

and with mountains on every side, the true horizon was not visible, and it was impossible to make very accurate observations. The rosy clouds remained long after the coronations had died away, but the chief splendour was displayed for an hour and a half after sunset.

If the aurora of this spring was not more brilliant than those of the last two autumns, it was, I think, more remarkable for its sharp contrasts of colour, and for the peculiar "coal-sacks," or areas of blackness, which seemed to be actually a part of the aurora as much as the red or green light.

DAVID WEDDERBURN

I HAVE to correct an important error in my account of the aurora of the 4th, published by you on the 8th. I stated that it was finest between 6 and 7. At 9 it appeared to be fading, and I ceased to watch it; but I learned afterwards that it rekindled, and was at its highest between 9 and 10. The colour was still red, and the columns of light met near the zenith.

JOSEPH JOHN MURPHY

Old Forge, Dunmurry, Co. Antrim, Feb. 12

The Great Comet of 1861

THE following observation may interest your readers. It is taken from a volume entitled, "The Industrial Progress of New South Wales," published by authority of the Colonial Government. Under the head of Astronomical Progress is a paper by Mr. Tebbutt, in which he says that, while observing in Australia on the morning of July 1, 1861 (*i. e.*, really, in the afternoon before sunset of our June 30), he noticed the widening out of the branches of the tail of the comet then visible. He remarks that this observation is very interesting when taken in connection with the announcement made by Mr. Hind, that "it appears not only possible, but even probable, that in the course of June 30, 1861, the earth passed through the tail of the comet, at a distance of perhaps two thirds of its length from the nucleus."

There were at least two observers in England of what was probably the opposite effect of perspective (*viz.*, the closing up of the branches of the tail) on the evening of June 30. The rapid, angular motion of one of the streamers was separately observed by Mr. George Williams, of Liverpool, and the Rev. T. W. Webb, of Hardwick, the latter of whom has given a detailed account of his observations in the "Monthly Notices of the Royal Astronomical Society," vol. xxii., p. 311. According to these observations, our actual passage through the streamers of the tail must have taken place about sunset on the evening of June 30.

A. C. RANYARD

ON LUMINOUS MATTER IN THE ATMOSPHERE

MUCH has lately been written and lectured on atoms, molecules, organic matter suspended in the air, effects of the light passing through the sky, abstracting its blue colour, and changing it into red. May I therefore be allowed to add some facts which I noticed during a long and careful observation of a hitherto almost unknown phenomenon to which my attention was drawn by chance.

Some years ago I had directed my excellent six-feet of Merz, Munich, towards the sun in order to draw the sun-spots in the camera-obscura. One day (April 27, 1863), when the sun had scarcely passed, and I was pushing the instrument to get its disc again in the field, I was astonished to perceive a mass of luminous little bodies, apparently coming from the sun, and passing altogether with great velocity towards the east. They brightened in a white and sparkling light, and were as numerous as stars; but as their velocity was much too great, and as they disappeared when I followed them to some distance from the sun, I was inclined to take them for little bodies floating in the atmosphere, and getting their light from the sun, an opinion which soon became stronger when I grew aware that I had to draw out the eye-piece some millimetres in order to get them quite clear

and distinct. As I had never heard of the existence of any such bodies, I resolved to give notice to Dr. Wolf, Director of the Observatory at Zurich, who convinced himself of the strange phenomenon, and, encouraging me to persist in my investigations, told me that the late Sig. Capocci, on the Capodimonte Observatory at Naples, had mentioned these little bodies appearing to him under similar circumstances on May 11, 1845. Since that time Prof. Dr. Edward Heis, of Münster, Westphalia, in his "Wochenschrift für Astronomie," 1869, March 24, also gave full corroboration to this fact. I therefore went on, and uniting the investigation to the daily labour of observing and drawing the sun-spots, my arrangement of the camera-obscura improved and ensured these results as well. Convinced of the importance of the phenomenon, I resolved to direct my whole attention to it, and to examine it thoroughly. I decided to find out not only the distance, the size, the shape, the frequency, the velocity, and the nature of the light of these little bodies, but also to take notice of their daily direction by comparing it with the simultaneous direction of winds and clouds. I continued my observations during a period of three years.

As I mentioned above, I was obliged to draw out the eye-piece of the telescope in order to have the little objects more distinct. Now, everybody knows that the focal distance of any lens, or system of lenses, such as the telescope is, will differ according to whether the beams come from a more or less distant object. The little bodies did not appear distinct in the focus of the sun; I had to draw out the eye-piece; but if the focal distance was greater, their distance was smaller than that of the sun, and by means of a scale placed on the eye-piece, I soon obtained the result that these little bodies belong to our atmosphere, floating in a stratum of about 4,000 metres down to about 200 metres, the most numerous swarm passing almost always at a distance of not less than 500 metres. Here I remark that for my observations I had chosen the time of the sun being in, or about, the meridian, for then I was sure to have its light as strong, and the sky as clear as possible, while mostly preferring a magnifying power of only 48 diameters.

Taking the little bodies in the right focus, I was enabled not only to draw their shape, which I found very various, but also to measure their apparent diameter, which did not differ less, and depended much on distance, the nearer ones being larger, and, as I learned from the scale the accurate distance of every one, I calculated their diameter to vary from 10 to 59 millimetres, the average being 32 millimetres. Their shape was very various, too. The greater number were oblong, angular, resembling flakes, some few were orbicular, while some smaller ones were star-shaped, with transparent arms.

With respect to their frequency, I was surprised to find on certain days, especially in April and May, an incalculable number of little bodies in the field of the instrument, passing without interruption for hours. In general I found their number to be connected with the purity of the sky; and every day I noticed the average, the daily minimum occurring in the morning and evening hours, the maximum in the noon-tide hours; also the annual minimums in the summer and winter months, the chief maximum from April 20th to May 15th, the second, much lower maximum in August and September. I often saw their number increase soon after clouds had passed.

The velocity of the bodies, irregular in the lower strata, being about 2 metres in a second, became greater and more regular in the higher ones, where, for instance, at a distance of 3,000 metres, I found them to pass 8 metres during the same period, a rapidity agreeing closely with that of the *cirri*, which often passed at or above this distance. Whether far or near, all these little bodies glittered in a magnificent white light behind the sky, but as it retreated farther from the sun its blue colour became darker, the light of the bodies consequently diminished, and was