why our sensations often disagree with the indications of the thermometer. We are chilled by the cold, while the thermometer is at 39° or 40°. We feel overpowered by a temperature of 67°, while at other times 75° is quite agreeable.

Our bodies, in fact, are moderately sensible to heat and cold, but very sensible to evaporation; more or less perspiration is constantly passing through the skin. The evaporation of this moisture constantly cools the surface of the body. When this evaporation is active, we do not really feel all the heat which prevails; thus our skin is always colder than it would be without this evaporation.

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* This, though true in a general sense, is not *absolutely* so. Recent experiments by Dines and Griffith, in England, and by Masure, in France, have proved (what theory would have indicated) that if water is below the dew-point temperature, it becomes a condenser, and, far from evaporating, it increases in volume.—ED.

SUPPLEMENTARY TABLE OF RAINFALL IN APRIL, 1881.

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

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	·37	XI.	Carno, Tybritle	1·28
,,	Margate, Acol	·64	,,	Corwen, Rhug	·49
,,	Littlehampton	·65	,,	Port Madoc	2·47
,,	St. Leonards	·65	,,	Douglas.....	1·77
,,	Hailsham	·78	XII.	Carsphairn	1·57
,,	I. of W., St. Lawrence.	1·23	,,	Melrose, Abbey Gate...	1·12
,,	Alton, Ashdell.....	·45	XIV.	Glasgow, Queen's Park.	1·33
III.	Great Missenden.....	1·09	XV.	Islay, Gruinart School..	1·30
,,	Winslow, Addington ...	·59	XVI.	Cupar, Kembach.....	1·24
,,	Oxford, Magdalen Col...	·80	,,	Aberfeldy H.R.S.	·17
,,	Northampton	·70	,,	Dalnaspidal	1·73
,,	Cambridge, Merton Vil.	...	XVII.	Tomintoul.....	1·64
IV.	Harlow, Sheering	·86	,,	Keith H.R.S.	·94
,,	Diss	1·19	XVIII.	Forres H.R.S.	·67
,,	Swaffham	1·12	,,	Strome Ferry H.R.S....	1·04
,,	Hindringham	·85	,,	Lochbroom	1·24
V.	Salisbury, Alderbury...	·56	,,	Tain, Springfield.....	1·14
,,	Calne, Compton Bassett	·70	,,	Loch Shiel, Glenfinnan.	3·25
,,	Beaminster Vicarage ...	1·44	XIX.	Lairg H.R.S.	1·53
,,	Ashburton, Holne Vic..	1·47	,,	Altnabreac H.R.S.	2·91
,,	Langtree Wick	·88	,,	Watten H.R.S.	1·30
,,	Lynmouth, Glenthorne.	1·69	XX.	Fermoy, Glenville	2·31
,,	St. Austell, Cosgarne...	1·74	,,	Tralee, Castlemorris ...	·94
,,	Ilebrewers, Walrond Pk.	...	,,	Cahir, Tubrid	1·51
VI.	Bristol, Ashleydown ...	...	,,	Tipperary, Henry St....	1·92
,,	Ross	·57	,,	Newcastle West	2·66
,,	Wem, Sansaw Hall.....	·91	,,	Kilrush	1·49
,,	Cheadle, The Heath Ho.	1·12	,,	Corofin	1·53
,,	Bickenhill Vicarage ..	...	XXI.	Kilkenny, Butler House	...
VII.	Melton, Coston	1·29	,,	Carlow, Browne's Hill..	1·33
,,	Horncastle, Bucknall ...	1·28	,,	Kilsallaghan.....	...
VIII.	Macclesfield Park	1·44	,,	Navan, Balrath	1·58
,,	Walton-on-the-Hill.....	1·86	,,	Athlone, Twyford	1·56
,,	Broughton-in-Furness ..	2·18	,,	Mullingar, Belvedere ...	1·47
IX.	Wakefield, Stanley Vic.	1·40	XXII.	Ballinasloe	1·09
,,	Ripon, Mickley	1·03	,,	Clifden, Kylemore	2·85
,,	Scarborough.....	·76	,,	Crossmolina, Enniscoe..	1·31
,,	Mickleton.....	1·69	,,	Carrick-on-Shannon ...	1·06
X.	Haltwhistle, Unthank..	1·65	XXIII.	Dowra	1·90
,,	Shap, Copy Hill	1·11	,,	Rockcorry.....	2·27
XI.	Llanfrechfa Grange	1·05	,,	Warrenpoint	2·34
,,	Llandovery	1·70	,,	Newtownards	1·59
,,	Solva	1·39	,,	Carnlough.....	1·81
,,	Castle Malgwyn	2·67	,,	Bushmills	1·12
,,	Rhayader, Nantgwillt..	2·46	,,	Buncrana	2·07

