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BIBLIOGRAPHY.*

DR. HELLMANN estimates that he could compile and publish a thousand copies of a meteorological bibliography, with upwards of 30,000 titles, in a bound octavo volume of about 1,300 pages, for about £1,200. This is a work which once well done, would, as far as the past is concerned, be done for all time, and an annual supplement would be a simple matter.

We should be delighted to acknowledge that we have been misinformed, but at present we believe that we are correct in stating, that Dr. Hellmann's proposal has been shelved on account of the expense.

We have been so astounded at the trumperiness of this objection, that we have tried to ascertain how much the various meteorological establishments are costing per annum at present. It is not possible to find out; no one knows what the English office costs, and *à fortiori*, one cannot find out the total cost all over the world; but the figures given in the report of the Congress at Rome, give a total of £144,000 per annum, with England and France left blank. And besides these, there is the elaborate Indian system; there are Australia, New Zealand, South Africa, Mauritius, &c., so that we are certainly far within the mark when we say that Governmental meteorology is costing the various nations £200,000 per annum.

Whence it results that the representatives of official meteorology cannot see their way to spending 1-167th part of one year's income in learning what their predecessors have done; or, to get rid of the fraction, it comes to this, that a man with a hundred pounds a-year to spend upon meteorology, will not give twelve shillings to know where to look for the recorded experience of his predecessors!

That we are not solitary in setting a high value on bibliographical information, is proved by the courageous way in which the subject is being attacked by Mr. Ramsay, in the work to which he has given

* "The Scientific Roll and Magazine of Systematized Notes," by Alexander Ramsay, F.G.S. Vol. I., Part I., Nos. I.-III. Bradbury & Co., London. 8vo.

"Report of the International Meteorological Committee, meeting at Berne, 1880." Stanford, London. 8vo.

the somewhat vague title of "The Scientific Roll." Although there are many points in it of which we do not approve, we would not be without our copies for five times their cost; and we advise all who are interested in meteorological bibliography to procure copies, either for their own use, or to encourage a useful work.

But we want something far and away beyond what Mr. Ramsay is giving us. We want Dr. Hellmann's scheme carried out in its entirety, and carried out at once. We believe that he has under-estimated the cost; he puts it at £1,200; we prefer facing the worst state of affairs, and admit that it *may* cost £2,000.

Now; how is this to be raised? We think that it might be easily and promptly effected with very little trouble. The leading directors have already (Berne meeting, page 8) promised their aid. We would, in consideration thereof, allow those of them who desired, to buy one copy of the "Bibliography," at half the published price. We would not allow a single copy of the "Bibliography" to be given away. The whole thousand copies should be stamped with a rotation number, and a numbered list of all those ordered before publication should be given in the volume. This list would of itself be very instructive.

We should put the price *very high*, certainly not less than £5 per copy, and we should prefer £10, or even £20, and we are quite ready to put our name down for that sum if it will at all help to bring matters to a crisis. If the book is not worth as much as one barometer it would be a wretched catalogue, quite unworthy of printing.

Then, quoting again from the Berne Report, page 44, and assuming the very limited sale of 150 copies, we should have—

At £5 per copy, and printing 1,000.		At £10 per copy, and printing only 500.	
	£		£
Say 12 copies at half-price ...	30	Say 12 copies at half-price.....	60
.. 138 .. full-price ...	690	.. 138 .. full price	1380
Cost of remaining 850 copies	1280	Cost of remaining 350 copies...	460
	<hr/>		<hr/>
	£2000		£1900
Cost covered when 406 are sold.		Cost covered when 196 are sold.	
Profit when 500 sold	£470	Profit when 250 sold	£540
Eventual profit if all sold..	£2970	Eventual profit if 500 sold.....	£3040

We are not drawing up the prospectus of a Limited Liability Company, but we firmly believe that if Dr. Hellmann personally, or in conjunction with some large printing firm, undertakes the task, he will eventually make a handsome profit.

It might be well to consider the expediency of doubling the price after a certain fixed date, say, three months from issue of circular. But the main essentials to financial success are the absolute prohibition of free copies, and the fixing of a very high price.

THE ORGANIZATION OF THE METEOROLOGICAL SERVICE IN SOME OF THE PRINCIPAL COUNTRIES OF EUROPE.*

VII.—SWEDEN.

1. *The Central Meteorological Office.*—The Royal Academy of Sciences at Stockholm established a meteorological network of stations, in the years 1856-8, at the instigation of Professor Edlund, who undertook the management of the stations, and provided them with verified instruments. He wrote a set of instructions for the observers (Stockholm, 1858), and in 1859 he began the publication of the observations in *Meteorologiska Jakttagelser i Sverige*, which were continued until 1872, and appeared in 14 vols. In these year-books the observations of 12 stations are printed *in extenso*, together with the five-day means of the same for all elements; for the remaining stations five-day means only are given. In 1873 the service was re-organized, and a Special Central Office was established, with Dr. R. Rubenson as director. The service only includes stations of the second and third order, as the only station of the first order, viz., Upsala, is an independent institution. The stations of the second order number 32, about half of them being on the sea-coast. The observers, who are mostly telegraph clerks, receive a remuneration of about £11 10s. a-year. Observations are taken at 8 a.m., 2 and 9 p.m.; the mean temperature has been deduced by the formula :—

$$\frac{8h. + 2h. + 5 \times 9h.}{7}$$

The stations are supplied with siphon barometers. The thermometer screen is similar to Glaisher's; the rain gauges have an area of one-tenth square metre (14 in. diameter). The stations are inspected on an average every three years.

