The Orbit-Elements of Comet II, 1881.

By J. Tebbutt, F.R.A.S.

[Read before the Astronomical Section, Royal Society of N.S.W., 5 August, 1881.]

Having before reported to you the appearance of the recent large comet, I have now much pleasure in presenting to you an approximate determination of the orbit-elements of that body. Owing to ill health and the pressure of other avocations foreign to astronomy, I have been obliged to defer the calculation of the orbit. The paper which I am now about to read is a brief one, but it contains, nevertheless, the results of a large amount of calculation, and the results themselves will, I am assured, be of an exceedingly interesting character. I have then deduced the following approximate parabola from my own observations on May 22nd, the evening of discovery, June 1st and 11th. The residuals for the middle place are very large, but I am unable in the limited time which I have at my disposal previously to the meeting to reduce them within the limits of errors of observation:

Perihelion passage .............. 1881, June 15 63318d. G.M.T.
Longitude of the perihelion ...... 263° 34'0} M.Equinox, 1881:0
Longitude of the ascending node ... 270 37 2
Inclination of the orbit ........... 63 15 6
Perihelion distance ............. 0'74336
Motion' ................................ Direct.

It was supposed by some persons previously to the calculation of the orbit that our late visitor was identical with the Comets II, 1819, II, 1861, but I believe I explained satisfactorily in the Herald of 9th June last that such identity could not be possible. It appears, however, from a comparison of the above elements with those of the recorded comets that it is more probably a return of the Great Comet of 1807. This comet was discovered by Parisi, an Augustine monk, at Castro Giovanni, in Italy, on September 9th of that year, and some days afterwards by Pons at Marseilles. The observations extended over a period of nearly seven months, and the orbit was carefully investigated by several computers. In Olber's Abhandlung über die Bahn eines Cometen, Encke's edition, 1847, there are no fewer than fourteen sets of elements, all of which, except two, are parabolic. Readers of astronomical literature will call to mind that this comet is rendered interesting from the fact that it was subjected to examination by the powerful reflectors of Sir William Herschel, and also from the circumstance that its
movements were the subject of a classical memoir by the illustrious Bessel. Delambre, in his *Astronomie Théorique et Pratique, tome iii*, says that the period lies between 1403\textsuperscript{6} and 2157\textsuperscript{4} years, and that the perturbations will produce great changes in the elements, principally in the time of revolution. In fact, the length of the assigned period is almost the only circumstance that militates against the supposition of the identity of this comet with that which visited us in May and June last. We must, however, bear in mind that observations taken in the beginning of the present century are not so accurate as those now made by astronomers. In support of my remarks on the non-identity of our late visitor with the Comets II, 1819, II, 1861, and on its probable identity with that of 1807, I here give the orbit-elements of the three comets for comparison with those I have deduced. The elements of Comet II, 1819, and of Comet 1807 are by Brinkley and Bessel respectively, and those of Comet II, 1861, are from Dr. Heinrich Kreutz's definitive investigation, a copy of which elaborate work he kindly sent to me some months ago.

<table>
<thead>
<tr>
<th>Comet II, 1819</th>
<th>Comet II, 1861</th>
<th>Comet, 1807</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perihelion passage, G.M.T.</td>
<td>June 27d. 17h.</td>
<td>June 11d. 12h.</td>
</tr>
<tr>
<td>Longitude of perihelion</td>
<td>287\textsuperscript{5} 57'</td>
<td>240\textsuperscript{9} 21'</td>
</tr>
<tr>
<td>Longitude of ascending node</td>
<td>274 36</td>
<td>279 15</td>
</tr>
<tr>
<td>Inclination of the orbit</td>
<td>80 46</td>
<td>85 26</td>
</tr>
<tr>
<td>Perihelion distance</td>
<td>0 3410</td>
<td>0 8224</td>
</tr>
<tr>
<td>Period of revolution</td>
<td>400\textsuperscript{4} years</td>
<td></td>
</tr>
</tbody>
</table>

The longitudes are roughly corrected for the precession of the equinoxes since the respective epochs. Remarkable as our late visitor is in connection with its supposed identity with the comet of 1807, it is perhaps quite as remarkable in another respect. The fact is the earth has had an exceedingly narrow escape from being enveloped in the matter of the comet's tail. I find that on the evening of discovery, May 22nd, the distances of the comet from the sun and earth were respectively eighty-two and seventy-one millions of miles. For some days the earth and comet, as I at the time pointed out, were rapidly approaching each other. On the morning of June 12th, when my last reliable observation was taken, the respective distances had diminished to sixty-nine and thirty-two millions of miles. At sixteen minutes past 1 o'clock in the afternoon of June 16th, Sydney time, the comet passed through perihelion at a distance of sixty-nine millions of miles from the sun, and at eighteen minutes past 7 o'clock in the afternoon of the 19th it reached the plane of the earth's orbit at the ascending node. On looking at the elements before given it will be seen that the longitude of the node is 270\textsuperscript{6} 37', and I find that the heliocentric longitude of the earth at the same time was 268\textsuperscript{5} 9', so it follows on the assumption that the comet's tail pointed directly from the sun that the earth, had she been about
two and a half days more in advance in her orbit, would have been exactly in the prolongation of the axis of the tail and at a distance of twenty-five millions of miles from the comet's nucleus. A similar result would have followed had the comet been later by the same period in coming up to the node. In fact it is not at all improbable, when the orbit comes to be investigated from the whole assemblage of observations, that the earth was really involved to some extent in the diffused matter of the tail.

