After the vast expenditure of capital in the purchase of the Cooke and Wheatstone patents, erection of lines over the kingdom, station inauguration, and the incorporation of the Company by special Act of Parliament, naturally the promoters of the Electric Telegraph Company endeavoured to create a monopoly in the transmission of messages for the public.

(*To be continued.*)

OUR ASTRONOMICAL COLUMN

THE TOTAL SOLAR ECLIPSE OF 1886, AUG. 29.—This eclipse will be a remarkable one, on account of the length of duration of totality, which will not fall far short of that of the eclipse of 1868, Aug. 18, though it unfortunately happens that its track is mainly over the Atlantic Ocean, and there will be no land station for physical observations while the sun is hidden for the longest interval. The elements of the eclipse are, very approximately, as follows :—

Conjunction in R.A. 1886, Aug. 29, at oh. 57m. 37·7s. G.M.T.

	°	′	″	
R.A.	157	50	51·9	
Moon's hourly motion in R.A.		37	4·8	
Sun's ,, ,, ...		2	16·7	
Moon's declination	9	10	38·4	N.
Sun's ,, ...	9	17	23·9	N.
Moon's hourly motion in Decl.		10	45·1	S.
Sun's ,, ,, ...		0	53·4	S.
Moon's horizontal parallax		61	20·5	
Sun's ,, ...			8·8	
Moon's true semidiameter		16	42·9	
Sun's ,, ...		15	51·1	

The central eclipse begins Aug. 28, at 23h. 12m. 32s. G.M.T., in longitude 79° 33′ W., and latitude 9° 51′ N., and ends Aug. 29 at 2h. 36m. 28s. in longitude 47° 19′ E., and latitude 21° 57′ S., and the sun is on the meridian centrally eclipsed in longitude 14° 13′ W., and latitude 2° 58′ N. The following are also points upon the central line :—

Longitude.	Latitude.
66° 47′ W	11° 36′ N
61 1 W	12 6 N
11 9 E	11 5 S
20 10	14 52
21 39	15 25
25 5 E	16 36 S

It would appear from this track that the only easily accessible station where the sun will be at a sufficient altitude will be at the southern extremity of the Island of Grenada, in the West Indies; for which point, assuming its longitude 4h. 6m. 20s. W. and latitude 11° 59′ N., we find—

	H.	M.	S.	
Beginning of totality, Aug. 28, at	19	10	7	Local
Ending ,, ,,	19	13	22	mean times.

The duration is therefore 3m. 15s., and the sun's altitude is about 20°.

If we take for a point where the sun will be near the meridian, longitude oh. 5om. 52s. W. and latitude 2° 8′ N., we have—

	H.	M.	S.	
Beginning of totality, Aug. 29, at	0	8	48	Local
Ending ,, ,,	0	15	14	mean times.

The duration of total eclipse, which is here nearly at its maximum, is therefore 6m. 26s., and the sun at the time is only 7° from the zenith.

From this point the length of totality diminishes, until, during the passage of central eclipse over Southern Africa from near St. Philip de Benguela to the Mozambique, it is comparatively short. It will be seen that the central line runs considerably to the north of the islands of Ascension and St. Helena.

The middle of general eclipse occurs at oh. 54m. 30s. G.M.T.; the sidereal time at Greenwich mean noon is 10h. 30m. 27s·8, and the equation of time om. 46s. subtractive from mean time, figures which may facilitate a further examination of the phenomenon.