From the year 1873-77 (the last published), the year book above mentioned, contains (1) the daily observations of 18 stations, printed *in extenso*; (2) monthly and yearly *résumés* of all stations (now 34 in number), and (3) 5-day means of temperature of all stations; the text is given in Swedish and French. The materials published since 1859 have been discussed in several ways by MM. Edlund, Rubenson, and Hildebrandsson. The following publications may be specially mentioned :—

E. Edlund, Bidrag till kännedom om Sveriges klimat (K. Svenska Vet.-Akad. Handl. Bd. 12).

R. Rubenson, Nederbördsmängden i Sverige.....1859-72 (Id. Bd. 13. No. 10).

R. Rubenson, Månads-och Årsmedia af temperaturen.....1860-72 (Id. Bd. 14).

R. Rubenson, Om storleken af temperaturens dagliga variation i Sverige (Id. Bd. 14. No. 10).

H. H. Hildebrandsson, Vindarnes frekvens i Sverige, under Jan. och Juli.....1852-63 (Öfversigt k. Vet. Akad. Förh. 1869. No. 5).

Recently M. Rubenson has published a *Catalogue des Aurores, boréales observées en Suede depuis le XVI me. siècle jusqu' à l'année 1877 y comprise.*

The rain stations first established by M. Hildebrandsson, in the year 1876, and at the present time numbering 200, are now under the superintendence of the central office.

Daily telegraphic reports are received from 27 inland and foreign stations, and bulletins are issued to the principal places. The weather chart published in the newspapers, is prepared by a special method, invented by Lieutenant Rung, which is also used in Germany. The funds at the disposal of the central office amount to a little over £1,200; but telegraphy is free, and office accommodation is given in the Academy of Sciences, which also bears the expense of the publication of the year books.

2. *The Nautical Meteorological Office.*—This office was established in 1877, with a yearly vote of about £490, and a first outlay of £385. As the ships' logs received are few, they are, after examination, forwarded to a larger foreign institute for utilization. The logs used are those of the English Meteorological Office, with the addition of the heading in Swedish. By mutual agreement, Sweden also undertakes the special discussion of the meteorology of the Baltic; Denmark takes the Cattegat, and Norway the North Sea; and the materials collected are mutually exchanged. An abridged and very convenient form of register is used for these inland seas. Observations are also taken thrice daily at the numerous lighthouses, in connection with the stations of the central office. The barometers in use are on the cistern-siphon principle. Stevenson's thermometer screens are employed, and Hagemann's anemometer is used for determining wind force. Some stations are also furnished with Negretti and Zambra's deep-sea thermometers, and with tide gauges. The director of this office is Captain Malmberg.

3. *The Meteorological Observatory of the University of Upsala.*—Meteorological observations were begun at Upsala about the middle of the last century, but have only been regularly printed *in extenso* since the year 1855, at the cost of the Royal Society of Sciences of Upsala (1855-62); the later years 1863-65 are contained in the Swedish year-books. From 30th May, 1865, to 9th August, 1868, hourly observations were made by the University students. These valuable observations with some additions have been published under the superintendence of Dr. Rubenson, and at the expense of some private gentlemen (Upsala, 1877). Latterly, eye observations have been replaced by the indications of Theorell's Meteorograph, which registers every 10 minutes. From the year 1869, the Observatory has published a monthly Meteorological Bulletin, the last being for 1880. Since 1878 the Observatory has been an independent institution under the superintendence of M. Hildebrandsson, whose valuable works are well known in this country. Among the publications of the observatory may be specially mentioned:—

Hildebrandsson, Sur la classification des nuages. Upsala, 1879.*

Hamberg, La température et l'humidité de l'air à différentes hauteurs observées à Upsal pendant l'été de 1875. (Act. Soc. R. Ups. 1876).

Hjelström, Om den dagliga förändringen i vindens hastighet, Upsala, 1877.

The Observatory of Upsala is the central station for the purely climatological stations of Sweden. This system was begun in 1869, and embraced observations of thunderstorms, hail, and subsequently, observations on the freezing and thawing of the rivers, &c., nights of frost, and phenological observations. These observations have been discussed in various papers published between 1872 and 1879. The observers are volunteers, and number about 400.

Cirrus Observations.—In December, 1873, M. Hildebrandsson organised a system of cirrus observations. These were taken by observers interested in the subject at the same times as the ordinary observations, and in November of 1874 he published his *Essai sur les courants supérieurs de l'atmosphère dans leur relation aux lignes isobariques*, based upon the operations of 21 stations in Sweden. The utility of the observation of the motions of cirrus clouds in the dynamic problems of meteorology was fully proved, and resulted in their further extension over the whole of Europe, and a more comprehensive discussion was published by M. Hildebrandsson in his *Atlas des mouvements supérieurs de l'atmosphère*, Upsal, 1877.

The Director of the Observatory draws his salary as a Professor at the University. The funds at his disposal for assistance, &c., amount to little more than £100. A portion of the cost of printing is borne by the Royal Society of Sciences of Upsala.

Observations of earth temperature were made by Angström in the garden of Physical Institute of the University. In 1867, four thermometers were placed at depths of 1, 2, 3, and 4 metres (3, 6, 10, and 13 feet), and the observations have been regularly continued, every second day, from 1868 until the present time.

In the same garden there is a massive structure for magnetic observations; but the iron ore in the soil of Sweden interferes with magnetic observations. They, however, have been the means of discovering the subterranean beds of iron :—

R. Thulén :—Sur la recherche des mines de fer à l'aide de mesures magnétiques. Upsal, 1877.

VIII.—SPAIN.

