If this deduction be correct, we may suspect that the spectroscope in revealing to us the gaseous nature of so many nebulæ has not told us the entire truth, and that solid bodies, varying greatly in different nebulæ as to their numbers and size, are frequently important constituents of them. Probably nebulæ vary indefinitely in the relative proportions of the solid and gaseous matter in their composition, from those which are nearly purely gaseous to those which contain scarcely anything but solid bodies. If these were exceedingly numerous, so as to overpower the gaseous spectrum of the nebula by the continuous spectrum they gave, and yet none were sufficiently large to appear as a distinct star, we should have presented to us the very features we recognize in the Andromeda nebula, and Sir John Herschel's prevision, made more than half a century ago, would be realized, that "the great nebula in Andromeda may be, and not improbably is, optically nebulous owing to the *smallness* of its constituent stars."

The cause of the appearance of these "temporary" stars still remains to be found. The letter of Prof. Monck's, which we print on pp. 335 and 336, contains an ingenious suggestion. Certainly, if we may consider Mr. Denning's observation of fixed meteor-radiants as proving that meteor-streams moving with a velocity of 200 miles a second and upwards are features of interstellar space, the passage of such a stream through a nebula might not be a matter of rare occurrence, seeing how many pass through our own system; and granted that the stream was sufficiently rich, and covered a sufficiently extensive area, all the phenomena of a temporary star might well be produced.

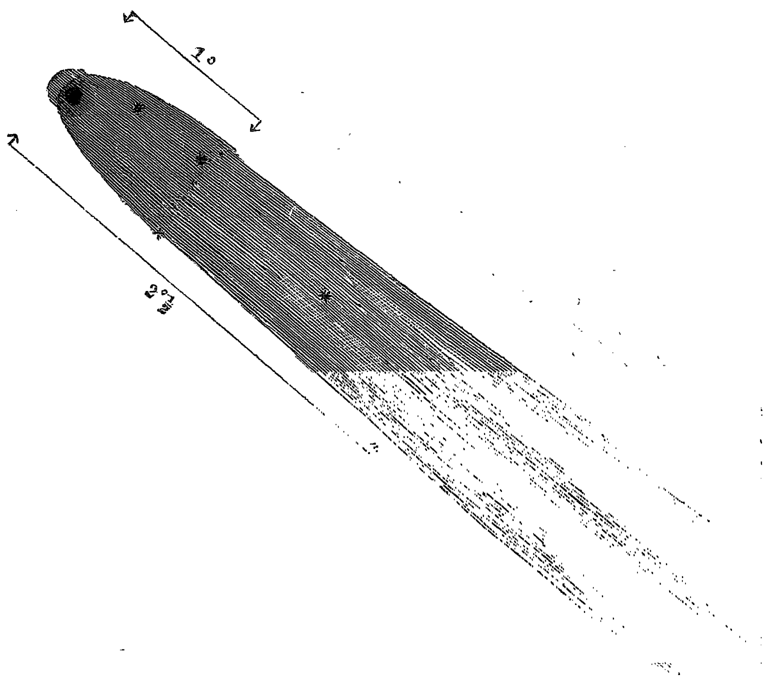
E. W. Maunder.

The Comet of 1812 (*Pons-Brooks*).

Not having seen any observations of the peculiar triple appearance of the tail of the above comet on January 21, 1884, I have thought an observation and a sketch of the comet's appearance in the telescope that night might be of value.

On the night of January 20 the stellar appearance of the nucleus was very remarkable; it was small, clearly defined, and very bright. For a distance of probably one degree behind the head the body had the appearance of a brush of light, terminating at that distance rather abruptly; but from out of this there extended for a considerable distance further a much fainter tail, which with the naked eye could be traced for about 18°, running along parallel to the southern edge of the zodiacal light. The fainter part of the tail with the telescope occasionally exhibited numerous fine dark lanes parallel to its axis.

There was considerable coma about the nucleus; this seemed to extend beyond the outline of the head in front. A very faint envelope extended completely around the head. One degree behind the nucleus, near the extremity of the abruptly terminated body, there seemed to be a continual disturbance in the cometary light. The



southern border of the head was decidedly more curved than the northern side. The whole body of the comet (*i. e.* the head extending back to the abrupt termination) was very *flat* in appearance, the light being even all over, like that from a flat disk.

On January 21 the nucleus, which had appeared so distinctly stellar on the night previous, had melted away into a mass of dense haze, the star-like form having vanished. The faint envelope extending about the head on the 20th could not be seen, though it was closely looked for. Otherwise the general appearance of the head and body was the same; but there seemed to be a decided pulsation in the light of the comet at a point about 1° back from the nucleus; though the appearance was probably imaginary, the body of the comet seemed to rapidly swell and contract, so that a small star close to it would seemingly for a moment be involved in the nebulous light and the next instant free of it. Nevertheless, the definition was good and the phenomenon striking.

The greatest change had occurred in the tail, which had separated into three distinct branches. The spaces between these branches were entirely free of nebulous matter and decidedly black; especially was this noticeable between the central and southern branches; the southern branch was much the brightest, the northern being very faint. The separation that caused the northern branch commenced at a somewhat greater distance from the head than the other. At this observation the head and body still retained the disk-like surface, and the coma extended considerably in front and almost obliterated the outline of the head. The sketch was made at about $7^h\ 30^m$ Nashville M. T.

The observations were made with the 5-in. refractor and comet eyepiece of about $1\frac{1}{4}°$ field. E. E. Barnard.

Vanderbilt University Observatory,
Nashville, Tenn., U.S.A., 1885, Aug. 28.

Commensurability of Motions *.

It is well known to astronomers that if two planets or satellites, in motion round the same centre of attractive force, have their periodic times, or mean motions, nearly commensurable, there will exist in the motions of these bodies certain curious and interesting peculiarities. About two centuries ago it was observed that the motion of Jupiter was slowly accelerated, and that of Saturn retarded. These irregularities perplexed astronomers for a long time, but at last they were explained by Laplace. He pointed out the fact that since twice the period of Saturn is nearly equal to five times the period of Jupiter, the mutual attraction of these planets produces a large irregularity in their motions; and this irregularity itself has a period of about nine hundred years. Many other similar cases have been found in our solar system, though none where the irregularity is so large. The masses of Jupiter and Saturn are so great that the mutual perturbations are very large, and the problem of computing them is a difficult one. Laplace gave the first investigation, and was followed by Pontecoulant and others, and especially by Hansen in his elaborate prize memoir on this subject. Recently, Leverrier has investigated this question, but unfortunately his tables of Saturn are not much better than the old ones of Bouvard published in 1821.

But suppose the motions of two bodies should be exactly commensurable, what may we expect under such conditions, and would such a system be stable? This question is not directly answered in the 'Mécanique Céleste,' although it is safe, I think, to infer the opinion of Laplace that there is nothing unstable in such a system.

Still the belief that such a system would be unstable, and would be destroyed by the slightest disturbance, seems to prevail extensively, and even among some astronomers of repute. Thus gaps in the ring of asteroids and divisions in the ring of Saturn have been explained on the theory that it is impossible for bodies to

* From 'The Sidereal Messenger,' Sept. 1885, pp. 200-202.