as it was dusk, the star-like object was seen to be accompanied by a great train of light turned towards the east, and estimated by Tycho to be 22° in length; the head of the comet he judged to be 7′ in diameter. Generally he describes the head as round, bright, and of a yellowish light; the tail appeared to be burning or formed of red rays, brighter and more deeply coloured near the head; it was also curved, the convexity on the side of the zenith. Tycho's observations with instruments terminated on January 12, 1578, but he saw the comet for the last time on January 26, and estimated its place with respect to neighbouring stars.

The orbit of the comet of 1577 was calculated by Halley, but in 1844 a new reduction of Tycho's observations with modern star-positions was made by Dr. Woldstedt, who investigated the most probable resulting elements, in an inaugural dissertation at the University of Helsingfors.

The definitive orbit is as follows:—

Perihelion passage 1577, October 26·9476 G.M.T.

	° ′	
Longitude of perihelion	129 42·0	1578·0
,, ascending node	25 20·4	
Inclination	75 9·7	
Perihelion distance	0·1775	

Motion—retrograde.

On November 1 when the comet was first seen in Peru, its right ascension would be 230°, with 29° south declination, distance from the earth 0·75, and from the sun 0·28, so that the intensity of light, as represented by the usual formula, would be 21·8. On the first day of observation in Europe, November 10, at 6h. G.M.T., its R.A. was 266° 19, Decl. – 19° 39′, distance from the earth 0·63, and from the sun 0·53, and hence the intensity of light was 9·1. On November 13, when Tycho detected the comet, the sun set at Uraniburg at 3h. 41m. mean time, and calculating for this time from the above elements, we find the R.A. was 276° 55′, Decl. – 14° 19′; the comet was distant from the earth 0·647, and from the sun 0·604, and the corresponding intensity of light 6·6, or only one-third of that when it was discovered in Peru, but it was then within 15° from the sun. Saturn was in about R.A. 281°, with 23° south declination. At the time of Tycho's last observation, or 7h. 30m. P.M. at Uraniburg, the comet was distant from the earth 2·65, and from the sun 2·07, the intensity of light, therefore, only 0·03. A consideration of these figures will amply bear out what we have stated, as to the conspicuous place which the comet of 1577 must claim.

THE SOUTHERN COMET.—A second telegram from Dr. Gould, received by Prof. C. A. F. Peters at Kiel the day after the first one, assigns a *southerly* motion to the great comet, or contrary to that mentioned in the previous one. Both statements may possibly be correct for the times to which they refer, as the case may be similar to that of the great comet of 1843, which sweeping round the sun with a velocity of 350 miles in a second, and almost grazing his surface, passed from ascending to descending node in two and a quarter hours.

METEOROLOGICAL NOTES

IN a "Brief Sketch of the Meteorology of the Bombay Presidency in 1878," Mr. F. Chambers opens a discussion of no little importance regarding certain relations subsisting among the meteorological phenomena of India. In that year the rainfall nearly everywhere throughout the Presidency was in excess of the normal quantity, and remarkably well distributed. No long-continued period of unusually dry weather was experienced in any district from the beginning of July to the end of the mon soon, the year being in this respect strikingly different from 1877 with its drought and terrible famine which followed in its footsteps. From a comparison of the weather phenomena of these two years, it is shown that the abnormal change of barometric pressure in July, 1878, as contrasted with July, 1877, was a fall of 0·068 inch, and the rainfall was 107 per cent. of the average fall greater in the latter than in the former month; in other words, the proportionate increase of rainfall corresponding to a fall in the pressure of 0·100 inch, was nearly 16 per cent. of the average fall. It is evident that if the extension of this inquiry to past and future years and to the whole of India, should confirm this important relation between the atmospheric pressure and the rainfall over their extensive region, or establish similar relations, the discovery will be of the utmost value in assisting towards the formation of forecasts of the probable character of coming monsoons.

IN the same report, Mr. Chambers extends this discussion over a much wider area than that of India, and from a comparison of the atmospheric pressure and rainfall of the Presidency with those at Zi-ka-wei, Manila, Batavia, and Mauritius, arrives at results which, though necessarily provisional in their character, are of the highest importance in the investigation of the great movements of the atmosphere. The general conclusion is that the special function performed by the central area of low barometric pressure in Asia during the summer months is merely that of a distributor of the monsoon vapour by the production of the successive "bursts" and "breaks" of the rainy season; but that the copiousness or scantiness of the vapour, and consequently of the rainfall, depends chiefly on the meteorological conditions previously existing in the Indian Ocean, the source whence the moisture and rainfall are drawn. The supreme value to meteorologists, in conducting such cosmopolitan inquiries, which attaches to the weather maps of the War Department of the United States, embracing the whole of the Northern Hemisphere, which we are now publishing, is very obvious. Their wide and deep significance will begin to be better seen on comparing the maps for May, 1878, about to appear in an early number of NATURE, with those for April, which have already appeared (NATURE, vol. xxi. p. 304). The shifting positions of the areas of high and low atmospheric pressure, with the consequent or accompanying changes of temperature, will throw much light on the changes of weather which occurred in the different regions of the Northern Hemisphere, and their rainfall; and the maps of subsequent months will go far in the elucidation of such large questions as the rainfall of India during the monsoon season of 1878, and the exceptional weather we have had in these islands for the past fifteen months.

