THE additions to the Zoological Society's Gardens during the past week include a Lion (*Felis leo*, ♂) from Africa, presented by Mr. Rowland Ward; a Common Squirrel (*Sciurus vulgaris*), British, presented by Mrs. Herbert Morris; a Woodlark (*Alauda arborea*); a Whinchat (*Pratincola rubetra*), British, presented by Mr. J. Young; a Black Tanager (*Tachyphonus melaleucus*) from South America, presented by Madame Caté; a Rhinoceros Hornbill (*Buceros rhinoceros*, ♂) from the Malay Peninsula, deposited; two Black-necked Stilt-Plovers (*Himantopus nigricollis*) from South America, a Long-eared Owl (*Asio otus*), two Common Pheasants (*Phasianus colchicus*, ♀ ♀), British, purchased.

OUR ASTRONOMICAL COLUMN.

CASSEGRAIN AND GREGORIAN REFLECTORS.—For some time past, Prof. Schaeberle, of the Lick Observatory, has been experimenting on the applications of these rather neglected forms of reflecting telescopes with the special view of applying them for celestial photography. The field of view in such instruments is darker than in refracting telescopes, and if the mirrors are good, there is every reason to expect that in planetary photography the results obtained by a telescope twelve or fifteen feet in length will be at least equal to those obtained with the most powerful refractors. There is so little published on the theory of the instruments that Prof. Schaeberle has re-investigated the fundamental formulæ, which may be useful to many observers (*Astronomical Journal*, No. 364). In the case of the Cassegrain it is easily shown that the secondary mirror must theoretically be the convex side of an hyperboloid of revolution, while in the Gregorian it must be the concave side of an ellipsoid of revolution; in both cases the axis and focus of the secondary reflector must coincide with those of the primary. If F denote the focal length of the parabolic reflector, H the distance between the centre of the mirror and the secondary focus (being negative when it falls between the two reflectors); the axial radius of curvature of the secondary reflector; L the equivalent focal length of the combination; then, for both forms

$$L = \frac{F}{r}\left\{(F + H) \pm \sqrt{r^2 + (F + H)^2}\right\} \quad . \; . \; . \; (1)$$

$$r = \frac{2LF(F + H)}{L^2 - F^2} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; (2)$$

$$H = \frac{r(L^2 - F^2)}{2LF} - F \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; (3)$$

These formulæ refer to the theoretical conditions for perfect definition; in practice, the secondary mirror is so small that for the same value of r, a spherical surface, or a paraboloid, hyperboloid, or ellipsoid, of any eccentricity, gives tolerable images, the size of which may be varied by simply moving the secondary along the optic axis. There will, however, always be a point of best definition; and if this does not give a convenient position for the secondary focus, the eccentricity of the small reflector must be altered by local polishing. The figuring of the secondary mirror is too delicate for direct measurements, and can only be tested in the telescope itself.

WELLS' ALGOL VARIABLE.—Further particulars of the new variable of the Algol type in the constellation Delphinus (NATURE, vol. liii. p. 206) are given in *Harvard Observatory Circular*, No. 5. The observations so far obtained show that its time of minimum, uncorrected for the velocity of light, can be closely represented by the formula J.D. 2412002·5 + 4·8064 E. For nearly two hours before and after the minimum it is fainter than the twelfth magnitude, but it is not yet possible to say how faint it really becomes. The increase of brightness takes place at first very rapidly, but afterwards more slowly, and the full brightness, magnitude 9·5, is reached in about five hours. Numerous photographs indicate that during the four days between the minima, the brightness is sensibly constant. The changes can be explained on the assumption that the star revolves about a relatively dark body, and that it is totally eclipsed at the minimum, the light then, if any, being that of the companion. The conditions are accordingly somewhat similar to those of U Cephei. The new variable is BD + 17° 4367, its R.A. and decl. for 1900 being respectively 20° 33′·1 and + 17° 56′.

THE NEW COMET.—From observations of the new comet, Perrine-Lamp, made on February 15, 16, and 17, the following elements and ephemeris for Berlin midnight have been computed by Dr. Lamp:

T = 1896 January 31·999 Berlin mean time.

$$\left.\begin{array}{l}\omega = 358^\circ\ 38'\ 16''\\ \Omega = 208\ \ 36\ \ 29\\ i = 155\ \ 30\ \ 15\end{array}\right\}1896{\cdot}0$$

$$\log q = 9{\cdot}77022$$

	R.A. h. m. s.	Decl. ° ′	Brightness.
Feb. 27 ..	22 59 40 ...	+ 46 8·7	
,, 29 ...	23 54 31 ...	+ 49 49·2 ...	0·9

M. Bigourdan, who observed the comet at Paris on February 16, states that the comet was not then visible to the naked eye, though bright enough to be easily seen in a telescope of 50 mm. aperture. It was observed to be round, about 2′ in diameter, with a diffuse central condensation about 20″ in extent. At the centre of this condensation a small stellar nucleus was occasionally suspected. No tail was visible.

