

index to current technical literature. The issue of a distinctly European edition of the magazine was commenced last month, and we are confident that it will meet with as much success here as it has in the United States.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. F. Greswolde-Williams; a Suakin Gazelle (*Gazella brookii*) from Abyssinia, presented by Dr. L. de Gebert; two Ring-necked Parrakeets (*Palæornis torquatus*) from India, presented by Mrs. G. F. Cooper; a Macaque Monkey (*Macacus cynomolgus, albino*) from Manilla, presented by Mr. James Coombs; two Double-spurred Francolins (*Francolinus bicalcaratus*) from West Africa, four Rosy Bullfinches (*Erythropsiza githaginea*), bred in England, presented by Mr. E. G. B. Meade-Waldo; two Herring Gulls (*Larus argentatus*), British, presented by Mr. T. Hope Robinson; two Rhomb-marked Snakes (*Trimerorhinus rhombeatus*), two — Snakes (*Chlorophis hoplogaster*), a Puff Adder (*Bitis arietans*) from South Africa, presented by Mr. J. E. Matcham; a Ring-tailed Lemur (*Lemur catta, ♀*) from Madagascar, a Macaque Monkey (*Macacus cynomolgus*) from India, deposited; six Rosy-faced Love Birds (*Agapornis roseicollis*) from South Africa, a Malaccan Parrakeet (*Palæornis longicauda*) from Malacca, four Siskins (*Chrysomitris spinus*), four Lesser Redpolls (*Linota rufescens*), British, a Bridled Wallaby (*Onychogale frenata*) from Australia, a Loggerhead Turtle (*Thalassochelys caretta*) from the Mediterranean, purchased.

OUR ASTRONOMICAL COLUMN.

THE NOVEMBER METEOR SWARMS.—Up to the present time we have not received any news that the Leonids were more abundant this year than last. Indeed, bad weather seems to have universally prevailed about the time of observation. At the Paris Observatory five observers only noted twenty meteors, while M. Hansky, at the Meudon Observatory, saw in all seven, four of which were Leonids. M. Janssen, in consequence of the exceedingly bad weather experienced in Western Europe, telegraphed to San Francisco to inquire whether a more brilliant display had been noted there. The answer he received was to the effect that nothing more than the ordinary shower was observed. Perhaps, however, observers may be (or may have been) more fortunate with the Andromedes, which are expected between the 23rd and 27th of this month. This swarm is also of considerable strength, and should be more than usually active. Its period of revolution being six and a half years, and the last maximum having occurred on November 23, 1892, we expect the shower this month to be above the ordinary yearly display. There are several points about the Andromedes that are of peculiar interest. One of these is that the orbit in which they move is very similar to that of the comet Biela; in fact, the bodies which produce the phenomena of shooting stars may be none other than the component parts of this comet. In the years 1872 and 1885 the maximum display occurred on the 27th of the month, but at the following expected shower it took place on the 23rd. This difference is explained, according to Bredichin, by the perturbatory effects due to the proximity of the planet Jupiter, thus causing the node to recede 4°. The radiant point of this swarm (25° + 43°) has a large northern declination, which renders it always above the horizon. The meteors themselves are different from the Leonids in that they move more slowly, and are of a yellowish tinge.

In the note under this heading, that appeared last week, it should have been mentioned that the observations recorded were made by Dr. W. J. S. Lockyer at the Solar Physics Observatory, South Kensington.

In another part of this journal Mr. Denning summarises the results of this year's Leonid display.

CURRENT ASTRONOMICAL ARTICLES.—M. Gaston Armelin contributes an interesting article on that curious variable Mira Ceti to *La Nature* for November (No. 1274). After a brief historical summary the writer describes some theories current to-day, and points out the variations in the time of maxima observed

of late years, and their consequent suggested explanations.—The bulletin of the *Société Astronomique de France* for the same month contains, among other interesting matter, a drawing of comet Perrine as observed at the observatory of Juvisy. M. Camille Flammarion deals with the Leonid swarm of meteors. The number contains several contributions of planetary notes.—In the October number of *Himmel und Erde*, a brief account is given of the present state of the proposed large Potsdam refractor. There seems to have been some difficulty about the optical parts, so that it has been decided to assume that the aperture will be 80 cm., and commence at once with the construction of the instrument and a suitable dome. This instrument when finished will be then the largest in Europe, the aperture being nearly thirty-two inches. This article contains the results of many investigations on the absorption properties of different thicknesses and kinds of glass.

COMET PERRINE (OCTOBER 16).—This comet is gradually becoming fainter, but a continuation of the ephemeris for the current week will perhaps prove useful:—

1897.	R.A.			Decl.	log r.	log Δ.	Br.
	h.	m.	s.				
Nov. 25 ...	18	16	49 ...	+ 59° 24' 6"			
26 ...	15	45	...	58 44' 8"	0'1376	0'0278	0'7
27 ...	14	47	...	58 6' 4"			
28 ...	13	54	...	57 29' 3"	0'1366	0'0370	0'7
29 ...	13	6	...	56 53' 4"			
30 ...	12	23	...	56 18' 8"	0'1357	0'0459	0'7
Dec. 1 ...	11	43	...	55 45' 5"			
2 ...	11	7	...	55 13' 5"	0'1351	0'0546	0'7
3 ...	18	10	34 ...	+ 54 42' 4"			

REV. DR. SEARLE has resigned the directorship of the astronomical observatory of the Catholic University of America. His place will be taken by Mr. Alfred Doolittle.

THEORY OF THE MOTION OF THE MOON.¹

OF the lunar theories hitherto completed the two greatest are undoubtedly those of Hansen and Delaunay. The former has for its chief object the formation of tables; the inconvenience of slowly converging series is avoided by using numerical values throughout; and the problem solved is the one actually presented by nature, every known cause of disturbance being allowed for. It suffers, however, under the disadvantage that there are no means of correcting the results for any change in the values of the constants that observation may demand. This drawback was avoided by Delaunay, but only at the expense of still greater evils from the point of view of the making of an ephemeris; for owing to the slow convergence of certain series, twenty years' labour did not suffice to give sufficiently approximate results; moreover, the problem had to be considerably modified from the circumstances of nature, in order to achieve a result within even so long a time.

The memoir that Dr. Brown has lately presented to the Royal Astronomical Society, forms the first part of a fresh attempt to calculate the motion of our satellite. All Delaunay's modifications of the problem are adopted: that is to say, the sun and earth are supposed centrobaric, the mass of the moon is neglected, as is also the action of the planets, and the true mass of the sun is increased by that of the earth. The calculation of the effect of the attraction of the planets and of the protuberant parts of the earth's equator will follow when the modified problem is solved. The solution can also be easily modified so as to allow for the greater part of the effect of the remaining modifications, and the outstanding error Dr. Brown has shown to be insensible to observation; but it is, however, far larger than the minute fraction of a second to which his calculations are pushed.

Dr. Brown's theory resembles Delaunay's in being algebraical with, however, one important exception: the ratio of the mean motions is replaced by its numerical value. By this means the slowly converging series that occur in Delaunay's theory are avoided; and no admissible correction of the value of the above ratio can introduce any change in the results that would be sensible to observation. This modification in the form, combined

¹ "Theory of the Motion of the Moon." Containing a new calculation of the expressions for the coordinates of the Moon in terms of the time." By Ernest W. Brown, M.A., Sc.D. (Reprinted from the *Memoirs* of the Royal Astronomical Society, vol. liii.)