

# The Work of John Isaac Plummer at Orwell Park Observatory in the years 1874 to 1890

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This paper builds on the unpublished collation by the Orwell Astronomical Society entitled *John Isaac Plummer*. It takes the form of a chronology and critique of papers published by John Isaac Plummer (1844-1925) in the *Monthly Notices of the Royal Astronomical Society* and *Astronomische Nachrichten* on work undertaken at the Orwell Park Observatory, Ipswich, in the years 1874 to 1890. This work, mainly, although not exclusively, in England, took the form of measuring the positions and deriving the orbits of as many comets as could be observed from Orwell Park. Plummer also published papers in other journals, such as *Nature* and *The Observatory*, but these are to be the subject of future research.

John Isaac Plummer (1844-1925) was employed by ‘Colonel’ George Tomline (1813-1889)<sup>1</sup> as a professional astronomer to operate and observe with the new 10-inch refracting telescope housed in the observatory that Tomline had completed in 1874 at his country house at Orwell Park, near Ipswich, England. Plummer’s formative years, and earlier astronomical observing at Durham under the tutelage of the Reverend Doctor Temple Chevalier (1794-1873), are dealt with more fully elsewhere<sup>2</sup>.



**Figure 1**

**John Isaac Plummer (1844-1925)**

Image by courtesy of Orwell Astronomical Society.

## 1874

Plummer joined “Colonel Tomline’s Observatory” (the phrase he was to use to describe his employment in his annual report to the Royal Astronomical Society (R.A.S.)) in June 1874. In fact, in his first report<sup>3</sup>, he proudly listed the equipment in the new observatory and set out his manifesto:

“[to]... employ this fine instrument [the Tomline refractor] chiefly for the observation of comets, both periodical and occasional.”

Figure 2 shows the 10-inch refractor mentioned.



**Figure 2**

**The 10-inch Tomline refractor**

Image by courtesy of Orwell Astronomical Society.

For the remainder of his first year at Orwell Park, Plummer was setting up the observatory. This first entailed battling with the “opticians” (as he derisively called them) as they set up the 10-inch Merz lens<sup>4</sup>. The German-style mounting was manufactured by the Ipswich company, Ransomes, Sims & Head, which had made heavy castings for Airy’s altazimuth instrument, 12¾-inch “great equatorial” refractor and 8-inch transit circle.

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Plummer next spent time trying to estimate the exact longitude of the observatory using "... a small transit instrument and an excellent clock by Dent." His initial estimates were  $52^{\circ} 0' 33''$  north,  $4' 55.8''$  east<sup>5</sup>. This presumably entailed comparing timed measurements with another observatory (possibly the Royal Observatory, Greenwich), although this detail is not mentioned in his paper.



**Figure 3**

### **The 3-inch transit instrument installed in the Orwell Park Observatory**

The location of the transit room is shown in Figure 4.  
Image by courtesy of Orwell Astronomical Society.

Also in 1874 Plummer was introduced to the Ipswich Science Society - he hosted a visit by members to the observatory in July of that year. This was the start of a long association with this Society, to which he gave several lectures between 1874 and 1890. These were well reported in the local Suffolk press<sup>6</sup> - the *Suffolk Chronicle* and the *East Anglian Daily Times*.

In his first formal paper reporting observations from the Orwell Park Observatory, he noted the preponderance of the zodiacal light during the autumn of 1874, during the appearance of Coggia's comet. He suggested that there may be a periodic enhancement of the strength of the phenomenon over some eight years, based on his previous observations whilst in Durham<sup>7</sup>.

## 1875

As already mentioned, Plummer's main work was the measurement and reduction of cometary orbits. His first published results, in *Astronomische Nachrichten*<sup>8</sup>, concerned Coggia's Comet (V 1874). It should be emphasised that he concentrated only on the orbits of the comets he observed - he made no estimates of their magnitudes.

Not much else happened this year, for as Plummer noted, work suffered because of the "prevalence of unusually cloudy weather for so many months". This was not to be the last time he mentioned cloud cover preventing observations at Orwell Park<sup>9</sup>, and the paucity of comets.

Other work started, included a blossoming interest in estimating the diameters of Venus and the Moon, and their respective brightnesses. This built on his earlier work at Durham, where he observed many lunar occultations, to investigate the properties of the supposed lunar atmosphere<sup>10</sup>. He also held a "strong suspicion" that the irradiation of Venus (i.e. its apparent brightness) varied with the transparency of the Earth's atmosphere. The lack of opportunity to gather evidence to support his hypothesis must have frustrated him.