THE SUN'S PARALLAX.—Prof. Galle, Director of the Observatory at Breslau, in a letter to M. Leverrier, gives the definitive result of his discussion of observations of the minor planet Flora (Hind, 1847, Oct. 18) in the autumn of 1873, at observatories in both hemispheres, with the view to a determination of the solar parallax. The receipt of particulars concerning some doubtful observations at Melbourne and other stations had enabled him to apply some small corrections, by which, however, the value of the sun's parallax published in No. 2,033 of the *Astronomische Nachrichten* is but very slightly changed. Prof. Galle now finds from eighty-one corresponding observations between the two hemispheres, forty-one stars of comparison to the north of the planet and forty to the south, that "the definitive result for the solar parallax should be fixed at $\pi = 8''{\cdot}873$, with a very small uncertainty in the hundredths of the second." He adds, that of ninety-six corresponding observations in all, he had excluded fifteen on account of some discordances arising from imperfections in the southern instruments, but even if these fifteen observations were included, the value is only changed to $8''{\cdot}878$. Prof. Galle is engaged in the composition of a memoir giving full details of his investigation. He remarks upon the close agreement of his result with that obtained by the numerous and very exact measures of the velocity of light, by M. Cornu, at the Observatory of Paris, with the theoretical determination of M. Leverrier from the perturbations of the planet Mars, and with M. Puiseux's first result from observations of the transit of Venus at Pekin and St. Paul Island. He directs attention to the circumstance, that another favourable opportunity of applying the method which has furnished a value for the sun's parallax by observations of Flora in the northern and southern hemisphere, so nearly in agreement with values deduced in other ways, will be afforded about the opposition of Eurydice (Peters, 1862, Sept. 22), which occurs on the 20th of September next, when the planet will be a bright ninth magnitude. It will be in perihelion early in the previous month, and at its nearest approach to the earth on Sept. 13, will be distant less than 0·878 of the earth's mean distance from the sun. Prof. Galle hopes to secure on this occasion the co-operation of the astronomers who have taken part in the observations of Flora.

THE MINOR PLANETS.—On comparing elements of this group as known to the present time, it appears that *Flora* has the shortest period of revolution, 1193 days, and of those which have been satisfactorily calculated, *Sylvia* has the longest, 2374 days, the corresponding mean distances, expressed in parts of the earth's mean distance from the sun, being 2·201 and 3·482. The nearest approach to the sun is made by *Phocea*, 1·787, while *Freia* recedes furthest from him, the aphelion distance being 4·002. We may add to these the following values near the extremes of distance :—

	Distance in Perihelion.
Melpomene	1·796
Clio	1·805
Victoria	1·823
Iris and Ariadne ...	1·835
Eurydice	1·854
Flora	1·856
Polyhymnia	1·890
Virginia	1·899

	Distance in Aphelion.
Sylvia	3·757
Cybele	3·803
Pales	3·810
Euphrosyne	3·849
Hermione	3·882

Polyhymnia has the greatest excentricity, 0·33998, and *Lomia* the least, 0·02176; *Pallas* the greatest inclination, 34° 42′, and *Massalia* the least, 0° 41′. It will be seen that the difference of distance from the sun between Phocea in perihelion and Freia in aphelion is 2·215, corresponding to about 204,000,000 miles.

M. Leverrier's *Bulletin International* of June 5 cor-

tains a telegraphic intimation from the Smithsonian Institution of the discovery of a new minor planet by Prof. Peters in R.A. 17h. 21m., and N.P.D. 113° 21′. It is as bright as stars of the eleventh magnitude, and is No. 144 of this group of planets.

[Since the above was in type we receive notice of the discovery of No. 145, by Prof. Peters, in R.A. 17h 14m, N.P.D. 113°·8′, apparently on June 4. Motion towards S. : twelfth magnitude.]

LECTURES AT THE ZOOLOGICAL GARDENS *

VI.—*Mr. Flower on Elephants.*

WITH the exception of the domesticated species few mammals are so well known to everyone as the Elephant, few are more interesting from their sagacity and usefulness to mankind, and few are so wholly separated and isolated from all other forms which now exist. Formerly the Elephants were grouped with the Rhinoceroses or with the Pigs, but a better knowledge of their structure has shown that they form an entirely distinct order, to which the name *Proboscidea* has been given, on account of the trunk, or proboscis, which is one of their most striking features. Two well-marked species of Elephant exist, the Indian (*Elephas indicus*) and the African (*E. africanus*).

The former is found in a wild state throughout the forest-lands of the greater part of India, Ceylon, Burmah, Siam, Cochin-China, the Malay Peninsula, and Sumatra, except where it has been driven back by the advance of civilisation; whether it is indigenous to any of the other islands of the Eastern Archipelago is doubtful. The Elephant of Sumatra and Ceylon has been separated by Schlegel as a distinct species, *E. sumatranus*, but Dr. Falconer and others have shown that their differences, though appreciable, do not amount to specific characters. The Indian Elephant has been domesticated from the earliest ages—in India before historic times, and also by the ancient Persians. It has been used in war, in carriage, and in state pageants, and is still much employed in road-making and bridge-building, where its strength, its sagacity, and its adroitness in piling logs, lifting weights, and similar operations, render its services invaluable.