APRIL, 1881.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	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°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	Camden Square	.46	— 1·56	·21	11	9	67·8	17	27·8	21	6	14
II.		Maidstone (Hunton Court)	·42	— 1·43	·13	26	8	...	...	...	...	...	...
,,		Strathfield Turgiss	·44	— 1·47	·29	11	7	66·4	17	26·2	21	8	18
III.		Hitchin	·73	— 1·22	·12	11	12	62·0	13	25·0	3, 6	12	...
,,		Banbury	·65	— 1·36	·28	11	10	61·5	13	27·5	4	11	...
IV.		Bury St. Edmunds (Culford)	1·61	— ·18	·40	14	15	65·0	11*	25·0	9	13	...
,,		Norwich (Cossey)	1·02	— ·84	·24	12	15	64·0	11	29·0	4	11	15
V.		Bridport	1·74	...	1·08	13	9	64·0	17	26·0	1, 21	8	...
,,		Barnstaple	1·50	— ·88	·46	13	9	69·0	17	31·5	21	...	...
,,		Bodmin	1·91	— 1·42	·70	10	13	65·0	17	29·0	4	5	9
VI.		Cirencester	·87	— 1·53	·42	11	6	...	...	...	...	...	...
,,		Church Stretton (Wcolstaston	1·12	— 1·20	·42	11	9	65·0	13	23·0	4	11	...
,,		Tenbury (Orleton)	·91	— 1·26	·59	11	8	66·2	28	24·2	21	12	14
VII.		Leicester (Town Museum)	1·50	...	·85	14	11	69·3	17	24·0	4	10	21
,,		Boston	1·16	— ·73	·27	15	10	65·0	13	27·0	4	6	...
,,		Grimsby (Killingholme)	1·25	— ·51	·35	11	13	60·0	29	30·0	4	2	...
,,		Mansfield	1·12	— ·70	·61	14	12	62·5	13	24·0	4	11	16
VIII.		Manchester (Ardwick)	1·45	— ·58	·67	15	11	67·0	13	27·0	4	9	...
IX.		Wetherby (Ribstone)	1·08	— 1·43	·48	12	8	...	...	...	..	...	...
,,		Skipton (Arncliffe)	2·17	— ·89	·52	30	13	61·0	13	27·0	3	12	...
X.		North Shields	1·05	— ·95	·26	26	11	...	...	...	...	...	...
,,		Borrowdale (Seathwaite)	3·75	— 1·19	·73	30	13	...	...	...	...	..	...
XI.	WALES.	Cardiff (Ely)	...	...	...	...	...	...	...	...	...	...	...
,,		Haverfordwest	2·09	— ·73	·63	13	8	63·5	18	27·0	3	9	11
,,		Aberystwith Goginan	...	...	...	...	...	...	...	...	...	...	...
,,		Llandudno	·94	— ·94	·43	11	8	66·0	13	27·8	4	7	...
XII.	SCOTLAND.	Cargen	1·41	— ·87	·26	30	13	61·8	13	24·0	4	10	...
,,		Hawick (Silverbut Hall)	1·60	— ·61	·42	26	8	...	...	...	...	...	...
XIV.		Douglas Castle (Newmains)	1·04	— ·84	·55	30	7	...	...	...	...	...	...
XV.		Loch Long (Arddaroch)	...	...	...	...	...	...	...	...	...	...	...
,,		Kilmory	2·05	— ·58	·68	25	9	...	...	23·0	4	13	...
,,		Mull (Quinish)	·97	...	·30	24	8	...	...	...	...	...	...
XVI.		Loch Leven	·70	— 1·51	·20	30	6	...	...	...	...	...	...
,,		Arbroath	·78	— 1·13	·32	30	8	59·0	24	28·0	6	5	...
XVII.		Braemar	1·09	— ·99	·36	26	11	57·0	29	16·0	3	18	25
,,		Aberdeen	·92	...	·31	29	19	60·0	29	23·0	2	9	...
XVIII		Portree	1·80	— 1·75	1·07	24	9	...	...	...	...	...	...
,,		Inverness (Culloden)	·20	— 1·15	...	...	..	61·2	13	24·0	3	10	17
XIX.		Dunrobin	1·47	...	·44	25	11	56·5	28	24·0	3	7	...
,,		Sandwick	1·53	— ·34	·37	24	15	53·2	17	29·6	2	3	9
XX.	IRELAND.	Cork (Blackrock)	1·79	— 1·31	·66	10	10	70·0	28	29·0	2	8	...
,,		Darrynane Abbey	...	...	...	...	...	...	...	...	...	...	...
,,		Waterford (Brook Lodge)	1·66	...	·36	29	11	60·0	16	31·0	1, 2†	5	...
,,		Killaloe	2·10	...	·97	30	10	68·0	15	28·0	9	9	...
XXI.		Portarlington	1·44	— ·59	·30	25	13	61·0	15	26·0	8	9	...
,,		Monkstown	1·22	...	·54	13	9	63·0	26	27·5	1	..	...
XXII.		Galway	1·21	— 1·62	·43	29	14	62·0	16	26·0	2	8	...
XXIII		Waringstown	1·69	— ·20	·34	13	15	63·0	15	23·0	3, 5	12	13
,,		Londonderry	1·45	...	·50	13	12	60·0	12	30·0	3	4	11
,,		Edenfel (Omagh)	2·16	— ·16	·56	12	14	60·0	18	25·0	2, 5	10	..

