ture of the cooled liquid its phosphorescence diminished, until at −65° it entirely disappeared. The portion of the tube above the alcohol continued to phosphoresce strongly. After thirty minutes' immersion in the cooled alcohol, the tube was removed, and as it gradually acquired the temperature of the air, the lower portion began to glow. Before the glow—blue, green, or orange in colour, depending on the nature of the metallic sulphide—entirely disappeared, the colour became a faint yellow. It was found by comparative experiments that the alcohol exerted no specific influence on the results. These seemed to be entirely dependent upon the diminution or total cessation of molecular vibrations at the low temperature.

AN interesting paper on the Sicilian earthquakes of last August has recently been published by Dr. Mario Baratta (*Boll. della Soc. Geogr. Ital.*, Ott., 1894). The first shock of the series was felt on July 29 at Randazzo, and was succeeded by several other slight shocks, mostly in the Lipari Islands. Then came the severe earthquake of August 7 at 12h. 58m. p.m., and the still stronger one of August 8 at 5h. 16m. a.m. (Greenwich mean time). These affected chiefly the south-eastern slope of Etna, and were followed by more than twenty shocks in the same district, lasting until August 26. The meizoseismal area of the principal earthquake (August 8) is only about 7 km. long and 3 to 4 km. broad, and, as the intensity diminished rapidly outwards, it would seem that the focus cannot have been far from the surface. Moreover, the longer axis of this area runs north-west and south-east, and, when produced, passes through the central crater of Etna. It therefore probably coincides with a radial fissure of the cone, and indeed is not far, if at all, distant from that along which the eruption of 1329 took place. The pressure exerted by the column of lava in the central funnel, or by the forces which have raised it to its present height, may have caused such a fracture to be reopened. Thus, it is not impossible that the recent earthquakes indicate an unsuccessful attempt at a new lateral eruption.

FURTHER details relating to the same earthquakes are given in the *Bollettino Meteorico* (Suppl. 110) of the Geodynamic Office of Rome. The depth of the focus of the principal earthquake, according to Prof. Riccò, was about 4 km. The pulsations were recorded at Rome by the great seismograph, consisting of a pendulum 16 metres long, with a mass of 200 kg.; the first traces at 5h. 17m. 30s., and the principal maximum at 5h. 18m. 55s. The puteometer of the Observatory of Catania shows a trace about 21½ mm. long, indicating a temporary lowering of the well-water, which, in returning, stopped about 4 mm. below its original level.

THE additions to the Zoological Society's Gardens during the past week include a Yellow Baboon (*Cynocephalus babouin*, ♀) from Fort Salisbury, South Africa, presented by General Owen Williams; two Grisons (*Galictis vittata*) from Brazil, presented by Mr. H. A. Catlett; a Song Thrush (*Turdus musicus*), a Goldfinch (*Carduelis elegans*), British, presented by Mr. B. M. Smith; a Grenadier Weaver Bird (*Euplectes oryx*, ♂) from West Africa, presented by Lady McKenna; a Wild Cat (*Felis catus*) from Scotland, deposited; five Shore Larks (*Otocorys alpestris*), British, purchased.

OUR ASTRONOMICAL COLUMN.

ADVANCES IN LUNAR PHOTOGRAPHY.—MM. Lœwy and Puiseux recently communicated to the Paris Academy a paper on photographs of the moon, taken at the Paris Observatory, by means of the great Condé equatorial. Some of the photographs have been enlarged by Dr. Weinek, and the enlargements seem to have excelled in beauty and detail previous lunar pictures of a similar kind. An examination of the photographs shows that not only can they be used to verify the general features of the moon's surface, as depicted upon the most recent and complete lunar maps, but they also show a number of details and small craters which so far have been omitted from such maps. There are, of course, a number of causes which prevent a single photograph from being an ideal representation of a celestial object, and enlargements are usually regarded with a certain amount of suspicion, for there is always a possibility that interesting formations will be unconsciously manufactured in the process. MM. Lœwy and Puiseux know this as well as anyone; nevertheless, they find that the enlargements undoubtedly reveal new features, and definitely determine the existence of several contested objects. They think an instrument of long focus is essential for the best results, and that the enlargements should not be carried beyond twenty or thirty diameters. One object upon which the photographs have thrown light is the small isolated crater Linné, situated in the middle of the Sea of Serenity. According to Shroeter, Beer, Maedler, Lohrmann, and other selenographers, this crater was distinctly visible up to 1866, when Schmidt announced its disappearance. It was afterwards discovered again, but was much smaller than when described and figured by Beer and Maedler. Dr. Weinek finds that the object appears upon a plate taken on March 14, but only one kilometre in diameter—that is, about one-tenth the value assigned to it by the earlier observers. The crater has also been found on other plates, and Sig. Schiaparelli has testified to its reality. Four new objects—three craters, and the fourth an isolated elevation of some kind—have been found in the plain which extends to the south of Ariadaeus, between the bright crater-plain Cayley and the Silberschlag crater. Ten new craters can be detected in the typical walled plain Albategnius. All the rills observed to the west of Triesnecker can be seen to extend beyond the limits previously assigned to them, and to connect Ariadaeus, Hyginus, and Triesnecker with interlacing clefts. Judging from these results, we cannot but conclude that the photographs represent real advances in lunar photography.