The second species inhabits Africa, south of the Sahara, from the Indian Ocean to the Atlantic, and formerly extended its range to the Cape of Good Hope. In ancient times it was domesticated by the Carthaginians, and was the species generally imported by the Romans, but no succeeding African race has had the sagacity to make use of it. It is killed in vast numbers for the sake of its ivory, of which an enormous quantity is annually brought to Europe; and in so wasteful a fashion is this slaughter carried on, that the species will probably soon be exterminated. Although so well known to the ancients, it is only quite recently that live African elephants have been brought to Europe in modern times. There was one in Antwerp in 1863, and two years later a pair were obtained by the Zoological Society, which are still alive and well, the male having attained a height of ten feet. Since this, numbers of these animals have been imported down the Nile from the Soudan, and they are now common in menageries.

In size there is not much difference between the two species, and the maximum height would appear to be about eleven feet; an Indian elephant shot by Sir Victor Brooke reached that stature, which was not exceeded by the tallest of eleven hundred individuals measured by Dr. Falconer. In external appearance the two species are easily distinguishable. The African elephant has a lighter and more shapely head, a less protuberant forehead, and a larger eye, but its most striking peculiarity is the enormous size of its ears. It also stands proportionately higher on its legs, and has a more arched back.

* Continued from p. 93.

The number of nails is different, being four on the fore feet and three on the hind, whereas in the Indian species these feet have four and five nails respectively. Sportsmen say that the height of an elephant always equals double the circumference of the foot, and this is confirmed by the individuals now in the Gardens; in the male the proportion is absolutely correct, and in the female it is within three inches. The mental characters of the Indian and African elephants are different, the latter being bolder, quicker, and more obstinate.

In considering the general structure of the Elephants, the first peculiarity to be noticed is the trunk, which is really an enormous prolongation of the nose and upper lip. It is almost entirely composed of a complex mass of muscles which give it its great power and flexibility, and it is amply supplied with nerves. The great massiveness of the head is not owing to the size of the brain, but to huge air-cells in the body of the bones, which are an extraordinary development of the frontal sinuses. This expansion is necessary to afford room for the attachment of the great muscles which wield the head and proboscis.

The teeth of the Elephant are very peculiar. The tusks, which answer to the middle incisors of man, sometimes reach a weight of 150 lbs., or even, it is said, of 200 lbs. each. They have no enamel, being entirely composed of *ivory*—a peculiarly fine, tough, and elastic dentine—and are persistent in growth throughout life. Thus, if bullets happen to lodge in the pulp-cavity they are carried down by the growth into the tusk itself, in which they are sometimes found embedded. The molars are six in number in each side of each jaw, and are composed of alternated transverse plates of enamel, dentine, and cement. Owing to the different hardness of these materials they wear unequally, and produce cross ridges on the surface of the tooth, which form it into an admirable grindstone for crushing the food. The molars are not deciduous, but move forward in a curious way; only one (or at most a part of two) is in use at once, and each as it is worn away is pushed forwards by its successor, which eventually takes its place. The six teeth last out the life of the animal, which is said to extend to a hundred years or more. In the Asiatic species the plates of the molars are much finer and more regularly parallel than in the African elephant, in which they are fewer in number and have somewhat of a lozenge shape.

It was formerly a widespread delusion that the Elephant had no joints, and even now many people believe that their joints move in the contrary way from those of other quadrupeds. The explanation of this lies in the fact that the elbow and knee of an elephant are much nearer the ground than those of a horse or a cow, and are thus confused by a casual observer with the so-called "knee" (the true wrist) and "hock" (the true ankle) of the latter animals.

Although the Elephants are now so isolated among animals, it was not always so. They have many fossil relatives whose range once extended all over Europe (including Britain), Asia, North America, and part of South America. Of these the most generally known is the Mammoth, of which specimens have been so wonderfully preserved in the Siberian ice, and which was closely allied to the living Asiatic species. Going further back we have the Mastodon, in which the grinding teeth were much less differentiated and more like those of other animals. Beyond this it is difficult to trace their relationships. Possibly they may have been through the Dinotherium, or through some of the wonderful creatures whose remains have recently been discovered in the Eocene formations of America. But it is clear that in the Elephants we have the last remaining representatives of a mighty and once numerous race which have played their part in nature and disappeared, and it is only too probable that the survivors also are doomed to speedy extinction.