small mast with a halliard fitted on the port quarter-deck. I saw that it was useless to attempt to notice the first moment of the entry of Venus, for I did not want to fatigue myself and run the risk of not being able to observe the total immersion. Indeed, I had sufficient trouble to fix the sun, on account of the movement of the ship.

"When Venus had half entered, or nearly so, on the disk of the sun, which I recognised by my reflecting quadrant, I attached myself, so to speak, to the telescope of 15 ft. to try to catch the moment of total entry. As my watch was none of the best, and as I could not take the height of the sun precisely at the moment when Venus appeared to me to be totally immersed, it occurred to me to make use of the sand-glass, by means of which the way of the vessel was measured, and I had by my side a man well up to turning the glass at the instant in such a way that it was impossible to have an error of more than a quarter of a second each time.

"The weather having become overcast, and the rain having shown itself, I did not think it would be possible to notice the exit of Venus. Consequently I did not cause the mast to be changed, as I ought to have done, for we had tacked since half-past 11.

"At 2 o'clock it cleared a little, and shortly after the weather cleared so that I could see Venus very distinctly with my green objective, and without the help of any other coloured glass, and I was not incommoded. I saw, from this observation, that it was not impossible for a person used to the movement of a vessel, and accustomed to the use of large instruments, to observe, especially when the sea is calm, the immersions of the satellites of Jupiter with a telescope of 12 or 15 ft., which would have a large field, and to determine the time of those immersions in the above manner; for I believe myself safe in asserting that I did not make from them from 15 to 20 seconds in time of error on an immersion of the first satellite of Jupiter."

The observations made under these extraordinary circumstances, give for the total immersion of Venus, 8h. 27m. 56½s.; the commencement of the exit, 2h. 22m. 53s.; the total exit, 2h. 38m. 52½s., which gives for the duration, 6h. 10m. 55¾s., and for the time taken by the diameter to cross the limb of the sun, 15m. 59s. As M. de Seligny had observed at the Isle of France the exit of Venus, Le Gentil formed, for the meridian of his observation, 88° 20′ 15″. The log-book gave 87° 14′ 0″.

As there was to be another transit of Venus on June 3, 1769, Le Gentil resolved to spend eight years in the southern hemisphere in wait for it. He had the devotion to carry this resolution into effect, spending his time in making a series of curious and interesting observations in the Mascarene Islands, Madagascar, Marianne Islands, the Philippines, and the coasts of India. He had fixed on Manilla as his place of observation, and reached it about August 1866, but he was ordered to return to Pondicherry. By what must seem a cruel fatality, this patient devotee of science, when the day of the Transit arrived, found his view of the sun completely shut out by clouds during the whole phenomenon, although for many days previous the sky had been cloudless. On the other hand, two friends whom he had left at Manilla were fortunate enough to witness the transit without obstruction. Le Gentil died on October 22, 1792.

ON THE TEMPORARY FADING OF SOME LEAVES WHEN EXPOSED TO THE SUN

FOR some time past I have taken much interest in this subject, since it at first seemed to indicate that chlorophyll in living plants could be decomposed by light in the same manner as when dissolved out from them by alcohol or other solvents. It also seemed to agree with the fact which I had established by comparative quantitative analysis, that leaves grown much exposed to the sun contain a relatively less amount of chlorophyll than those somewhat more shaded, in some cases even only one-third the quantity. My attention was first called to a diurnal change in the colour of a kind of moss commonly grown in hothouses, by Mr. Ewing, of the Sheffield Botanical Gardens, and subsequently to a similar change in a tropical species of maiden-hair fern, by Dr. Branson of Baslow. In both cases the colour of the fronds, after the darkness of night, was deep green, but after exposure to the bright sun of day it was a far paler and whiter green, which was again restored by the subsequent absence of light. I was particularly anxious to ascertain whether this change was due to a diminution in the amount of chlorophyll, but was unable to detect any well-marked difference by careful comparative quantitative analyses. I therefore came to the conclusion that, at all events in the case of the moss, the change in colour was due to some sort of mechanical alteration in the structure of the fronds, but did not examine the question more fully. The true explanation appears to be that adopted by Prillieux, who describes his observations in *Comptes Rendus*, t. lxxviii. p. 506. According to him and to the previous experiments of Famintzin and Borodin, exposure to bright light causes both granular and amorphous chlorophyll to collect together at the sides of the cells, instead of being more evenly distributed. The result of this is that a much larger relative proportion of white light is reflected, and the leaves or fronds appear of a paler and whiter green. These conclusions are thus in perfect agreement with my own quantitative analyses, and we may, I think, look upon this combined evidence of two independent methods as furnishing a satisfactory explanation of the greater part, if not of the whole, of the temporary change in colour.