ONE of the most conspicuous services that could be made to science by a simple catalogue of phenomena has just been rendered by Dr. Rubenson, director of the Central Meteorological Institute of Sweden. The work, which appears in the *Transactions* of the Royal Academy of Sciences of Sweden, is the first part of a catalogue of all the auroras observed in Sweden down to 1877. This part includes those which were observed and recorded from 1536 to 1799. The more special value of the catalogue, in addition to the length of time over which it spreads, consists in the circumstance that it is restricted to a well-defined portion of the earth's surface but of sufficient extent to afford results showing a generally close correspondence to the number of auroras which actually occurred over that part of the globe. The observations in the earlier years are fragmentary and scanty, but from 1722 the catalogue may be regarded as tolerably complete. From 1722 to 1799 auroras are recorded as having been seen on 4,245 nights. These years embrace fully seven sun-spot periods. Arranging the number of days each year on which the aurora was noted, according to the sun-spot periods, we obtain the following highly important results for the eleven years period of sun-spots: 30, 54, 63, 68, 78, 67, 62, 56, 55, 50, and 42. Hence the maximum occurred on the fifth year, there being thus three years from the minimum to the maximum, but six years from the maximum to the minimum. The following figures distribute these 4,245 auroras, in percentages, through the months of the year:—January, 9·7; February, 11·2; March, 13·8; April, 8·7; May, 1·8; June, 0·1; July, 0·5; August, 5·5; September, 13·7; October, 14·6; November, 10·4; and December, 10·0. The most rapid increase takes place on August 28, and the most rapid decrease on April 20.

MR. WILLIAM MARRIOTT examines in the *Journal of the Meteorological Society*, for October, two series of thermometric observations made for the twelve months ending with March, 1879, the one series being taken with a Stevenson's screen properly exposed on a grass-plot 17 feet square, and the other series with a pair of wall-screens fastened to the brick wall of an outhouse with a northern aspect. The results show that the mean of the daily maxima for the year was 1°·0 lower in the wall-screen than in Stevenson's screen, but the mean of the daily minima was 0°·5 higher. The mean temperature by the wall-screen being thus only a quarter of a degree less than that by Stevenson's screen, it is concluded that the mean temperature may be roughly ascertained from thermometers shaded by a wall with a northern aspect. It is to be noted, however, that while Stevenson's screens placed over grass plots well exposed to the sun give results comparable with each other, wall-screens give results which are not comparable, *inter se*, it being perhaps impossible to find two wall-screens in positions tolerably comparable. But it is in investigating the daily range and sudden changes of temperature, the humidity of the air, and others of the prime factors of climate that wall-screens as instruments of observation totally break down.

A PAPER of researches on the rainfall of Austria-Hungary has been recently presented to the Vienna Academy by Dr. Hann. His object is, while showing the main features of distribution of rain in the country, to establish a rational method of deduction of results from measurements of rainfall during short intervals of time. In the greater part of Austria-Hungary, he shows that June is the most rainy month; it is so in the whole of Bohemia and Hungary, with Siebenbürgen, in the eastern part of Galicia, and in Bukowina. In Moravia and Silesia nearly the same rain falls in June and August, with an intermediate decrease in July. West Galicia and the Tatra-region show a preponderance of July rain. Southwards from the Upper Dranthal a maximum in October becomes predominant. From about 45° lat. southwards more rain falls in the three winter than in the three summer months. The further south the more pronounced is the distinction of a dry from a wet period. The dryest months in the whole of Austria-Hungary down to 45° (where July is the driest month) are January and February; and especially notable is the little rainfall of February at the southern base of the central chain of the Alps.

PHYSICAL NOTES

MEASUREMENTS of the heat conductivity of iron hitherto have given rather discordant results. This must be due, according to Herr G. Kirchhoff and Herr Hansemann, to the fact that in most of them the quantities of heat given out or received from without by the body examined have not been sufficiently taken into account. These physicists have recently described to the Berlin Academy experiments by a method in which a cubical iron mass, after being left to itself a long time, had a strong water-spray directed against one of its side surfaces, the water being some degrees hotter (or colder) than the place of observation. At several points back from the heated surface vertical passages were made, each to receive one junction of a thermopile of thin German silver and copper wire, the other junction being at constant temperature. An observer, with the aid of a chronograph, marked the point of time at which certain divisions of the scale of the (mirror) galvanometer passed the vertical wire of the telescope, at the same time dictating their number to an assistant. Referring to the memoir for further details, we note the conclusion arrived at, viz., that the heat-conductivity of iron divided by the product of its specific heat and its density, at the temperature $\theta = 16{\cdot}94 - 0{\cdot}034\ (\theta - 15)$, when the temperature is measured in centigrade degrees, and the units of time and length are seconds and millimetres. With this result, that of H. Weber agrees best; he obtained the number 16·97 for 39° C. The results of F. Neumann, Ångström, and Forbes, on the other hand, are more divergent. (The substance used in the experiments here described was Dortmund puddled steel, containing 0·129 per cent. carbon and 0·080 silicium.)