PERRINE'S COMET (1895).—Dr. E. Lamp has drawn our attention to a misprint in the ephemeris of Perrine's comet, given in NATURE on January 23; the declinations throughout should be placed a line lower. Hence our statement last week, that on re-discovery the declination of the comet was a degree in error was unfounded; as a matter of fact, the corrections to the ephemeris were only + 4s. and + 0′·5. The following is a corrected and extended ephemeris:—

	R.A. h. m. s.	Decl. ° ′	Brightness.
Feb. 29 ...	19 46 48 ...	+ 1 55·1 ...	0·12
Mar. 4 ...	46 41 ...	3 0·7 ...	0·11
,, 8 ...	19 46 16 ...	+ 4 6·7 ...	0·10

M. Bigourdan describes the comet as being round, with a diameter of about 50″, and showing a somewhat diffuse nucleus. It is seen with about the same facility as a star of the twelfth magnitude.

MAGNETIC SURVEYS.[1]

ON looking through these two volumes, the first thought that strikes one is that magnetical observations require a great deal of time for reduction and preparation for publication. In the Russian work, this great consumption of time is perhaps to some extent explained by the distance that separates the place of observation from any centre of civilisation, whence the results could be published, and the inevitable difficulties of communication. Perhaps still more is it to be explained by the fact, that several authors have to compile their separate portions under editorial supervision. Still, eleven years does seem a long interval to elapse between the completion of the observations and the distribution of the results to the public. In the Italian work; carried out in the cultured and accessible cities of Italy, six years have sufficed for the reduction and the printing.

This remark must not be construed as expressing any wish to minimise the difficulties that a scientific expedition to the wilds of North-East Siberia must of necessity encounter, or to make light of the dangers that these enterprising officers experienced in their expatriation, cheerfully endured for scientific ends. One disaster that these scientific experts had to undergo may be mentioned, as it illustrates not only the severities under which they were placed, but the readiness of resource with which they remedied the mishaps, far away from trained workmen and mechanical apparatus. On August 6, 1882 (about the time of the Fort Rae Expedition, it may be remarked), when nearing their destination, they experienced a north-east storm of more than an unpleasant character, which carried their craft on to the rocks, and tumbled their apparatus into the water. The chest containing the instruments for observing the magnetic variation at Ssagastyr (Long. E. 8h. 26m.; Lat. 73° 23′ N.) remained some hours at the bottom, before it could be successfully landed,

1 "Beobachtungen der Russischen Polarstation an der Lenamündung." I. Theil Astronomische und Magnetische Beobachtungen 1882–1884." Bearbeitet von V. Fuss, F. Müller und N. Jürgens. Herausgegeben von Dr. A. v. Tillo, 1895.
"Misure Assolute degli Elementi del Magnetismo Terrestre, eseguite in Italia negli anni 1888 e 1889 dal Dott. Luigi Palazzo." (Roma, 1895.)

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and when opened, on September 6, it presented a gruesome spectacle. The magnets were covered with rust, the wood-work was swollen and would not fit the joints for which it was intended, the wires in the eyepieces missing, silvered mirrors spoilt, and other horrors which it can be imagined scientific apparatus would present after such treatment. All the damages had to be remedied on the spot by their own ingenuity, while, to add to their distress, they lost by the upset much of their petroleum, and had to reduce their light. Nevertheless, in the early days of November, all repairs were effected and the instruments ready for work.

The results of the expedition are practically divided into three parts. In the first, which is more especially under the superintendence of M. V. Fuss, are given the description of the method and the results of the observations at numerous stations for the determination of geographical position. These observations have not been made with that rigorous accuracy to which we are accustomed in inquiries that have for their aim the discussion of the variations of latitude. They are rather field observations, made with the sextant, and instruments possessing similar accuracy, and are no doubt very useful in constructing maps of a practically unknown country. In the same way with the longitude determinations, there is no electrical communication between these places, of which Jakutsk is possibly the only one that would be recognised by the ordinary English reader. A few box chronometers were carried from station to station to determine the difference of local time. Moon culminations and occultations were also employed, and, strange to say, eclipses of Jupiter's satellites. Nothing is said about the errors of the tables or the corrections that have been applied to remove those errors, but the results agree fairly well with other methods. Possibly those observations only have been used, which coincided with others made in a known longitude; but since the whole chain is made to depend for absolute longitude on that of a station at Jakutsk, determined on the occasion of the eighteenth century transits of Venus, and now unrecognisable, they do not probably interfere much with the final accuracy. The outcome of the inquiry is to give us more or less trustworthy positions of some twenty-four stations ranging between 8h.-9h. east longitude from Greenwich, and from 60°-74°, north latitude.