I shall now take my leave of this interesting subject, in the hope that I may be spared to return to it at a future opportunity. I may mention that my reports of the comet's appearance have now probably reached Europe, and that I am about to send all my observations fully reduced. In conclusion, I find from No. 2374 of the Astronomische Nachrichten a comet was discovered by Swift, in the United States, on the 30th April, and that according to elements by Dr. Oppenheim, in No. 2376, the latest date to hand, that comet must have come into the southern hemisphere. Indeed this circumstance was known to Lord Crawford, of the Dun Echt Observatory, and he promised at the May meeting of the Royal Astronomical Society to telegraph to Australia. I have not heard, however, if the promise was carried into effect. I myself was not aware of the comet's discovery till the 19th July, and it was then too late to search for it. According to Oppenheim's elements this comet passed its perihelion on May 21st, so that the comet of which this paper expressly treats will probably be No. II of 1881.
MICROSCOPICAL SECTION.

PRELIMINARY MEETING, HELD 12 APRIL, 1881.

Dr. Wright was voted in the Chair.

It was decided to hold the meetings of the Section on the evenings of the second Monday in each month. The following gentlemen were elected office-bearers for the ensuing session:

Chairman: Dr. Wright. Secretary: Mr. P. R. Pedley. Committee: Dr. Morris, Mr. F. B. Kyngdon, Mr. G. D. Hirst, Mr. T. Brindley.

9 MAY, 1881.

Dr. Wright in the Chair.

The Chairman exhibited a new Tolles' 1/10 inch objective, the performance of which was remarkably satisfactory on a valve of A. pellucida mounted in the bisulphide of carbon and phosphorus medium. In ordering this objective Dr. Wright suggested that the front of the setting should be constructed of gold, as being the metal least liable to be chemically acted upon by the various fluids used for the immersion of the lens. Mr. Tolles considered that a gold front would be inexpedient and unnecessary, and had had the front gilt instead. Mr. H. O. Walker exhibited a Swift's 1/3-inch objective, with which he successfully resolved P. angulatum.

13 JUNE, 1881.

Dr. Wright in the Chair.

Dr. Wright read some notes on the comparative performances of two 1/10-inch objectives by Mr. Tolles, and a 1/8-inch homogeneous lens by Mr. Zeiss, from which it was gathered that Mr. Zeiss's lens was more achromatic than those of Mr. Tolles, but that in the Tolles objectives the correction for spherical aberration was more perfect, thus admitting of the use of deeper eye-pieces.

Dr. Morris and Dr. Wright exhibited the powers of the lenses in question on some exceedingly difficult valves of N. rhomboides, the striae on which were remarkably faint and numbered about 90,000 to the inch.

Mr. J. U. C. Colyer read a note from Capt. Trouton describing a remarkably luminous appearance of the sea in lat. 11° 58' N., long. 51° 53' E. (off the coast of Aden, 100 miles west of Socotra), apparently occasioned by millions of animalcula, which produced a snowy white sheen altogether differing from the ordinary phosphorescent appearance of the tropical seas.

11 JULY, 1881.

Dr. Wright in the Chair.

Dr. Wright exhibited A. pellucida, dry, resolved by Tolles' homogeneous 1/10-inch objective.
Rev. Mr. Martin called the attention of the meeting to the beautiful black ground illumination to be obtained from the ordinary Webster condenser, in conjunction with Ross's new swinging tail-piece.

8 August, 1881.

Dr. Wright in the Chair.

Through the kindness of Mr. L. Brück, the Secretary was enabled to exhibit a variety of new and interesting microscopical apparatus. Amongst these exhibits were two large and completely furnished microscopes, by Messrs. Hartnack of Paris, and by Messrs. Schmidt and Haensch of Berlin. Considerable interest was taken in the trial of Prof. Abbe's new condenser, which it was found could be worked up to an extremely high angle. A Loewe's microtome, and Hartnack's improved stereoscopic ocular, with two eye-pieces and adjustment for position of eyes, received a great amount of attention, and were much admired.

Dr. Wright exhibited two samples of fossil diatoms, the one from Victoria, and the other from Gunnedah, New South Wales. Mr. Pedley exhibited sections of brain and spinal cord.

14 September, 1881.

Owing to the inclemency of the weather the meeting lapsed for want of a quorum.

12 October, 1881.

Dr. Wright in the Chair.

The Chairman exhibited two of Tolles' solid eye-pieces. With these eye-pieces—½ and ¾-inch—Dr. Wright was able to obtain greater amplification, with equal definition, and with proportionately less loss of light than with Huyghenian oculars of like powers.

Mr. Pedley exhibited a series of histological preparations.

14 November, 1881.

Dr. Wright in the Chair.

The Chairman exhibited Dr. J. Edwards Smith's V-shaped diaphragm, and the last edition of Dr. Carpenter's "The Microscope." Dr. Wright also exhibited the scales of a hairless podura from Mr. Sharp, of Adelong. This podura is in all probability identical with Podura macrotoma of Dr. G. W. Royston Pigott, the intimate structure of the scale being readily resolved into beaded spherules by Tolles' duplex ½ o.g. Mr. Pedley exhibited a number of double-stained histological preparations, and fully explained the process.
MEDICAL SECTION.

The Medical Section of the Royal Society held a preliminary meeting, April 29th, 1881, at which the following officers were appointed:—Chairman: Dr. Mackellar. Secretaries: Dr. Jones, Dr. Maclaurin. Committee: Dr. Cox, Dr. Schuette, Dr. Roberts, Dr. Morgan.

Seven general meetings were held, at which numerous papers were read and pathological specimens exhibited.

A paper read by Dr. Manning on the question, "Is Insanity increasing?" was recommended to the Council of the Society for publication.

H. N. MACLAURIN,
Hon. Sec., Medical Section.