## 1876

This year saw Plummer start his photometric experiments, measuring the brightness of Venus, comparing shadows cast by the planet and a standard whale-oil candle at known distances<sup>11</sup>. This was primarily because there were no comets available for him to observe<sup>12</sup>. The result was that he found the brightness of the "mean full Moon" to be 799.5 times that of Venus at greatest brilliancy. Unfortunately, at that time there was little similar work with which to compare his findings. Modern values put his estimate as being a factor of about 2.4 too low. He also found, by chance observation, that Sirius cast a shadow of one ninth the brightness of Venus, which is remarkably accurate. He stated that he was quite sure no one else had made this type of observation of Sirius before.

Plummer also commented disparagingly on the accuracy of the catalogue of stars published by the British Association<sup>13</sup>, noting ever-increasing differences between contemporary observations of prominent stars and those historic observations of Bradley<sup>14</sup>. Others had formed the same opinion.

Also this year Plummer had the bright idea of proposing a new numbering system for the host of new minor planets (or planetoids as he called them) being discovered at this time<sup>15</sup>. Unfortu-

nately, he was not to know the huge number of solar system objects that would eventually need to be numbered. His peers must have had some idea, though, because his suggestions were rejected, as was his idea for renumbering stars within their constellations, grouped by magnitude in order of Right Ascension.

In this year, Plummer was elected a Fellow of the Royal Astronomical Society.

### 1877

During 1877, Plummer continued his apparent luminosity work by trying to measure the brightness of the totally eclipsed moon of 23 August. This was not altogether successful, and with the return of a number of comets, he concentrated on the “proper” work of the observatory<sup>16</sup>. However, he did publish a paper on an effect that he had noticed of regular annual fluctuations of the accuracy of the transit instrument when used to obtain local sidereal time. He ascribed this to the thermal influences from “the mass of brickwork” that composed the support of the “Equatoreal [sic] Telescope” (the Tomline refractor)<sup>17</sup>. However, there is no mention of any remedial work to verify or correct this supposed influence.

### 1878

The heavens were quiet again this year, so Plummer took the advantage of catching up on his mathematical reductions of previous cometary and stellar observations, publishing them in the *Astronomische Nachrichten*<sup>18</sup>. Also of note this year was Plummer’s improved calculation of the observatory’s longitude (4' 57.75" east). This determination is discussed in the Conclusions section below.

The observation of the transit of Mercury, which occurred on 6 May, was another high point in the year, eliciting the satisfied words:

“ [it] ... was very fairly observed, and afforded gratifying proof of the excellence of definition of the object glass.”<sup>19</sup>

However, in September of this year the telescope had to be dismantled to remove particles of rust from the declination axis bearing. A Mr Sims performed the work, after which Plummer noted that the instrument “has been quite satisfactory”<sup>20</sup>. This was most probably the Sims from Ransomes, Sims & Head, the Ipswich-based engineering firm that had built its mounting. In recent times a very similar problem has arisen again. The Orwell Astronomical Society is at present investigating options to rectify the problem.

### 1879

This was a good year for comets: Comets Brorsen, Swift, Hartwig and Palisa were visible. He lamented that observations on the latter two would have been better:

“if intelligence of their discovery had reached the observatory at an earlier date.”<sup>21</sup>

One can only wonder whether this was a general expression of despair, or was aimed at someone or some organisation in particular.

After five years Plummer also completed his determination of the observatory’s exact geographic co-ordinates. This is discussed further later in this paper. Plummer’s reports never mention any altitude measuring instrument, such as a meridian circle, so we must assume that he found the observatory’s latitude using a sextant.

### 1880

This was another good year for comets – especially Schäberle, Hartwig and Pechüle. This obviously kept Plummer busy as he made a resolution to complete the “considerable arrears of cometary work which have not been fully reduced.” He did, however, publish his results for comet Brorsen (1879) in *Astronomische Nachrichten*<sup>22</sup>.

This year also saw a new departure in the work of the observatory. Plummer became interested once again in lunar occultations, in the hope of “detecting and elucidating the phenomena of projection on the limb”<sup>23</sup>. This is possibly a reference to the diffraction effects on an occulted star caused by the edge of the Moon.