In the year 1737, F. F. Navarette published the first "*Efemérides-barométrico-médicas*, and, besides these, the only observations made during the latter part of the 18th century which are deserving of

* This work, of which only 60 copies were printed, contains some of the best photographs of clouds that had been taken. Some very successful photographs have recently been taken by Mr. G. M. Whipple, at the Kew Observatory.

mention are those of Madrid, Barcelona, and San Fernando. After many vain attempts at establishing a good system of observations, the Government seems to have lost courage, for it is not until October, 1850, that we find a Royal decree establishing 23 meteorological stations at the universities and gymnasiums. At the same time, the Madrid Astronomical Observatory was re-organised and received a special department for meteorology, which was also to serve as the central meteorological station. A number of the proposed stations were provided with English instruments, and instructions were prepared by M. Rico y Sinobas (Madrid, 1854). Many of the observers, however, who were unpaid, soon ceased observing, and the observations were not published in a regular form but in separate sheets, the best of which was in the "*Revista de la Academia de ciencias*." Consequently, the Government placed the superintendence of meteorological observations under the newly-formed statistical commission (*Junta de Estadística*).

At the instigation of one of the members of the commission, the present director of the Observatory, A. Aguilar y Vela, that body took up the matter warmly, and finally brought a definite organisation into the meteorological system, and the observers received remuneration and verified instruments. The observations were published, or at least the results, in the "*Anuarios estadísticos de España*" (1858-65). In July, 1865, the meteorological service was placed under the Ministry of the Interior, which, on its part, entrusted it (for the second time) to the Observatory at Madrid.

In addition to the Observatories of the first order—viz., Madrid and San Fernando, which will be referred to presently—there are at present 22 official stations of the second order, the observers at which receive remuneration varying from about £10 to £21 per annum. In addition, observations are received from 6 unofficial stations. The stations of the second order are better furnished generally than other similar stations in Europe, but observations are only taken at 9 a.m. and 3 p.m., and no regular inspection of the stations is undertaken.

Publications. The results of the observations are published in some detail in the annals, "*Resumen de las observaciones meteorológicas efectuadas en la Península*" (1865-75). The stations, Murcia, Valencia and Santiago, also publish *résumés* of their observations separately. For Burgos, the wind observations for 4 hours daily, recorded by a Salleron's anemograph, have been published in detail for the year 1867 (Burgos, 1868). The "*Anuario del Observatorio*," issued since 1860, contains a *résumé* of the meteorological observations, and vol. xvi. (1858) contains the means for 10 years (1865-1874). The "*Resúmenes*" are rather late in appearing, but since September, 1879, a *résumé* of the observations, brought up to time, is published in the "*Boletín mensual*" of the "*Dirección general de Beneficencia y Sanidad*," from which we are glad to see that several new stations of the second order have lately been established.

Weather Telegraphy. Since the year 1864, telegraphic reports have been received. The reports now number 48 besides the Canaries, and are supplemented by summaries from Portugal and France. Telegraphic *résumés* of the actual and probable weather are forwarded about 2 p.m. to the ports; the bulletin appears in the papers of the following morning, and a collective telegram containing reports from 8 stations is sent to Paris. The telegraphic reports for the years 1872-9 have been separately published.

The cost of the meteorological service amounted in 1878 to about £1,050, exclusive of the salaries at the central station and of telegraphy, which is free.

Meteorological Observations at the Madrid Observatory. Although J. Juan had proposed the establishment of the Observatory as early as 1780, it was only in 1847 that the building was finished, and no suitable staff was appointed until 1854. From the commencement of the working of the Observatory, meteorology formed an integral part of its operations. With regard to earlier series of observations at Madrid, it may be mentioned that M. Juan had commenced tolerably complete observations as early as 1747 (*Cotte : Mémoires sur la météorologie*, vol. ii.), and J. Garriga had also made observations for 25 years.

Two standard barometers are in use at the Observatory, one by Newman and one by Casella. The thermometers are exposed in a Glaisher's stand. Earth thermometers are placed at depths of 0·6, 1·2, 1·8, 3·0, 3·7 metres (2, 4, 6, 10 and 12 ft.), and are read at noon. A rain-gauge with square receiver of 11·8 ins. a side is used, and near it an atmometer of similar dimensions, which is filled daily with two litres (122 cubic inches) of water. It is observed daily by means of a tube, due allowance being made for any rainfall during the meantime. The wind is recorded by anemometers on Osler's and Robinson's principles. In 1860, the Observatory obtained one of Secchi's meteorographs, but notwithstanding every exertion it has not been possible to keep it in working order. From the year 1859, direct observations have been made every three hours from 6 a.m. till midnight.

Publications.—Up to the year 1865 more complete abstracts of the results have been published in the following works :—

“Anuarios del Real Observatorio de Madrid,”

“Revista de l'Academia de ciencias,” and

“Resumen de las observaciones meteorologicas efectuadas en Madrid, 1865.”

With the year 1866 the publication of the observations, *in extenso*, was begun in the work, “*Observaciones Meteorologicas . . . de Madrid.*”

The observations for the ten years, 1860—69, were subjected to a careful discussion by M. Merino. In vols. xi.-xiii. and xv.-xvii. of the “*Anuaris del R. Observatorio de Madrid*,” he discusses the various elements, and their mutual dependence upon each other.

The Marine Observatory of San Fernando.—This is a station of the first order, and possesses one of the best series of observations in Spain. From 1850 the series is unbroken, and the observations are taken many times a day. From the year 1875, complete self-recording observations have been made.

Publications.—From the year 1870 the observations have been published in detail in the *Annals of the Observatory* for the years 1870—78. From the year 1875 hourly observations have been given, except for the rainfall.

The director of the Observatory, Captain C. Pujazon, attended the Maritime Conference in London in 1874, and has induced his government to establish a regular system of observations in the Spanish Navy. The Observatory supplies verified instruments to the ships of war, and also to such mercantile captains as are willing to take the observations.

