November, 1789), "I should certainly have been able to announce its existence as early as August 19, 1787, when at 22h 18m 56s I saw and marked it down as probably a sixth satellite, then about 12° past its greatest preceding elongation. . . . In the year 1788 very little could be done towards a discovery as my 20-feet speculum was so tarnished by zenith sweeps that I could hardly see the Georgian satellites. In hopes of great success with my 40-feet speculum I deferred the attack on Saturn till that should be finished, and having taken an early opportunity of directing it to Saturn, the very first moment I saw the planet, which was the 28th of last August, I was presented with a view of six of its satellites in such situations, and so bright as rendered it impossible to mistake or not to see them; and also on the 17th Sept. I detected the seventh satellite when at its greatest preceding elongation." In ascertaining the period of the sixth satellite, Herschel states that he used the 19th August, 1787, as a starting-point. Later he states that the seventh satellite "appears in the 40-feet, no bigger than a very small lucid point," yet he says, "I see it very well with the 20-feet reflector, to which the exquisite figure of the speculum not a little contributes." This is the account referred to in the former part of this paper.

It seems demonstrated then that though the satellite was seen in 1787 (as Hind also mentions), with the 20-feet telescope, it was not discovered in any proper sense of the word until August 28th, 1789, the instrument of the discovery being the 40-feet telescope. If the observation of 1787 is to be regarded as the discovery of the satellite, then by parity of reasoning Herschel did not discover Uranus nor did Galle observationally discover Neptune.

Note on the Densities of Jupiter’s Satellites.
By Richard A. Proctor, B.A.

Incorrect values of the densities of Jupiter’s satellites have somehow found their way into our text-books of astronomy, and have been repeated from one to another. They have led to erroneous assumptions respecting the condition of these bodies.

Thus, in Lardner’s Handbook, we find the following table: —

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.0000173</td>
<td>0.00510</td>
<td>0.02016</td>
<td>0.1143</td>
</tr>
<tr>
<td>II</td>
<td>0.0000212</td>
<td>0.00698</td>
<td>0.03115</td>
<td>0.1710</td>
</tr>
<tr>
<td>III</td>
<td>0.0000885</td>
<td>0.02163</td>
<td>0.06984</td>
<td>0.3960</td>
</tr>
<tr>
<td>IV</td>
<td>0.0000427</td>
<td>0.01285</td>
<td>0.03925</td>
<td>0.2225</td>
</tr>
</tbody>
</table>

It is strange that, though accepting different values of the satellites’ diameters, Mr. Chambers, in his Descriptive Astronomy, gives the same values for the densities, only omitting the last decimal figure.

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Whence these values were originally derived I cannot say.
They are unquestionably incorrect, and are, in fact, not even near
the true values. This is easily shown in any given case. Thus
take the second satellite, whose diameter is a little over 2000
miles, or about \(\frac{1}{4}\)th part of Jupiter's mean diameter. Then, if
of equal density with Jupiter, its mass would be about \(\frac{1}{4}\)th
part of Jupiter's, or would be represented by \(0.000156\). But
Laplace's estimate of the mass of this satellite is \(0.000232\), or
more than half as great again as that resulting from a density
only equaling Jupiter's. Hence the satellite's density is more
than half as great again as Jupiter's. But Jupiter's density is
represented by \(0.24\) if the Earth's is taken as unity; and by
\(1.36\) if the density of water is taken as unity. Hence this satel-
rite's density would be represented by more than \(0.36\), if Earth's
equal 1, and by more than \(2.04\) if the density of water \(= 1\).

So much to show that the values tabulated by Lardner
and Chambers are erroneous whensoever obtained.

The following values of the densities of the several satellites
have been obtained by combining Laplace's estimates of the mass,
with the values of the diameters given in the second column:

<table>
<thead>
<tr>
<th>Satellite</th>
<th>Diameter in Miles</th>
<th>Density, Earth as 1.</th>
<th>Density, Water as 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2352</td>
<td>0.198</td>
<td>1.143</td>
</tr>
<tr>
<td>II</td>
<td>2099</td>
<td>0.374</td>
<td>2.167</td>
</tr>
<tr>
<td>III</td>
<td>3436</td>
<td>0.325</td>
<td>1.833</td>
</tr>
<tr>
<td>IV</td>
<td>2926</td>
<td>0.253</td>
<td>1.468</td>
</tr>
</tbody>
</table>

It will be observed that all the satellites except the first thus
appear to have a greater mean density than Jupiter. Probably
their real densities are greater than those here tabulated, since
irradiation would increase their apparent diameters.

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Note on the Orbit of the Double Star Castor.
By J. M. Wilson, Esq.

The orbit of Castor appears to be hyperbolic, a form of orbit
which, as far as I am aware, has not been shown to exist in the
case of any binary system.* Mr. Gledhill was good enough to
furnish me with a list of measures of Castor, extending from
A.D. 1740 to the present time, and on charting these on a table of

* [It may be interesting to compare with Mr. Wilson's hyperbolic orbit the
elliptic orbit deduced by Mr. Hind from all the observations with which he was
acquainted, ranging over the period from 1718 to 1845. In the Monthly
Notices for December 1845, Mr. Hind remarks that "the elements are entirely
different from those previously computed by Sir John Herschel and M. Mödler;
and this difference is materially owing to the great influence exerted by recent
measures at Mr. Bishop's observatory, by Mr. Dawes." The results "are
as follows" (we quote from a note by Mr. Dawes in vol. xxxv. of our

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