COMETARY EPHEMERIDES.—The following ephemeris for Encke's comet is in continuation of that given on November 22, and is due to Dr. O Backlund. M. Schulhof's ephemeris, in the *Astronomische Nachrichten*, No. 3267, is used for Swift's comet:—

	Encke's Comet. *Ephemeris for Berlin Midnight.*		Swift's Comet. *Ephemeris for Paris Midnight.*	
1894.	R.A. (app.)	Decl. (app.)	R.A. (app.)	Decl. (app.)
	h. m. s.	° ′ ″	h. m. s.	° ′ ″
Dec. 28	22 14 57	+3 35 18	0 3 23	−0 20 22
30	14 27	3 19 58	0 8 33	0 17 53
Jan. 1	13 52	3 3 38	0 13 41	+0 53 45
3	13 9	2 45 51	18 46	1 33 10
5	12 16	2 26 7	23 49	2 10 9
7	11 8	2 3 47	28 51	2 46 41
9	9 42	1 38 1	33 50	3 22 44
11	7 52	1 7 53	38 48	3 58 19
13	5 31	+0 32 10	43 43	4 33 24
15	2 32	−0 10 34	48 37	5 8 0
17	21 58 47	1 2 10	53 29	5 42 5
19	54 3	2 4 42	58 19	6 15 42
21	48 10	3 20 29	13 8	6 48 48
23	40 57	4 51 53	7 55	7 21 24
25	32 13	6 40 45	12 41	7 53 29
27	21 57	−8 47 28	17 26	8 25 4

It will be seen from these ephemerides that the two comets are in the same region of the sky, both being a few degrees south of Pegasus. Observations of the comets are greatly needed.

RUSSIAN ASTRONOMICAL OBSERVATIONS.—The latest *Bulletin* (vol. xxxv. No. 4) of the Imperial Academy of Sciences at St. Petersburg is almost entirely devoted to astronomical papers. E. Lindemann contributes a discussion of the visual and photographic magnitudes of Nova Aurigæ, and gives a light-curve extending from December 10, 1891, to April 13, 1892. N. Nyren discusses the observations made at Pulkova with the vertical circle, between 1882 and 1891, from the point of view of variations of latitude. The curves derived from the observations indicate that the interval between two maxima is 433 days, and between two minima, 434 days. As to the amplitude of the variation, though no definitive result is stated, the value of the radius of the circle described by the instantaneous pole appears to be 0″·145, and the direction of

motion from west to east. Another paper on the same subject is contributed to the *Bulletin* by S. Kostinsky. In this case, the observations discussed were made with the great meridian instrument of the Pulkova Observatory, mounted in the prime vertical. The period obtained was 411 days, and the amplitude 0″·541. In addition to these papers, there is one on the orbits of Bielid meteors, deduced by M. Bredichin from observations made in 1892.

ON A REMARKABLE EARTHQUAKE DISTURBANCE OBSERVED AT STRASSBURG, NICOLAIEW, AND BIRMINGHAM, ON JUNE 3, 1893.

INTRODUCTORY NOTE.

THE Horizontal Pendulum.—The observations described in the subjoined article were made with the horizontal pendulum designed by Prof. Zöllner, and modified by Dr. von Rebeur-Paschwitz. This instrument consists of three thin brass tubes jointed together in the form of an isosceles triangle, the vertical angle of which is about 45°. The two equal sides are prolonged slightly beyond the base, and to the ends are attached two small spherical agate cups, the concavity of the lower one being directed from the centre of gravity of the pendulum, and that of the upper one towards it. When the pendulum is placed in position, these cups rest on two steel-points attached to the stand of the instrument and directed normally to the surfaces of the agate cups. One steel-point is almost exactly above the other, so that the axis of rotation is nearly, but not quite, vertical, its inclination to the vertical being still great compared with the movements of the ground we wish to investigate. The pendulum rests in the vertical plane passing through the axis of rotation, and on the side towards which it inclines. If this is towards the east, and if the axis is slightly tilted in the east and west plane, there will be no deflection of the pendulum; the only change will be in its sensitiveness. But if the axis is tilted in any other plane, it will no longer incline towards the east, and the pendulum will be deflected from its original position, in order to remain in the same vertical plane with the axis of rotation. It is evident that the smaller the original inclination of the axis to the vertical, the greater will be the deflection for a given tilt of the axis in the north and south plane; that is, the greater will be the sensitiveness of the pendulum.

From the middle of the nearly vertical tube of the pendulum, there projects outwards a small bar. Passing through an aperture in the frame to which the steel-points are attached, this bar carries a mirror, whose plane is at right angles to that of the pendulum. A ray of light, proceeding from a fixed source, is reflected by the mirror, and registers the movements of the pendulum on a strip of photographic paper wrapped round a revolving drum. The zero-line is traced by a ray of light reflected by a fixed mirror just below the other, and attached to the stand of the instrument.[1]

Observation of Earthquake Pulsations.—Nothing could show better than Dr. von Rebeur-Paschwitz's interesting paper how desirable it would be to have a few well-chosen stations in different parts of the world where these pulsations could be registered. They might then be traced as they spread out from the origin of a great earthquake, and might even be followed, as he suggests, in their course, completely round the world.