IX.—PORTUGAL.

The organisation of the meteorological service in Portugal is highly developed—in some points it is ahead of that of other countries. It possesses two completely furnished observatories, a sufficient number of stations of the second order, a telegraphic weather service, and a system for maritime meteorology.

The Observatory of the Infante D. Luiz, at Lisbon.—The labours of Maury in the domain of ocean meteorology, and the participation of Portugal in the Brussels Conference in 1853, gave G. J. Pegado occasion to advocate the establishment of an observatory at Lisbon, and of a network of stations. The Crown Prince D. Luiz, then Admiral of the Fleet, and now King, favoured the plan, and the erection of the observatory was begun in the year 1853; the first observations were made on 1st October, 1854. These are published in great detail in the "*Trabalhos do Observatorio*," for the years 1854—63. On the death of Pegado, M. Silva was appointed director, and he was succeeded by M. Fradesso da Silveira, who did much for the development of the service. At his death, in 1874, the present director, J. C. de Brito Capello, was entrusted with the superintendence. The Observatory forms the central station, and is also a station of the first order, at which complete magnetical and meteorological observations are taken. The self-recording instruments were made by Salleron of Paris, and in addition to the records of these instruments, direct observations are taken five times daily. Becquerel's electrical earth thermometers are placed at seven different depths, and are read at 9 a.m. daily. Since January, 1880, five of Lamont's earth thermometers have been placed at similar depths. Two rain gauges are in use, one attached to the anemometer, at a height of 23 metres (75 feet) above the ground. Another, of 1-100th square metre area ($4\frac{1}{2}$ in. diameter), is placed 1.6 metre (5 feet) above the ground. One of Cator's pressure anemometers is also in use. There is also one of Thomson's electrographs (modified by

Branly). Its records have been published in the *Annals* for the year 1877. All the principal instruments in use are described in detail in the second volume of the *Annals*, and also in Fradesso da Silveira's "*Relatorio do serviço* (Lisboa, 1872).

Publications.—The observations at the Observatory are published in the *Annaes* of the Observatory, vols. i.-xvi., for the years 1856-78. The first vol. contains a discussion of the observations of the years 1856-63, which are contained in greater detail in the *Trabalhos* above mentioned. In the first two vols. (1864-65) hourly observations are given, and subsequently two-hourly observations. The discussion of these rich materials for Lisbon has recently been undertaken by M. Capello, and published as appendices to the *Annals* in the following monographs :—

- 1—Resumo das princepaes observações meteorologicas executadas durante o periodo de 20 annos decorridos desde 1856-1875 (*Annaes* XIV. 1876).
- 2—Temperatura do ar em Lisboa, 1856-75 (Lisboa, 1878).
- 3—Pression atmosphérique à Lisbonne, 1856-75 (Lisb., 1879).
- 4—La pluie à Lisbonne (Lisbonne, 1879).

We may mention that particular attention is paid to magnetic observations, although these do not enter into our present subject.

The Stations of the Second Order.—In the year 1861 the station at Oporto was established, and two years later those of Campo Maior and Guarda. In 1865 the Parliament voted funds for the establishment of 10 stations, including those of Madeira and the Azores. There are also some colonial stations, *e.g.*, on the island of St. Thomas. Goa and St. Paolo de Loanda, publish their observations independently, but these observations are almost unknown in European circles. The stations generally are well furnished, including Kew barometers, and small Robinson's anemometers. The results of the observations at the stations of the second order are published as follows :—Up to the end of the year 1872, 10 day and monthly means for all hours of observation, and for all elements, in the *Annals* of the Observatory, vols. i.-x., 1863-72; from the year 1873, the 9 a.m. readings, daily means, maxima, and minima for every day, and monthly means are published in the half-yearly publication, *Postos Meteorologicos*, 1874-77. In the year 1877, the publication of the observations of five stations (including Lisbon) was begun upon the "international" system. In vol. xi. (1873) of the *Annals*, there is a *résumé* of nine years observations (1864-72) for seven stations.

Weather Telegraphy.—Reports are received daily from nine inland stations, and from Funchal (Madeira), and a summary from Paris, and a bulletin containing forecasts for the next day has been published in the newspapers since 1865. Storm warnings, similar to those in use in England, and with night signals at some stations, were begun in 1871.

Ocean Meteorology.—There has been a special department for this

service since 1854. Both the navy and the mercantile marine are supplied with verified instruments by the Lisbon Observatory, but the amount of information received is naturally but small.

The funds at the disposal of the Central Observatory are only about £1,560 a year, but the salaries of the director (chiefly) and two principal assistants are drawn from the navy, and telegraphy is free.

The Observatory of Coimbra.—This observatory is independent of the central institution, and belongs to the University of Coimbra, and would rank as a station of the second order, according to the definition of the Vienna Congress. For the years 1864-66, results of observations are published in the "*Resumos Annuaes*" of the University (Coimbra, 1870). With the year 1867, detailed observations are published in "*Observações Meteorologicas, &c., de Coimbra*," and the publication is brought well up to time, the last volume being for 1879. Observations on solar physics have also considerable attention. The present director is Dr. A. S. Viégas, who appears recently to have succeeded M. J. A. de Sousa. The funds at the disposal of the Observatory, including the charges for magnetic observations, amount to about £540 a year.

We are again indebted to Dr. Hellmann's able reports for the above particulars.

J. S. HARDING.

METEOROLOGICAL OBSERVATIONS AT GABOON, WEST AFRICA.*

THE exhaustive and enervating character of the climate of Western Africa, or at any rate, of that part which extends from the banks of the Senegal to those of the Congo, has one natural result, viz., it renders accurate and systematic records of the climate extremely scarce.