* And 29. † And 3, 5, 20.

+ 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; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—Nightingale first heard on 14th, first swallow seen on 16th, cuckoo first heard on 16th; mountain ash in leaf on 11th, larch on 12th.

HITCHEN.—One of the driest and coldest Aprils on record; S on the 20th.

CULFORD.—The first part of the month was very dry, with cold E. winds and frost at night, but it ended with beautiful growing weather and fine showers.

COSSEY.—Very bright but cold weather for the first ten days, with frosty nights; swallows seen on 12th, nightingale heard on 17th.

BODMIN.—Mean temp. 49°·1.

CIRENCESTER.—A very dry month, with a long continuance of N.E. winds; a good time for farmers to clear the land, which very much needed the dry weather. Vegetation backward.

WOOLSTASTON.—Mean temp. of the month 44°·4; cuckoo first heard on 17th, sand martins seen on the same day, swallows not seen till the 30th; T and H on 25th and 26th.

ORLETON.—The strong drying N.E. winds which set in during March continued till the 11th of this month, with a sky generally clear, and severe frosts almost every morning; a change of wind then took place, and the weather was warm and pleasant till the 18th, when it became cold again, with frequent severe frosts till the 24th; the remainder of the month was again warm and pleasant. The mean temp. was more than 3° below the average of 20 years, and the prevalence of severe frosts at night was very unusual; the bar. was high and steady, and the rainfall very small, which greatly favoured all farming operations. Very distant T was heard on the 26th; the chiffchaff was seen on the 12th, swallows on the 16th, and the cuckoo heard on the 21st, no thrush has been seen for five months, and blackbirds have become very scarce. Cherry and damson trees came into full blossom about the 30th.

LEICESTER.—TSS at 2 p.m. and 3.30 p.m. on 14th, and T on 23rd; lunar halo on 12th, dense fog on night of 16th.