H. C. SORBY

THE COMET

AFTER a very unusual amount of difficulty in the determination of the orbit I have succeeded in deducing a set of parabolic elements which appear to possess considerable precision. They are as follows:—

Perihelion passage, July, 8·83652 Greenwich M.T.

Longitude of Perihelion ...	271 3 51·5	Mean equinox
,, Ascending node ...	118 43 25·5	July 0
Inclination to ecliptic ...	66 21 16·0	
Log. Perihelion distance ...	9·8298719	

Motion direct.

Our last observation, a very good one, gives this position:—

June 22, at 10h. 4m. 21s. M. T. at Twickenham.

R.A. ... 7h. 21m. 58·05s.

D. ... +68° 9′ 34″·5

which compared with the above orbit (parallax and aberration allowed for) shows only the following insignificant differences—in R.A. −2″; in D. +14″.

This close agreement with parabolic motion is not favourable to identity of the comet with that of 1737, notwithstanding similarity of elements, but we must look to observers in the southern hemisphere to enable us to decide this point. The comet may certainly be there observed till October or November in the Antarctic circumpolar heavens.

The subjoined ephemeris will suffice to indicate the course of the comet, while it continues visible in our latitudes:—

AT GREENWICH—*Midnight.*

	R.A.	N.P.D.	Distance.	Intensity of light.
	h. m.	° ′		
June 25	7 27·3	22 33	0·816	2·4
27	7 30·6	23 11	0·769	2·8
29	7 33·7	24 3	0·721	3·3
July 1	7 36·5	25 10	0·673	3·9
3	7 39·1	26 34	0·624	4·6
5	7 41·3	28 24	0·575	5·5
7	7 43·2	30 46	0·528	6·6
9	7 44·8	33 48	0·482	7·9
11	7 46·2	37 39	0·437	9·6
13	7 47·5	42 30	0·396	11·5
15	7 48·6	48 33	0·359	13·7

I have assumed the intensity of light on June 13 = 1.

The orbit of the comet makes a very close approach to that of the planet Venus. My last elements indicate for least distance of orbits . . 0·011.

For calculation of places after July 15 the following expressions for the comet's heliocentric co-ordinates referred to the equator, will be useful, in conjunction with X, Y, Z, of the *Nautical Almanac*.

$$x = r\,[9{\cdot}77492]\,\sin(v + 26^\circ\ 8'{\cdot}5)$$
$$y = r\,[9{\cdot}98665]\,\sin(v + 276^\circ\ 17'{\cdot}1)$$
$$z = r\,[9{\cdot}92408]\,\sin(v + 176^\circ\ 54'{\cdot}5)$$

J. R. HIND

Mr. Bishop's Observatory, Twickenham, June 23

The following additional information is taken from a letter by Mr. Hind in yesterday's *Times*:—

"The comet will be nearest to the earth on the night of July 22, its distance being then less than 0·3.

"Last night at 11.30, the moon being yet above the horizon, the comet appeared to be in the least degree fainter than the star Upsilon, Ursæ Majoris, which Argelander estimates rather higher than the fourth magnitude. In the strongly illuminated sky of these midsummer nights it was very sensibly brighter than the neighbouring stars 42 and 43 Camelopardi. By measures of the nucleus taken with the filar-micrometer, it appeared to be rather more than 4,000 miles in diameter, and the tail, assuming it to be projected from the nucleus in the line of the radius-vector, would be 4,000,000 miles in length.

"During the first fortnight in July the comet will undoubtedly be a pretty conspicuous object in the constellation Lynx, where there are few bright stars.

"At the end of September its brightness, by theory, should be the same as on the night of discovery (April 17), and it will then be well observed in the southern hemisphere, in the neighbourhood of the star Alpha Chamæleontis."

