consequence the money was also voted by the House of Peasants. There is every reason to expect that the question of the practicability of the undertaking will be settled in the next summer, and I hope that the result may be satisfactory.

The Diet has with the same liberality given the necessary money for the Swedish share in the proposed large Middle-European Triangulation from Palermo to Trondjem, and has also made a grant of the money which will be required to erect a new Astronomical Observatory at the University of Lund. I expect therefore that the excellent astronomer at the University, Mr. Möller, will read with intense interest the correspondence regarding the Melbourne Telescope, which even to me has been of great interest.

II. "Results of hourly Observations of the Magnetic Declination made by Sir Francis Leopold M'Clintock, R.N., and the Officers of the Yacht 'Fox,' at Port Kennedy, in the Arctic Sea, in the Winter of 1858–59; and a Comparison of these Results with those obtained by Captain Maguire, R.N., and the Officers of H.M.S. 'Plover,' in 1852, 1853, and 1854, at Point Barrow." By Major-General Sabine, R.A., President. Received December 21, 1863.

(Abstract.)

When about to undertake a voyage to the Arctic Sea in 1857, in the yacht 'Fox,' in search of the ships of Sir John Franklin's expedition, Captain M'Clintock requested that the Royal Society would supply him with such information and instructions as might enable him to make the best use of the opportunity which the voyage was likely to afford for the prosecution of magnetical and meteorological observations.

As the present communication is limited to a discussion of the hourly observations of the declination made by Captain M'Clintock and his officers from December 1, 1858 to March 31, 1859 inclusive, the portion of the instructions with which Captain M'Clintock was supplied which relates to such observations forms an appropriate introduction. It is followed by a full statement from Captain M'Clintock himself of the circumstances under which an observatory was established on the ice at a distance of 220 yards from the ship, and hourly observations maintained during five months of the arctic winter, being only discontinued when, on the return of a more genial season, the services of both officers and sailors were required in prosecuting the more immediate objects of the expedition.

On the return of the 'Fox' to England, the observations were sent, through the Royal Society, to the Woolwich establishment for the reduction and publication of magnetic observations. The results of the observations treated of in this paper are discussed in comparison with those obtained from similar observations made by Captain Maguire and the officers of H.M.S. 'Plover' at Point Barrow, on the shore of the Arctic

Sea, 1200 miles distant from Port Kennedy (Captain M'Clintock's station), in the winters of 1852–53, and 1853–54, published in the Phil. Trans. for 1857, Art. xxiv.

The first point established conclusively by this comparison is, that, after due allowance has been made for the difference in the antagonistic force of the horizontal portion of the earth's magnetism by which any disturbing action on the declination-magnet is opposed at the two stations, the intensity of the disturbing force is considerably less at Port Kennedy than at Point Barrow—that is to say, less at the station which is nearest to the points of 90° of dip, and of the maximum of the total terrestrial magnetic force, than at the station which is more distant from those points. The indication thus derived from the magnetic record at the two stations accords with the fact of the far greater frequency of the aurora at Point Barrow, where in the two winters its appearance is recorded on six days out of every seven, whilst the proportion at Port Kennedy is not more than one day in four.

For the purpose of examining the periodical laws of the disturbances at Port Kennedy, those which exhibited the largest differences from their respective normals of the same month and hour, amounting to between one-fourth and one-fifth of the whole body of the hourly observations, were separated from the others, and were subjected to analysis in the customary manner. It is thus shown that both at Port Kennedy and at Point Barrow the disturbances so treated form themselves into distinct categories of easterly and westerly deflection,—the curve representing the easterly deflections having the same general form and single maximum as that of the easterly deflections at Kew, exhibited in Pl. XIII. fig. 1 of the Phil. Trans. for 1863, Art. XII.; and the westerly curve having the same general form and double maximum as is seen in fig. 2 of the same Plate, representing the westerly deflections at Kew.

A remarkable correspondence is pointed out in regard to the hours at which the maxima of easterly and westerly deflection take place at Port Kennedy and Point Barrow. The maximum of easterly deflection occurs at the same hour of *absolute* time at the two stations; and the maximum of westerly deflection at the same hour of *local* time at the two stations.

The author concludes by taking a general review of the phenomena of the solar-diurnal variation, particularly in the vicinity of the dip of 90°, where the geographical and magnetical directions of the magnetic needle are often strongly contrasted. At Port Kennedy the normal direction of the magnet is 35° to the east of south, and at Point Barrow 41° to the west of north: the contrast at the two stations in this respect is therefore nearly as great as can exist in any part of the globe, wanting only 6° of 180°, or of being diametrically opposite. The solar-diurnal variation at these stations furnishes an apt illustration of the author's exposition.

He further takes the occasion of the phenomena of the disturbance diurnal variation at Port Kennedy, and at Nertschinsk in Siberia, to show

the caution which is necessary in endeavouring to derive the epochs of the decennial period from the magnitude of the diurnal range of the declination-magnet, and the preference due to the variation in the amount of the disturbances in different years.

January 14, 1864.

Major-General SABINE, President, in the Chair.

The following communications were read:—

I. "Examination of *Rubia munjista*, the East-Indian Madder, or Munjeet of Commerce." By JOHN STENHOUSE, LL.D., F.R.S. Received December 21, 1863.

(Abstract.)

As a portion of this paper has already appeared in the 'Proceedings,' vol. xii. p. 633, I shall confine myself in this abstract to briefly noticing the additional observations which I have subsequently made.

By numerous analyses of munjistine crystallized out of spirits and dried at 100° C., and likewise of sublimed munjistine, I find that its formula is $C_{16}H_6O_6$. This result has been confirmed by analyses of the lead-salt, the formula of which I find to be $5(C_{16}H_6O_6)$, $6PbO$, exactly corresponding to the purpurine compound described by Wolff and Strecker*.

A comparison of the subjoined formula of alizarine, purpurine, and munjistine,

Alizarine	$C_{20}H_6O_6$,
Purpurine	$C_{18}H_6O_6$,
Munjistine.....	$C_{16}H_6O_6$,

indicates the very close relationship between these three substances, the only true colouring principles of the different species of madder with which we are acquainted.

Tinctorial Power of Munjeet.

From a numerous series of experiments I have just completed, I find that the garancine from munjeet has about half the tinctorial power of the garancine made from the best madder, viz. Naples roots. These, however, yield only about 30 to 33 per cent. of garancine, while munjeet, according to my friend Mr. Higgin of Manchester, yields from 52 to 55 per cent. The actual amount of colouring matter in munjeet and the best madder are very nearly the same; but the inferiority of munjeet as a dye-stuff results mainly from its containing only the comparatively feeble colouring matters purpurine and munjistine. The latter in large quantity is positively injurious; so much is this the case, that when the greater part of the munjistine is removed from munjeet-garancine by boiling water, it yields much richer shades with alumina mordants.

* Annalen der Chemie, vol. lxxv. p. 24.