The large pecuniary profits to be made on the shores of the Gulf of Guinea, tempt many men of all nations to face the climate, but from one cause or another, the scientific tastes which they may have had in other localities, soon become dissipated, and hence, though there are sundry fragmentary records, there are very few which are of much scientific value.

Occasionally we get a bright exception, as in the work of Dr. Borius, *Recherches sur la Climat du Sénégal*, which was fully reviewed in Vol. X. of this Magazine, pages 17 to 22.

We have the pleasure of noticing a similar, but smaller, work on the present occasion, epitomising a most careful series of observations made by Herr Soyaux during the year 1880.

The station is almost exactly on the Equator, 0°25' N., and 9°35' E.,

* Die Ergebnisse der meteorologischen Beobachtungen des Herrn Hermann Soyaux in Ssibange-Farm am Awandu (Munda), Gabun, Westafrika, während des Jahres, 1880. Von Dr. A. Von Danckleman.

about five miles E.N.E. of the town of Gaboon, and about 300 feet above sea level. The surrounding country is primitive forest, with many streams, rivers, and mangrove swamps. The thermometers were in a lattice-work box on a high post over grass. All the thermometers had been compared with standards, and were also compared during the year. The rain gauge had its receiving surface 5 ft. 9 in. above the ground.

The regular observation hours were 7 a.m., 2 p.m., and 9 p.m., but twice a month observations were made every hour, so as to determine the curve of daily temperature, and to be able to deduce true mean values. Observations were also made very nearly every hour throughout November. It appears that for this station the true mean daily temperature within about $0^{\circ}2$ is given by :—

$$\frac{7 \text{ a.m.} + 2 \text{ p.m.} + 2 \times 9 \text{ p.m.}}{4}$$

The following table gives perhaps one of the best sets of values of air temperature for West Africa yet obtained :—

1880.	7h. a.m.	2h. p.m.	9h. p.m.	Mean.	Mean.		Absolute	
					Max.	Min.	Max	Min.
	°	°	°	°	°	°	°	°
January	74.5	85.3	75.9	77.9	86.9	72.1	90.0	69.8
February	74.5	84.7	74.7	77.2	87.4	72.0	92.1	68.5
March	74.8	83.1	75.2	77.2	85.6	72.7	90.3	68.7
April	75.4	84.0	75.2	77.5	86.5	72.9	90.3	70.0
May	74.8	83.1	74.8	77.0	85.5	72.1	89.8	70.0
June	69.6	79.3	71.6	73.0	82.6	68.0	85.3	63.3
July	70.3	77.4	72.0	72.9	80.6	68.7	84.7	64.9
August	71.1	79.2	72.1	73.6	82.4	69.4	86.0	66.7
September	73.0	81.7	74.1	75.7	85.5	71.1	90.0	67.1
October	73.9	81.9	74.8	76.5	84.7	72.1	88.3	68.2
November	73.4	81.1	73.9	75.6	84.2	72.3	90.5	70.3
December	73.2	82.6	74.1	76.1	85.3	72.1	88.0	67.5
Year... ..	73.2	82.0	74.1	75.9	84.7	71.2	92.1	63.3

As might be expected from the description of the locality, the air is excessively damp, the mean elastic force of vapour being 0.795 in., and the mean relative humidity 87.9; and Herr Soyaux says, that “in the morning the mosquito nets over the beds are dripping water, hence rheumatic affections are very frequent.”

The direction and force of the wind was recorded thrice daily at the before-mentioned observation hours, and nearly every hour throughout November. The result shows that usually there is a dead calm from 11 p.m. to 6 a.m., and the direction during the remaining hours is almost wholly due to a slight sea breeze in the afternoon.

The sky is generally cloudy; there were only five clear days in 1880, while there were 179 overcast ones; the mean for the year is about 7.8. Herr Soyaux has diligently taken the direction of cirri, which always come from E.S.E., the paths of cirro strati and cirro cumuli are somewhat more variable, but chiefly from E.

The fall of rain, including collected mist and dew, is given in the following table :—

1880.	Total.	Greatest Fall.	Days	
	in.	Amount.	Date.	Above 0·1 in. Above 1·0 in.
January	6·69	2·55 ...	7	8 ... 3
February	10·68	4·64 ...	28	14 ... 3
March	19·31	4·01 ...	14	22 ... 6
April.....	13·02	2·59 ...	21	16 ... 5
May	2·50	·77 ...	14	10 ... 0
June	1·18	1·14 ...	8	3 ... 1
July	·04	·04 ...	14	1 ... 0
August	1·07	·56 ...	20	8 ... 0
September	4·26	1·52 ...	24	8 ... 3
October	7·78	1·65 ...	29	20 ... 2
November	24·36	5·24 ...	25	21 ... 10
December.....	11·78	3·54 ...	18	17 ... 3

Total.. ... 102·67 148 .. 36

The above yearly total seems to be regarded as probably a fair average one. There fell in one hour on February 28th, 1880, 4·46 in.

In bringing this summary to an end, we are sure that we are justified in offering to Dr. Von Danckelman thanks for his able summary of the observations, and still heartier thanks to Herr Soyaux for making them. May someone soon provide him with a barometer, if he will accept the offer, and long may he resist the rheumatism and other disadvantages of the climate, and send to his native country records as accurate as those which we have been discussing.

THE METEOROLOGICAL SOCIETY.

The closing monthly meeting of this Society for the present session was held on Wednesday, June 15th, at the Institution of Civil Engineers; Mr. G. J. Symons, F.R.S. (President), in the Chair. Eleven gentlemen were elected Fellows of the Society, viz. :— F. Crowley, A. M. Davis, Rev. R. Drake, F. H. D. Eyre, W. M. Gibson, E. W. Mathew, J.P., D.L., J. Parnell, M.A., F.R.A.S., J. Rigby, T. G. Rylands, F.L.S., F.G.S., H. Smith, and A. H. Wood, C.E.