HERR E. WIEDEMANN has recently made further experiments on the phosphorescent or fluorescent light produced by electric discharges (*Wied. Ann.*, No. 1). Nearly all platino-cyanide double salts show fluorescence under the discharge; but, so long as they were undecomposed, no double fluorescence was observed. When platino-barium cyanide had been traversed by a single discharge, the strong green fluorescent light showed no dichroism, but, after a series of discharges, dichroism appeared. It also occurred when the crystals of that or other platino-cyanide double salts were left a long time *in vacuo* (without electric discharge), whereby they lost water; and the more rapid appearance of dichroism under the electric discharges is attributed to heating of the crystals. Herr Wiedemann opposes Mr. Crookes's view, offering the following proof of its incorrectness:—If the positive current of a Holtz machine be sent through a very thick-walled discharge-tube, and the discharges be made to follow one another in such a rhythm that they are deflected from their course in the tube by the finger, only a weak phosphorescent light appears on the inner side of the tube, but a very bright green light appears on the *outer* side. The non-observation of this before is probably due to the thinness of the tubes commonly used. In narrow, and especially capillary tubes, too, only the inner wall becomes luminous.

WE take the following from the *New York Nation*:—"It is impossible for the unaided ear to determine with certainty the direction of a distant sound, especially when the atmosphere is foggy; hence the great utility to navigators of the instrument which its inventor, Prof. Alfred M. Mayer, of the Stevens Institute, has felicitously named the 'topophone,' or sound-placer. It consists of 'a vertical rod passing through the roof of the deck-cabin,' and bearing on the upper end 'a horizontal bar carrying two adjustable resonators,' below which a pointer is set at right angles with the bar. Rubber tubes from the resonators pass through the roof of the cabin and unite in a single pipe connected with a pair of ear-tubes. The vertical rod is turned by means of a handle in any direction. The first step is to tune the resonators accurately to the pitch of the sound under observation, and fix them 'at a distance from each other somewhat less than the length of the wave of that sound;' the next, by turning the handle, to bring them simultaneously on the wave-surface, when, as 'they both receive, at the same instant, the same phase of vibration on the planes of their mouths,' it will result that if the connecting tubes be of the same length, the sound-pulses, acting together, will be reinforced to the ear, but if the tubes differ in length by one-half the wave-length of the sound, the pulses will oppose and neutralise each other, and thus tend to produce silence. At this moment the horizontal bar is a chord in the spherical wave-surface of which say the fog-horn is the centre; and the pointer represents a radius, 'or, in other words, coincides in alignment with a line drawn from the place where the sound is produced through the place of observation.' By sailing the ship a measured distance 'at an observed angle from the radius line thus found, a second radius line may in like manner be found,' and 'the distance between the two points of observation is the base-line of a triangle, of which the two convergent radii are the sides.' From these data the distance of the fog-horn is readily computed."

GEOGRAPHICAL NOTES

THE *Vega* reached Naples at 1.30 P.M. on Saturday, the 14th. Prof. Nordenskjöld and his staff received a warm reception from representatives of the Italian and Swedish Governments. Prof. Nordenskjöld has been made Grand Officer, and Lieut. Palander Commander of the Order of the Crown of Italy. On Monday the explorers were entertained at a grand banquet. The French Institute will hold its annual meeting on March 1, under the presidency of M. Daubrée, who will deliver an inaugural address, the subject being Prof. Nordenskjöld's expedition. It is expected that the professor will land in France on that day. He will stop at Marseilles and Lyons, where he will be received by the local geographical societies and authorities. The Paris Geographical Society will send a delegation to Marseilles. Prof. Nordenskjöld will receive the gold medal of the Society at Paris, in the large hall of the Sorbonne. The several learned societies of Paris will send delegations to witness this ceremony, which will be followed by a grand banquet on the succeeding day. It is expected that Prof. Nordenskjöld will reach London in about a month's time, but his present intention is not to give a public address. He does not feel himself sufficiently master of English for this purpose, and, moreover, as might he surmised, he has an aversion to "starring." The botanists and zoologists of the expedition will go overland, visiting all the museums with Arctic collections, and will rejoin the *Vega* at Copenhagen.

AT the last promotion of the Legion of Honour M. Levasseur, vice-president of the Paris Geographical Society, was appointed to the grade of officer for his geographical and statistical works. M. Levasseur is the editor of the statistical department of the *Annuaire* of the Bureau des Longitudes, which has been so much enlarged recently.

THE French Chambers, at the instigation of M. de Freycinet, have voted a sum of 600,000 fr. for the cost of sending exploring missions into the remoter parts of Algiers and Senegal, and penetrating into the Sahara of the Western Soudan. Their immediate object is to trace the lines of future railways, but the indirect influence on the extension of our geographical knowledge is most important. Three scientific expeditions are being organised in Algiers; one is to operate in the Algerian Sahara, and will not pass El Golea; a second, comprising a corps of