MR. HIND, in a letter with which he has favoured me, lays great stress upon the star-like appearance of the nucleus of the comet now visible, as seen in a telecope; and M. Rayet has already, in a communication to the Paris Academy, shown that its spectrum is continuous, that of the coma giving the three ordinary cometary bands. On Monday evening last the comet was bright enough, in spite of the moonlight, to enable me to observe this continuous spectrum with my 6½ inch Cooke and a pocket spectroscope. It struck me that the spectrum was short, *i.e.* that it was deficient in blue rays; and as one saw in the telescope a fan-like structure above the nucleus (as seen in an inverting telescope), so also in the spectroscope, the continuous spectrum sparkled as if many short bright lines or bands were superposed upon it. I shall be glad to learn that other observers with more powerful instruments have had their attention directed to these two points. J. NORMAN LOCKYER

NOTES

ON the 3rd inst. the corner stone of the American Museum of Natural History in New York was laid by the President of the United States. The ground belonging to the Museum measures about eighteen acres, and the building when completed according to plan will be larger than the British Museum. The object of the Museum is twofold:—First to interest and instruct the masses; and secondly, and specially, to render all possible assistance to specialists. The library presented to the Museum by Miss Wolfe, with a large collection of shells, also donated by Miss Wolfe to the Museum in memory of her father, who was its first President, was purchased by her at a cost of 35,000 dols. The other collections at present in the temporary Museum are valued at 250,000 dols. A rare and newly complete series of American birds, and many fine birds of Paradise and pheasants, now in the collection formerly belonging to Mr. D. G. Elliott, will be added. The Trustees have purchased the collection of Prince Maximilian, of Neuwied, on the Rhine, and a large number of specimens belonging to the late Edward Verreaux, of Paris. Large donations of shells, corals, and minerals, have been received, as also a collection of 20,000 insects. The collections will be bought and cared for by moneys contributed by the Trustees individually and the public, but the building now in progress will be erected at the expense of the city, which has already appropriated 500,000 dols. for this purpose.

Prof. Joseph Henry of the Smithsonian Institution gave an address on the above occasion, in which he spoke as follows on the necessity of endowing scientific research:—"The development of the institution would not be completed were it furnished with all the appliances I have mentioned. There is another duty which this city owes to itself and to the civilisation of the world. I allude to an endowment for the support of a college of discoverers and a number of men capable not only of expounding established and known truths, but of interrogating nature and discovering new facts, new phenomena, and new principles. The blindness of the public to the value of the abstract sciences and the matter of endowments of colleges for their support is remarkable. It is not everyone, however well educated he may be, that is capable of becoming a first-class scientist. Like poets, discoverers are born, not made, and when one of this class has been found he should be cherished, liberally provided with the means of subsistence, fully supplied with all the implements of information, and his life consecrated to the high and holy office of penetrating the mysteries of nature. What has been achieved in the knowledge of the forces in operation in nature, and the uses to which it is applied in controlling and directing these forces to useful purposes, constitutes the highest claim to the glory of our race.'

THE Duke of Devonshire, speaking at the banquet at Trinity College, Cambridge, on the 17th inst., said it had fallen to his lot during the last three or four years, while acting on a Royal Commission for inquiring into Scientific Education and the Advancement of Science, to become acquainted with the development and extension of scientific teaching in the several Universities of the kingdom, and of learning the views of those best qualified to express an opinion as to the requirements remaining to be supplied. The result of the inquiry had been satisfactory, inasmuch as it showed that a great deal had been done in the direction indicated, and that University authorities had manifested a strong desire that the Universities should be provided with all appliances necessary not only for centres of scientific education, but as centres also of general intellectual activity and of original research. This latter point was strongly insisted on in the evidence before the commissioners, and received their concurrence. A University which recognised the advancement and extension of knowledge as one of the main purposes of its existence was surely to be regarded as of a higher and nobler type than one which was satisfied with the position of a mere educational body. There was nothing antagonistic in these two objects; on the contrary, great advantage might be derived from their combination.

THE Emperor of Austria has been pleased to confer upon Mr. Robert H. Scott, F.R.S., the Director of the Meteorological Office, the Order of the Iron Crown, Third Class.

DR. TOLOZAN, physician to the Shah of Persia, has been elected a corresponding member of the French Academy in the section of Medicine and Surgery, and M. Studer of Berne in that of Geology. The latter is a veteran of 79 years.

THE organisation of the French National Observatory will