The following Papers were read :—

(1). The use of Synchronous Meteorological Charts for determining Mean Values over the Ocean, by Charles Harding, F.M.S.

(2). The Climate of Fiji, by R. L. Holmes, F.M.S. This paper gives the results of meteorological observations taken at Delanasau, Bua, Vanua Levu, during the ten years, 1871-80.

(3). Note on the Formation of Hail, by J. A. B. Oliver.

(4). Note on a Comparison of Maximum and Minimum Temperature and Rainfall observed on Table Mountain and at the Royal Observatory, Cape Town, during January and February, 1881, by John G. Gamble, M.A., M. Inst.C.E., F.M.S.

Mr. E. J. Spitta exhibited and described a new mercurial maximum and minimum registering thermometer.

SUPPLEMENTARY TABLE OF RAINFALL IN JUNE, 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 .....	...	XI.	Carno, Tybrite	3·17
„	Margate, Acol	2·41	„	Corwen, Rhug	3·14
„	Littlehampton	2·11	„	Port Madoc	4·62
„	St. Leonards	2·75	„	Douglas	4·75
„	Hailsham	2·52	XII.	Carsphairn	6·54
„	I. of W., St. Lawrence. ...	...	„	Melrose, Abbey Gate ...	3·29
„	Alton, Ashdell	1·92	XIV.	Glasgow, Queen's Park. ...	2·26
III.	Great Missenden	2·80	XV.	Islay, Gruinart School.. ...	...
„	Winslow, Addington ...	1·97	XVI.	Cupar, Kembach	2·32
„	Oxford, Magdalen Col... ..	1·78	„	Aberfeldy H.R.S.	1·55
„	Northampton	1·97	„	Dalnaspidal	4·64
„	Cambridge, Merton Vil. ...	3·25	XVII.	Tomintoul	1·66
IV.	Harlow, Sheering	1·71	„	Keith H.R.S.	2·42
„	Diss	1·45	XVIII.	Forres H.R.S.	1·64
„	Swaffham	1·89	„	Strome Ferry H.R.S.	5·49
„	Hindringham	1·98	„	Lochbroom	2·85
V.	Salisbury, Alderbury ...	2·02	„	Tain, Springfield .....	...
„	Calne, Compton Bassett ...	2·43	„	Loch Shiel, Glenfinnan. ...	10·99
„	Beaminster Vicarage ...	4·47	XIX.	Lairg H.R.S.	2·27
„	Ashburton, Holne Vic.. ...	5·25	„	Altnabreac H.R.S. ....	...
„	Langtree Wick .....	...	„	Watten H.R.S.	2·84
„	Lynmouth, Glenthorne. ...	2·88	XX.	Fermoy, Glenville	5·83
„	St. Austell, Cosgarne ...	4·48	„	Tralee, Castlemorris ...	5·05
„	Ilebrewers, Walrond Pk. ...	...	„	Cahir, Tubrid	4·19
VI.	Bristol, Ashleydown ...	...	„	Tipperary, Henry St....	4·28
„	Ross	2·90	„	Newcastle West	3·30
„	Wem, Sansaw Hall	2·29	„	Kilrush	4·52
„	Cheadle, The Heath Ho. ...	2·40	„	Corofin	5·07
„	Bickenhill Vicarage ...	...	XXI.	Kilkenny, Butler House ...	...
VII.	Melton, Coston	1·81	„	Carlow, Browne's Hill.. ...	4·16
„	Horncastle, Bucknall ...	1·88	„	Kilsallaghan .....	...
VIII.	Macclesfield Park	2·27	„	Navan, Balrath .....	...
„	Walton-on-the-Hill	2·26	„	Athlone, Twyford	4·97
„	Broughton-in-Furness ..	6·09	„	Mullingar, Belvedere ...	4·20
IX.	Wakefield, Stanley Vic. ...	1·48	XXII.	Ballinasloe	4·60
„	Ripon, Mickley	2·49	„	Clifden, Kylemore	11·40
„	Scarborough	1·26	„	Crossmolina, Enniscoe.. ...	4·97
„	Mickleton	2·98	„	Carrick-on-Shannon ...	4·62
X.	Haltwhistle, Unthank.. ...	2·92	XXIII.	Dowra	4·22
„	Shap, Copy Hill	4·70	„	Rockcorry	4·56
XI.	Llanfrechfa Grange	3·40	„	Warrenpoint	5·21
„	Llandovery	2·88	„	Newtownards	3·71
„	Solva	1·98	„	Carnlough .....	...
„	Castle Malgwyn	4·44	„	Bushmills	3·57
„	Rhayader, Nantgwillt.. ...	3·79	„	Buncrana	4·30

