is crackling as if under an increasing strain; these indications continue for uncertain periods, but they have been distinctly noticeable before the last few earthquakes. It would seem that the power of resistance of the earth before any surface movement is felt is very great, but, at last, like a bending stick, it suddenly breaks, and the jar gives the vibrations which we call an earthquake. If these 'crackles' can be detected we shall then have the means of approximately foretelling when the consequent crash is at hand. The observations of these 'crackles' which, so far as I am aware, have hitherto been studiously avoided or else unfortunately neglected, would also tell us something definite about periodicity. From my observations I feel certain that there are many small earthquakes which ordinary instruments pass by unnoticed. The consequence is that, when we attempt to correlate earth motions with those of, say, for instance, the moon, we do not find the accordance we should expect; the attraction of the moon has not been sufficiently great to overcome the elasticity of the earth's crust, and to cause shocks great enough to be recorded upon the usual instruments. If, however, instruments still more delicate are used, we shall find little earthquakes, or what I prefer to call earth tremors recorded in those places where we have been unsuccessfully looking for big ones. We shall, in fact, detect the little straws which are being piled up in regular order and which will eventually break the camel's back."

IN his just published report H.M.'s Consul at Yokohama states that the experiment made during the two previous years of manufacturing black teas for the English market has been attended with such disappointing results to all concerned that the industry is not likely to be persevered in for the future.

THE Birmingham Philosophical Society, at a meeting on February 12, did themselves the honour of electing Mr. Charles Darwin an honorary member and presenting him with an address on the occasion of his seventy-first birthday, the day of meeting.

CAPT. OLIVER desires us to state that in his letter in NATURE, vol. xxi. p. 348, he wrote by mistake, in referring to Halley's work, *official* for *optical*.

WE have on our table the following books:—"A Rule of Proportion," Dr. John Marshall (Smith, Elder); "Anatomy for Artists," Dr. John Marshall (Smith, Elder); "Der Realismus der modernen Naturwissenschaft," Dr. Anton von Leclair (Williams and Norgate); "Wave and Vortex Motion," Thomas Craig (van Nostrand); "Scotch Live Stock," James Bruce, (Edmonston and Co.); "Géologie Expérimentale," A. Daubrée; "Primer of the Industrial Geography of Great Britain and Ireland," G. P. Bevan (Sonnenschein and Allen); "Nile Gleanings," Villiers Stuart (John Murray); "Memoirs of Dr. P. P. Carpenter," Russell L. Carpenter (C. Kegan Paul); "Rural Bird Life," Charles Dixon (Longmans); "Hot Air," Richard Metcalf; "Ceylon Coffee Planters' Association," John Hughes; "Lethæa Geognostica," F. Roemer (E. Koch); "Biological Atlas," D. and A. N. M'Alpine (W. and A. K. Johnston); "Physical Geography," E. W. Lewis (Moffatt and Paige); "The Unity of Matter," A. S. Wilson (Samuel Highley); "The Art of Perfumery," G. W. S. Piesse (Longmans); "Who are the Irish?" James Bonwick (Bogue); "Das Protoplasma," Dr. Johannes v. Haustein (Carl Winter); "The Spectroscope in Medicine," C. A. McMunn (Churchill); "Zoology," A. S. Packard (H. Holt and Co.); "The Comstock Lode, its Formation and History," J. A. Church (J. Wiley and Son); "Handbuch der Botanik," Dr. N. J. C. Müller (Carl Winter); "River of Golden Sand," 2 vols., Capt. Gill (John Murray); "Chapters from the Physical History of the Earth," A. Nicols (Kegan Paul); "Medicinal Plants," parts 38, 39, 40, and 41, Robert Bentley and H. Trimen (Churchill); "Lange's History of Materialism," vol. 2, E. C. Thomas (Trübner); "Linkages," J. D. C. de Roos (van Nostrand); "Theory of Solid and Braced Elastic Arches," William Cain (van Nostrand); "On the Motion of Solid in a Fluid," Thomas Craig (van Nostrand); "Lucernariæ and their Allies," H. J. Clark (Washington).

