OUR ASTRONOMICAL COLUMN.

THE NOVEMBER METEORS (LEONIDS).—Although it was known that the presence of the moon would hinder materially the brilliancy of the display of the members of this particular meteor swarm, many hoped that the weather at least would compensate us for that of last year. We were, however, doomed to disappointment, and clouds were the order of the night, both in London and in many other counties where observers were on the watch. Mr. Denning, writing from Bristol on the 15th, observes lamentably, ". . . up to the present time my results are negative. November 12 was cloudy all night, November 13 cloudy, except for an interval of partly clear sky between 11h. 30m. and 14h., and November 14 overcast all night."

Saturday night (November 13) in London proved really a first-class night for such observations, excepting, of course, the presence of the moon. It is true that white fleecy clouds occasionally came rolling up from the southward, but they afforded a magnificent spectacle, and soon disappeared in the north, leaving the sky brilliantly clear. Three facts were impressed on one when watching the heavens: first, the dearth of meteors; second, the great number of stars visible considering the brightness of the moon; and third, the extreme mildness and absence of dew.

In a watch lasting more or less continuously from 9h. to 17h. o'clock, only twenty meteors were seen, fourteen of these being estimated as Leonids, three Andromedes, and two Lyrids.

The five most brilliant Leonids were plotted directly on a star chart (Mean Equinox 1870). Three of these, when their trails were prolonged backwards, converged nearly to a point giving the coordinates of the radiant point as 152°, + 25°, while the other two apparently emanated from 171°, + 19°. The details of each are as follows:—

No.	G.M. Time	Coords. of commencement		Coords. of end		Colour	Remarks
	h. m.	°	°	°	°		
1	13 50	177	+ 4	187	− 18	Yellowish	Very quick
2	14 10	184	+26	197	+33-4	—	,,
3	14 50	143-4	+22	123-4	+ 13	Yellow-blue	,,
4	15 30	156	+35	161	+ 45	—	,,
5	15 55	166	+11	182	− 8-9	Reddish tinge	Very slow, nucleus, very wavy trail near head just before disappearance

Number 5 was somewhat unusual, falling towards the south-eastern horizon very slowly, that part of the trail close to the head being distinctly wavy. It may be mentioned that two cameras pointed first towards the Pleiades in the earlier portion of the evening, and towards Leo when sufficiently high in the sky, recorded not a single trail, although fourteen plates were exposed for forty minutes each during the time of observation.

JUPITER'S THIRD AND FOURTH SATELLITES.—Prof. Barnard has communicated to the *Astr. Nach.* (No. 3453) some most interesting observations of the third and fourth satellites of Jupiter, together with a set of drawings of these bodies made both out of and at the time of transit. These observations are valuable, as they can be compared with those made by Mr. Douglass, and described in the *Astr. Nach.* (No. 3432). That they differ from these latter is only natural considering the difficulty of the observations themselves, but that this difference is so great and fundamental is very surprising. Mr. Douglass, it will be remembered, found that the surfaces of these two satellites were covered with series of fine dark lines, measuring less than 0″·1, or about 200 miles, and similar somewhat to those surface markings as observed at his observatory upon Mars, Venus, and Mercury. Prof. Barnard, on the other hand, has failed altogether to see these details, although he has employed the 36-inch Lick refractor in the attempt; the markings he observed always appeared to be large and more or less diffused, with the exception of the white polar caps which, as he says, are exactly like those of Mars. In the case of the third satellite the cap is generally situated at the north limb, although on one or two occasions a white southern cap has been observed. Both caps of the fourth satellite have been clearly distinguished, that at the north being sometimes exceptionally large, covering a surface equal to one-quarter to one-third of the diameter of the satellite.

Most interesting are the appearances and apparent changes of form which these satellites undergo when in transit. Thus, as regards the third satellite the transit "was very remarkable. The satellite appeared as a black or very dark spot on its disc, and close to the south limb of the satellite was a small, round, very white spot, fully as conspicuous as I have shown it. No other details were seen on it." The drawing referred to above shows the satellite's disc very nearly black, the spot measuring about one-sixth of the diameter of the satellite being represented nearly white. The observations of Prof. Barnard show fairly conclusively that the changes in form of the discs as they pass across the primary are only apparent, and not due to any peculiarity of shape of the satellites themselves. In fact, he himself is perfectly convinced that they are caused by the relative intensities of the satellite's markings in their transit over those of the primary. The peculiar feature of a double dark spot, or an elongated white spot shown by the first satellite in transit, is due to the fact that this body has a bright equatorial region and dark poles. When transiting across a bright portion of Jupiter's disc, the satellite appears like a double dark spot, and when over a dark portion like an elongated white one.

The discrepancy between the forms of the surface markings on these satellites, as seen by two such observers as Mr. Douglass and Prof. Barnard, is indeed remarkable, and it would be of interest to know what would be the result of an interchange of instruments at the time of the next oppositions.

COMET PERRINE (OCTOBER 16).—The following is a continuation of the ephemeris of Comet Perrine for the ensuing week as computed by Herr. J. Möller (*Astr. Nachr.*, No. 3456):—

12*h. Berlin M.T.*

1897.	R.A. h. m. s.	Decl. ° ′	log *r*.	log Δ.	Br.
Nov. 18	18 28 14	+64 43·0	0·1436	9·9896	0·9
19	26 1	63 53·0			
20	24 3	63 4·6	0·1418	9·9993	0·8
21	22 18	62 17·7			
22	20 43	61 32·3	0·1403	0·0089	0·8
23	19 17	60 48·3			
24	17 59	60 5·7	0·1388	0·0184	0·8
25	16 49	59 24·6			
26	18 15 45	+58 44·8	0·1376	0·0278	0·7

THE VARIABLE STAR β LYRÆ.—If Argelander's formula be used for the determination of the times of minima and maxima of this variable star, it will be found that these times do not exactly correspond with those now observed. Herr Pannekoek has recently undertaken to investigate the cause of this discrepancy, and has published his results in the *Koninklyke Akademie van Wetenschappen te Amsterdam* (vol. v. No. 7). A brief account of the main results are, however, contributed to the *Astronomische Nachrichten* (No. 3546). The improved formula for determining the times of the principal minima is given by Herr Pannekoek as

$$1855 \text{ Jan. } 6,\ 604 \text{ Greenwich M.T.} + 12{\cdot}908009\,E + 0{\cdot}000003855\,E^2 - 0{\cdot}000000000047\,E^3,$$

and he adds a table, which facilitates greatly this computation, containing every twentieth minimum from E = − 500 (1837) to E = + 1500 (1908).

To determine the amount, if any, of a variation in the light curve, Herr Pannekoek divided the period of observation into two parts, before and after 1870, and obtained two sets of mean values for the mantissæ of the principal points reckoned from a principal minimum:

	1st max. d.	2nd min. d.	2nd max. d.
1842–1870	3·12	6·40	9·54
1870–1895	3·32	6·48	9·73

This showed that the difference between the intervals from the principal minimum in the case of the maxima was quite apparent, while in the case of the secondary minimum it was comparatively small. It is pointed out, however, that a possible cause may be due to different methods of curve-drawing, some observers drawing the curves symmetrically, and others not. The curves, he finds, further show small irregularities in intensity somewhat of the same kind as those observed in η Aquilæ, which render uncertain the times of first maximum and principal minimum. Herr Pannekoek finds that only the variation in the time of the maxima can be put down to causes other than those of errors of observation and drawing.