JUNE, 1881.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which ·01 or more fell.	TEMPERATURE.				No. of Nights below 32°
		Total Fall.	Differ- ence from average 1870-9	Greatest Fall in 24 hours.		Max.		Min.		In shade. On grass		
				Dpth	Date			Deg.	Date.			
											inches.		in.	Deg.	Date.
I.	Camden Square.....	1·72	—	·95	·58	5	10	82·7	1	37·4	9	...
II.	Maidstone (Hunton Court)...	2·32	+	·25	·81	5	9	...	...	...	...	...
III.	Strathfield Turgiss	1·92	—	·18	·57	6	12	81·7	1	34·7	9	0 1
IV.	Hitchin	1·55	—	·58	·71	5	14	75·0	2	35·0	8	0...
V.	Banbury	2·28	—	·16	1·00	5	16	80·0	1	36·0	9	0...
VI.	Bury St. Edmunds (Culford)...	1·50	—	·77	·54	5	9	81·0	4	33·0	9	0...
VII.	Norwich (Cossey).....	1·66	—	·56	·64	5	12	79·0	2, 4	37·0	14	0 1
VIII.	Bridport	2·88	...	...	·59	5	13	71·0	24	29·0	10	1...
IX.	Barnstaple.....	3·40	—	·68	·79	19	17	82·0	1, 2	38·0	9	0...
X.	Bodmin	5·79	+	2·58	1·02	20	22	75·0	1	40·0	9	0 0
XI.	Cirencester	2·57	+	·08	·95	5	17	...	...	...	...	...
XII.	Church Stretton (Woolstaston)	3·22	+	·35	·55	6	20	75·0	2	38·0	7, 8	0...
XIII.	Tenbury (Orleton)	2·53	—	·21	·35	16	19	79·8	1, 2	32·5	9	0 1
XIV.	Leicester (Town Museum) ...	2·59	...	...	·67	6	16	79·0	1	36·2	7	0 3
XV.	Boston	2·14	—	·11	·64	5	13	85·0	3	37·0	10	0...
XVI.	Grimsby (Killingholme)	1·17	—	1·20	·27	16	16	75·0	2	39·0	8	0...
XVII.	Mansfield	2·00	—	·77	·32	16	15	78·1	1	38·0	9	0 0
XVIII.	Manchester (Ardwick).....	1·74	—	1·42	·34	25	14	81·0	2	39·0	9	0 0
XIX.	Wetherby (Ribstone)	1·43	—	1·44	·29	20	8	...	...	...	...	...
XX.	Skipton (Arnccliffe)	4·77	+	·95	·89	16	18	83·0	1, 2	34·0	9	0...
XXI.	North Shields	1·41	—	·62	·29	16	16	...	...	...	...	...
XXII.	Borrowdale (Seathwaite).....	16·38	+	8·57	4·99	30	20	...	...	...	...	...
XXIII.	Cardiff (Ely) ..	...	...	...	...	...	...	...	...	...	...	...
XXIV.	Haverfordwest	4·29	+	1·26	·65	4	15	77·0	2	36·6	8	0 2
XXV.	Aberystwith Goginan .....	...	...	...	...	...	...	...	...	...	...	...
XXVI.	Llandudno.....	2·99	+	·99	·47	6	19	72·9	2	40·4	8	0...
XXVII.	Cargen	4·78	+	1·61	1·09	30	18	77·4	1, 2	39·0	9	0...
XXVIII.	Hawick (Silverbut Hall)...	2·49	—	·02	·65	30	12	...	...	...	...	...
XXIX.	Douglas Castle (Newmains)...	2·99	—	·02	1·00	30	18	...	...	...	...	...
XXX.	Loch Long (Arddaroch) .....	...	...	...	...	...	...	...	...	...	...	...
XXXI.	Kilmory	5·68	+	1·84	·99	30	21	...	...	29·0	8	2...
XXXII.	Mull (Quinish)	6·37	...	...	·81	20	20	...	...	...	...	...
XXXIII.	Loch Leven	4·00	+	1·23	·80	30	13	...	...	...	...	...
XXXIV.	Arbroath	1·96	—	·65	·48	24	13	76·0	2	34·0	8	0...
XXXV.	Braemar	2·45	—	·64	·78	17	20	75·8	1	26·5	10	2 8
XXXVI.	Aberdeen	3·06	...	...	1·10	19	19	75·0	1	32·0	9	1...
XXXVII.	Portree	5·58	+	·76	·85	4	20	...	...	...	...	...
XXXVIII.	Inverness (Culloden)	1·24	—	1·01	...	...	...	75·2	1	34·8	10	0 2
XXXIX.	Dunrobin	3·30	...	...	·40	30	17	73·8	2	31·0	8	2...
XL.	Sandwick	2·51	+	·71	·39	4	19	68·0	1	37·3	9	0 1
XLI.	Cork (Blackrock)	5·23	+	1·68	·97	20	19	85·0	1, 2	36·0	8	0...
XLII.	Darrynane Abbey.....	...	...	...	...	...	...	...	...	...	...	...
XLIII.	Waterford (Brook Lodge) ...	4·78	...	...	·86	16	21	78·0	2	34·0	8	0...
XLIV.	Killaloe	5·89	...	...	·78	30	20	84·0	2	34·0	9	0...
XLV.	Portarlinton	3·89	+	1·46	·65	20	22	78·5	1	34·0	8	0...
XLVI.	Monkstown .....	...	...	...	...	...	...	...	...	...	...	...
XLVII.	Galway	4·86	+	1·05	1·02	4	21	76·0	1	38·0	9	0 0
XLVIII.	Waringstown	4·11	+	1·45	·56	20	18	85·0	1	35·0	8	0 1
XLIX.	Londonderry...	3·75	...	...	·49	22	22	77·0	1	40·0	8	0 0
L.	Edenfel (Omagh)	3·91	+	·86	·53	4	26	79·0	1	32·0	5	1 0

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

METEOROLOGICAL NOTES ON JUNE.

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

ENGLAND.

STRATHFIELD TURGISS.—The weather of the month was very favourable for agricultural work, and the crops made good progress. Hay crop very light; wheat crop promising. First hay cut on 2nd; wheat in ear on 3rd. Dog rose in flower on 6th; privet in flower on 25th. TS on 6th.

CULFORD.—A very dry month, crops very much in want of rain on this light soil. H and T on 6th; H and S on 9th.

COSSEY.—Hawthorn fully out on 1st; wheat bursting into ear on 7th; hay crop very light, wheat and barley short in straw.