THE additions to the Zoological Society's Gardens during the past week include a White-fronted Lemur (*Lemur albifrons*) from Madagascar, presented by Mr. W. C. Gordon; a Macaque Monkey (*Macacus cynomolgus*), a Rhesus Monkey (*Macacus erythræus*) from India, presented by Mr. J. Snowden Henry, F.Z.S.; two Hawk-headed Caiques (*Deroptyus accipitrinus*) from Brazil, presented by Mr. Chas. Frieke; a Spur-winged Goose (*Plectropterus gambensis*) from West Africa, presented by Mr. R. B. Dobree; a Peregrine Falcon (*Falco peregrinus*) from Newfoundland, presented by Mr. F. R. Haynes; a Robben Island Snake (*Coronella phocarum*) from South Africa, presented by Mr. W. Porter; a Bewick's Swan (*Cygnus bewicki*), North European, two Sharp-nosed Crocodiles (*Crocodilus acutus*) from Jamaica, deposited; a Serval (*Felis serval*) from West Africa, purchased.

## OUR ASTRONOMICAL COLUMN

THE COMET OF 1577.—For more reasons than one the comet which was observed at the end of 1577 and beginning of 1578 deserves prominent mention in the history of these bodies. It must have been the brightest comet of the sixteenth century, visible even in full sunshine, as we know from the testimony of Tycho Brahe, and it was from his careful observations of it, made at a critical time in the discussion as to the nature and distance of comets, that he proved it to have a much smaller parallax than the moon, and hence to be situated far beyond our satellite. Tycho's observations formed part of a work which, though it appears to have been completed so far as it referred to the comet in 1588, and copies distributed by Tycho to his friends in that year, was not published in the full sense of the term until 1603, when it was brought out at Prague after his death, under the care of his son-in-law. The work is entitled "Tychonis Brahe, Dani, De mundi ætheri recentioribus phænomenis liber secundus, qui est de illustri stella caudatâ anno 1577 conspectâ." In 1648 it was reprinted at Frankfort in the collective edition of Tycho's works. Pingré refers to the inaccuracy with which the observations of the comet were given in this edition, which served him for his *Cometographie*, but he thought he had discovered and corrected all the errors in his transcript of the observations for that work (vol. i. pp. 513–16).

The comet was seen in Peru as early as November 1, according to an historical work composed in 1589 by the Jesuit Joseph de Acosta, and about the same time, perhaps a day later, in Japan, as we learn from Kaempfer. It was seen in various parts of Europe on November 10, 11, and 12, and on November 13 Tycho observed it for the first time at Uraniburg, his observatory in the island of Huen. His experiences with regard to the comet are detailed in the work we have referred to. He thus describes his discovery of it: "Having gone out some time before sun-set, and while waiting supper, to amuse myself with witnessing the taking of fish from one of my ponds, I occupied myself while the net was being drawn, in surveying the western part of the sky, to see if the purity of the air promised for that night my usual pleasure of observing the stars. As I was least expecting it, I perceived in that direction a certain bright star, which appeared as distinct as Venus, when near to the earth and when seen before sunset or after sunrise. For the rays or *chevelure* of the star could not yet be perceived, the sun, still above the horizon, entirely obliterating the feeble brightness of its rays." Tycho then describes how he was astonished at the visibility of an unknown object of such brightness as to strike the eye while it was yet daylight; he was sure that there was no planet in that quarter of the sky excepting Saturn, which could not be seen in sunshine, and as to the fixed stars, he knew they were none of them visible under such circumstances. He asked those about him whether they saw an object in the direction he pointed out, and they replied it was perfectly distinct, and must be Venus because no other planet could be so conspicuous in daylight. Tycho, however, assured his friends that Venus was not in that part of the sky, and said it would be found as it grew darker that "aliquid insoliti admirandique" was there shining. Accordingly, as soon

© 1880 Nature Publishing Group

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 monsoon, 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

© 1880 Nature Publishing Group