In several Italian observatories there are established instruments suitable for this purpose. Horizontal pendulums, with recording apparatus, are now at work at Charkow and Nicolaiew in the south of Russia; and two others will soon be ready at Strassburg and Merseburg in Germany. A bifilar pendulum[2] at Birmingham, belonging to the British Association, will shortly be furnished with a photographic recorder. Thus Europe is at present fairly well provided for.

A large number of stations in other parts of the world is by no means absolutely necessary. Results of great value would be derived if recording instruments were erected at places near the east and west coasts of North America, in South America, South Africa, India, Australia or New Zealand, and the Sandwich Islands. In Japan Prof. Milne's tromometer[1] leaves little to be desired.

The chief element to be determined is the exact epoch of the beginning, maximum amplitude, and end of the pulsations, or of each group of pulsations. The horizontal pendulum, Dr. von Rebeur-Paschwitz informs me, can be arranged so that its sensitiveness for slow tilts of the ground can be diminished without necessarily lessening its sensitiveness for earthquake shocks. The strip of photographic paper can thus be reduced in width without running any risk of the spot of light leaving the paper during its ordinary daily and other movements. Without increasing the expense, a more rapid movement of the paper could be permitted, and this would enable the determination of the time to be made with greater accuracy. Possibly, also, the construction of the instruments might be simplified if earthquake-pulsations are to be the principal subject of investigation. In the bifilar pendulum, for example, since the amplitude of the oscillations is a point of minor importance, the somewhat elaborate machinery for determining the angular value of the scale divisions might be dispensed with, and also the arrangements for readjusting the spot of light from a distance.

Hardly less important in these investigations is the determination of the exact time of occurrence of the earthquake at or near its centre of disturbance. But on this it is the less necessary to insist, for in so many of the more marked seismic districts there now exist organisations for the study of earthquakes. It may not be out of place, however, to suggest that in all seismic records, and in every part if periodically published, the standard time employed should be clearly stated. It is not universally known, for instance, that, in Japan, Tokio time was replaced on January 1, 1888, by the time of 135° E. long. In accounts from Beluchistan, again, we cannot be certain whether Madras time or railway time is meant, for both are used. The trouble of inserting this important detail is hardly to be compared with the confusion and error that may result from its omission.

C. DAVISON.

IN the last report of the Earth Tremor Committee of the British Association, reference is made to an observation of earth-pulsations by Mr. C. Davison on the evening of June 3, 1893, at Birmingham, which was obtained by the aid of Mr. H. Darwin's bifilar pendulum. I take the following details from the report:—At 5.43 p.m. (G.M.T.) the image was found to be perfectly steady, but at 6.29, when the observer returned to the cellar, it was moving slowly and steadily from side to side of the field of view, thus indicating the passage of a system of earth-waves. At 6.42 the image had come to rest, but at 6.46 the oscillations commenced again, and continued to be visible with varying amplitude until 8.13. After 8.13, though the observer watched for two hours and a half, no further motion was noticed. The period of the waves was found by a number of observations to be between fifteen and twenty seconds, and the range of motion at its maximum one-eighth of a second.

Mr. Davison's observation is especially interesting, because it corresponds exactly with a *very extraordinary disturbance* which was registered by the horizontal pendulums at Strassburg and Nicolaiew. Amongst the considerable number of disturbances common to both these places, that of June 3 is certainly the most prominent during the interval from January 1 to September 4, 1893. In the accompanying illustration (Fig. 1) the two curves, obtained by photography, are shown side by side; in correspondence with the difference of longitude between the two places, the lower curve was moved 17·5 mm. to the left. The pendulum in both cases was placed in the east-west plane. In the following notes the time is Greenwich Mean Solar Time, and is given in decimal parts of the hour.

(*a*) *Strassburg.*—The disturbance begins suddenly and small at 4·42, the curve having been perfectly sharp and steady before. The range of motion increases to 4 mm. at 4·52 and decreases at 4·69. It then again increases so as to make the curve disappear entirely between 4·77 and 5·05. During the interval the light-point was displaced by $3\frac{1}{2}$ mm. to the north, which corresponds with a deflection of the pendulum towards the south. At 4·82, the person who keeps control over the instrument entered the cellar, to look after it and to determine the time correction, which is done by shutting off the light during

[1] For a fuller account of the horizontal pendulum, see Dr. von Rebeur-Paschwitz's great memoir, "Das Horizontalpendel" (*Nova Acta der kais. Leop. Carol. Deutschen Akademie der Naturforscher*, Bd. lx. 1892, pp. 1-216); also Brit. Assoc. Rep., 1893, pp. 303-308.

[2] NATURE, (July 12, 1894), vol. 50, pp. 246-249; Brit. Assoc. Rep., 1893, pp. 291-303.

[1] Brit. Assoc. Rep., 1892, pp. 107-109.