CIRENCESTER.—A genial month, rather cool, except the first three or four days; the refreshing showers which began about the middle of the month were very beneficial to the crops.

ORLETON.—The first four days were very fine and warm, the temp. attaining a max. of 79°·8 on the 1st and 2nd, and 79°·7 on the 3rd. On the 5th, the wind changed to N., and a great fall of temp. occurred accompanied by slight R and a cloudy sky; on the morning of the 9th a frost occurred on the ground, and the weather continued cold till the 12th. The remainder of the month was variable, with a few bright days, but generally a cloudy sky and frequent falls of R. Mean temp. 0°·8 below the average of 20 years; distant T on 6th, 8th, and 22nd.

LEICESTER.—Thunderstorm with R, S, and H at 6 p.m. on 6th. At and in the vicinity of Charnwood Forest the H was about two inches deep.

KILLINGHOLME.—Another dry month, R much wanted for grass land and turnip crop. The country has been very beautiful, the flowers on laburnum, lilac, and hawthorn more abundant than usual. Bar. steady, much haze; T on 15th, 16th, and 22nd.

MANSFIELD.—Thunderstorm at 3.30 p.m. on 22nd.

MANCHESTER.—A month of broken weather, sometimes genial and warm, at others cold and chilly, but altogether rather favourable agriculturally.

ARNcliffe.—So dark from 9.40 to 11 a.m. on 16th that in the house one could scarcely see to read.

NORTH SHIELDS.—Thunderstorms on 6th, 16th, 18th, and 21st.

SEATHWAITE.—Rainfall in 24 hours twice exceeded 4 in.: 4.50 in. falling on the 4th, and 4.99 in. on the 30th. H on 7th; S and T on 8th.

WALES.

HAVERFORDWEST.—The fine warm genial weather of May continued till the 3rd of June, after which a great fall of temp occurred, accompanied by R; the weather remained cold with frequent R; very bad for haymaking; towards the end of the month it became warmer, and there were many fine pleasant days with occasional falls of R at night.

LLANDUDNO.—A showery month, the rainfall being 34 per cent. above the average, yet not in excess of the requirements of the crops; a cold wave occurred from the 9th to the 11th inclusive, but notwithstanding this, the mean temp. was only a fraction of a degree below the average. There were 194.4 hours of bright sunshine during the month. S on distant hills on 7th.

SCOTLAND.

CARGEN.—With the exception of the first few days, the month was cold and unsettled, with a rainfall greatly above the average; mean temp. 55°·7, 1°·2 below the average. Turnip crop much injured by the fly; all other crops and pastures exceedingly good. T on 7th, and T and H on 8th.

HAWICK.—A month of fine genial growing weather, and the country never looked more beautiful; not a mavis nor a wren to be seen here.

QUINISH.—The month throughout was very ungenial and cold ; following on the drought of April and May the heavy rains have done much good to crops and pastures.

ABERDEEN.—The weather during the month was showery, but with bright intervals ; H on 7th, T and L between 2 and 3 p.m. on 21st.

PORTREE.—A wet cold month ; heavy H showers frequent.

CULLODEN.—Month generally cold, except on the 1st and 2nd, which were hot, clear, and sunny ; the rain fell in small quantities, and in consequence of the continued prevalence of W. wind the land has become very dry. Cereals promising, potatoes good, turnip crop deficient.

DUNROBIN.—Cold and wet with the exception of a few days at the beginning.

SANDWICK.—The first days of the month were warm, but on the 5th the wind changed to N., and remained in that quarter to the 14th (giving us sleet and H showers, with a smart frost on the night of the 9th) ; from the 15th to the 22nd the wind was mostly south-easterly, with rather higher temp., and during the remainder southerly and westerly, with a considerable improvement in the weather. There was a wind of 40 miles an hour for four hours before noon on the 16th. Vegetation very backward.

IRELAND.

WATERFORD.—Temp. low, except on the first three days ; rainfall above the average of the last five years ; prevailing winds S.S.W. Hay crop generally short. T on 2nd ; H on 5th and 7th. Gales on 17th and 21st.

KILLALOE.—Weather generally sultry and showery during the month ; crops late. The frost which occurred in many parts of the country on the 9th was not felt here.

WARINGSTOWN.—The last week of the month was rather cold and wet, but caused no injury. Vegetation very luxuriant, and all crops promising ; slight frost on grass on night of 8th, doing much damage to potatoes in neighbouring districts, especially on low ground.

LONDONDERRY.—On the whole a very genial month, warm and showery, crops growing rapidly. Wind principally S.W. A very heavy H shower on 7th ; T and L on 20th.

REGULAR OBSERVATIONS UPON THE TOP OF BEN NEVIS.

We have not space upon the present occasion to express fully our views respecting mountain stations, but we should be sorry for this number to go forth without chronicling the laborious undertaking commenced on June 1st by Mr. Clement Wragge, whose station on the Weaver Hills, in Staffordshire, we have already noticed.* Mr. Wragge having left Farley, opened communication with Mr. Buchan respecting the efforts of the Scottish Meteorological Society to establish an observatory at Ben Nevis, and the final result briefly is, that a complete set of instruments is fixed upon the top of Ben Nevis, the highest point in the British Isles, 4,406 feet above sea level. Mr. Wragge has gone into residence at Fort William, and has commenced the somewhat alarming task of rising between 4 and 5 a.m., and after making a low level observation, climbing to the summit in readiness for observations at 9, 9.30, and 10 a.m. *every day*. If this be not devotion to Meteorology, we should rather like to know to what that term should be applied.

* *Meteorological Magazine*, Vol. xv., p. 98 (August, 1880).