In the next section, under the superintendence of MM. N. Jürgens and F. Müller, are presented the results of the magnetical observations. M. Müller's part is more particularly confined to deriving the elements of the earth's magnetism at a considerable number of stations, all in North-East Siberia, by a few observations of the declination, dip, and horizontal force at each. M. Jürgens took charge of the Ssagastyr station, where, in greater detail, he sought not only the absolute force, but the hourly variation of the magnetic elements. M. Müller, as his share, is able to present a table in which, for seventeen stations, the three elements have been fairly well determined, while in twenty-eight more or less complete observations have been made. From November 1882 to June 1884, M. Jürgens' department made hourly observations of the declination, and of the horizontal and vertical force, and on selected days observations at every five minutes. The instruments appear to have been critically examined, and the results of an inquiry conducted so far away from beaten tracks possesses a special interest.

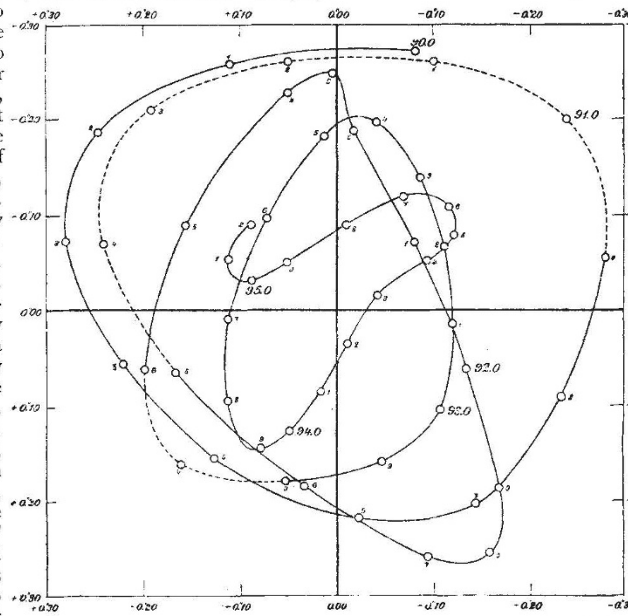
Advantage was taken of the peculiar position to make some observations on the aurora as to its form, colour, direction, and altitude. These will be found in what may be called the third section, together with the history of the expedition written by Dr. A. Bunge, wherein will be found many interesting remarks on a country but little known. The climate, the native inhabitants, the flora and fauna of the district, all come more or less under his observant notice, and are treated easily and pleasantly.

In the second work the element of adventure is, of course, wanting, and, with greater ease, Dr. Palazzo has been able to collect his data from various points on the Italian Peninsula, in such a way as to present a tolerably complete magnetic survey of the whole country. A chain of stations has been selected, starting from Rome and proceeding south-east past Naples towards Brindisi. Other positions have been occupied on the Adriatic coast, including one in the Tremiti Isles; while another group occupies the north-east, and includes Venice, Ravenna, and other well-known places. The entire series includes twenty-two stations. Dr. Palazzo has devoted great attention to the form of his instruments, and has been alive to the importance of deriving the instrumental constants with accuracy. His method of procedure is set out at length in the first part of his paper. In the second part, the details of his observations are given. On the average, these do not extend over more than two or three days at each station, which have sufficed for the determination of the declination by observing azimuths of the sun. The horizontal force has been obtained by the method of counting the number of oscillations made by the magnet in a given time. These in connection with the dip, also derived at each of the stations, have permitted him, in the usual method, to derive the vertical force and total intensity. The whole operation and deductions are conveniently exhibited in symmetrically arranged tables.

THE MOVEMENTS OF THE TERRESTRIAL POLE DURING THE YEARS 1890–95.

TOWARDS the latter end of last year Prof. Albrech gave a preliminary account of the, then, known movements of the terrestrial pole at the eleventh general conference of the "International Erdmessung." Since that date he has made a more definite investigation, the results of which will be published in the *Verhandlungen der Berliner Conferenz;* but as this will not just yet appear, he gives in the current number of the *Astr. Nach.* (No. 3333) a brief summary of the results.

The observations have been made at several observatories, namely, Kasan, Pulkowa, Prag, Berlin, Bamberg, Kiel, Karlsruhe, Strassburg, New York (Columbia College), and Bethlehem, also at the Military Geographical Institute in Vienna, the



Curve showing the relation between the *mean* and *apparent* positions of the pole during the years 1890-95.

Geodetic Institute in Potsdam, and at the American Coast and Geodetic Survey.

Prof. Albrech has not, however, used all the observations in the discussion, but enough "um den Versuch einer Ableitung der Bahn des Pols für den ganzen fünfjährigen Zeitraum mit Aussicht auf Erfolg durchführen zu konnen."

The method of computation adopted was somewhat analogous to that employed by Kostinsky in 1893. Commencing with the monthly observed mean from each station, the deviations ($\phi - \phi_0$) of the instantaneous pole elevations from a very accurate mean value were graphically formed for every tenth part of the year; a system of coordinates was also arranged in which the positive-axis of x pointed towards Greenwich, that of y 90° to the westward, the origin coinciding with the mean position of the pole.

In this way Prof. Albrech obtained a series of points, which, when plotted out and connected together by means of a curve, would show the relation of the position of the terrestrial pole, at any moment during the interval covered by the observations, to its mean position.

The accompanying curve is a reproduction of that given by Prof. Albrech.

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