KILLINGHOLME.—With the exception of two or three days, the weather was very cold until the last week, when there was a great improvement. All forms of vegetation unusually backward, but altogether the prospect is hopeful. First swallow seen on 15th, first willow wren on 17th, and cuckoo heard on 24th. T and L on 26th.

MANSFIELD.—Generally bright and sunny, with cold dry easterly winds till the 10th, and variable during the remainder of the month, with occasional showers, but warmer. A little S on the 19th and 20th.

ARNCLIFFE.—A dry cold month, with much E. and N.E. wind.

N. SHIELDS.—Fine till the 10th, then variable; S on the 19th, 20th and 21st; TS on the 25th.

SEATHWAITE.—TS with H on 26th.

WALES.

HAVERFORDWEST.—From March 25th to April 7th the shade temp. was several degrees below the freezing point every night, with a bitter icy blast from the E., which ceased not day or night; fine R occurred about the 10th, with a more genial atmosphere, but the weather again became cold with sharp night frosts on the 18th; the end of the month was, however, fine and spring like. Mean temp. 46°6.

LLANDUDNO.—The month was, on the whole, cold and very dry, the mean temp. being 3°·5 below, and the rainfall little more than half, the average. The low temperatures were confined chiefly to the first eight days of the month, during which time frost occurred each night but one, a very unusual occurrenec, but fortunately vegetation was not sufficiently forward to sustain any

damage. The weather altogether was most favourable for cleaning the land and seed sowing. Fruit blossom abundant and promising; 116 hours of bright sunshine.

SCOTLAND.

CARGEN.—The temp. was low during the month, and easterly winds prevailed to an unusual extent. L on 16th. Mean temp., 44°·3; 2°·5 below the average. 172 hours of sunshine.

HAWICK.—A cold, frosty month; patches of S on the hills from beginning to end. Pastures very backward. T on 26th.

BRAEMAR.—A very cold, but dry month, favourable for sowing. Vegetation making very slow progress. Hills covered with fresh S.

ABERDEEN.—Dry and cold, with variable winds. Rainfall very much below the average; vegetation backward, but the weather was favourable for sowing and planting. S and H on 1st and 20th.

PORTREE.—A very cold, frosty month, and pastures in extremely bad condition. S from 20th to 25th.

CULLODEN.—Weather generally cold and ungenial; vegetation very late, but a great quantity of fruit blossom. Rainfall small.

SANDWICK.—Cold, with N. and E. winds; mean temp. nearly 3° below the average of 54 years, and rainfall small; vegetation, in consequence, exceedingly backward. Gales of 45 miles an hour on 11th and 12th, and one of 40 miles an hour on 25th. Aurora on 2nd and 27th. S on the 1st.

IRELAND.

WATERFORD.—The driest April since 1875, and the hedges were only getting green at the end of the month. Swallows arrived on the 17th.

KILLALOE.—Rather a dry month; mean temp. above the average. Copious R at the close of the month, with a rise of temp. encouraged vegetation, which had been very backward.

MONKSTOWN.—The early part of the month was very dry and cold, with N.E. wind and bright sunshine; and this weather again prevailed for a few days after Easter. The month closed mild and rainy.

WARINGSTOWN.—Beautiful spring weather at the close of the month, but everything three weeks late.

LONDONDERRY.—On the whole a very favourable month for farming operations. Wind principally E. and N.E.

THE COMING SUMMER.

SIR,—When January or February has been very severe, and the following April colder than the average at Greenwich, we have almost always had an unsettled and somewhat cool summer in the same year. When, however, January and April have been dry, as in 1861 and 1855, we have usually had rather frequent periods of dry weather in the following four or five months, and the summer has been better than when the previous January and April have been wet. In the present year, January was exceedingly severe, and the mean temperature of April considerably below the mean temperature at Greenwich; but, as those months were dry, the coming summer should be not unfrequently rather dry in character, though changeable, and often cool. I may add, that the mean temperature of the period from the second week of July to the second week of August, will probably be warmer than the average at Greenwich.—Yours truly,

GEORGE D. BRUMHAM.

Barnsbury, May 2nd, 1881.