### 1881

So much for lunar occultations! This year was exclusively taken up with comet observations and fulfilling his ‘new-year resolution’ to remove the backlog of orbit reductions. However, he did mention that his observational work was hampered by unfavourable weather conditions, and, more mysteriously, “other causes.”<sup>24</sup>. Continuing his melancholic mood, he laments the fact that his cometary reductions depended upon out-of-date star catalogues for the positions of the reference stars, and the fact that the observatory lacked a meridian circle for determining the altitude of these stars.

Plummer also announced this year that he had obtained permission from Tomline to volunteer to assist Airy (the Astronomer Royal) during the forthcoming transit of Venus. Whether Airy had asked for Plummer, or whether he was a genuine volunteer, is unclear. However Airy must have

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known Tomline, because Airy's country home was only a few miles away at Playford. Furthermore, Tomline had employed Airy's son, Wilfrid, as the designing engineer for his observatory.

### 1882-1883

This annual report<sup>25</sup> is very much a 'catch-up' account of the observatory activities, because Plummer had been sent by the Royal Observatory, Greenwich to Bermuda for four months to observe the 1882 transit of Venus. Unfortunately, there appears to be no surviving record of his observations in the West Indies, other than to note that he gave a lecture on the subject at Harwich upon his return.

Four new comets were observed (I 1882, III 1882, I 1883 and Pons 1812), and many orbit reductions from previous observations were completed. His main complaint was still the difficulty he had in measuring accurately the positions of the reference stars.

### 1884-1886

This was another 'catch-up' report, as Plummer had been ill during this period<sup>26</sup>. Work was completed and published in *Astronomische Nachrichten*<sup>27</sup> on the following comets: 1884 III Wolf, 1885 I Encke, 1885 II Barnard, 1886 I Fabry, 1886 II Barnard and 1886 V Brooks I. He reported that the observations of two further comets - Barnard-Hartwig and Finlay - were being reduced.

### 1887

Observations of five more comets were reported in the observatory report for 1887<sup>28</sup> - Brooks, Barnard I, II & III, and Olbers. However, there was a notable change this year; Plummer started to submit his results to the *Monthly Notices of the Royal Astronomical Society*<sup>29</sup>, rather than in the *Astronomische Nachrichten*.

There is also an admission that comet tracking is what Plummer and the observatory did best, so that is what he is going to concentrate on in the future. There was a definite air of frustration in Plummer's tone, presumably as a response to the deficiencies of the equipment he had to hand.

### 1888

Bad weather and bad seeing conditions were the hallmark of this year's report<sup>30</sup>. Four comets were observed satisfactorily (Sawerthal I 1888, Brooks III 1888, Barnard e and f 1888) and results published<sup>31</sup>. Faye's comet was searched for but the conclusion was drawn that a 10-inch aperture was not sufficient to be able to observe this faint object

properly. Preparations were made to observe the occultations of small stars during the total eclipse of the moon on 28 January, but "were rendered futile by cloudy weather."

### 1889

This was Plummer's final report from the observatory<sup>32</sup>. In it he reported:

"... on August 25, after an illness of eight months, Colonel Tomline died at his residence in London."

He went on to say that the observatory was being closed up and that it was unclear whether funding (or "the means") would be available for him to complete the publication of the backlog of cometary data for the year.

Perhaps as an omen of Tomline's death, the declination axis of the telescope had become immovable several weeks before. The telescope was dismounted on 19 August, and the axis ground to the bearing, again by Mr Sims (again presumably of the manufacturer of the mounting, Ransomes & Sims). Plummer reported that after this attention the axis was "entirely satisfactory."

The outstanding orbital data that remained unpublished were for comets Barnard I and II 1889, Brooks 1889, Brooks 1890, Davidson 1889, Swift 1889, Barnard 1888 and Borelly 1890. Plummer completed his work at Orwell Park by publishing these results in 1890<sup>33</sup>.

### 1890 onwards

It may only have been coincidence, but the report following that of Plummer in the *Monthly Notices of the Royal Astronomical Society* for his last two years at the Observatory, was from the Hong Kong Observatory. It was to there that Plummer's career took him next, to take up the post of First Assistant. It was at this point that Plummer's association with Tomline's Orwell Park observatory ended.

### Conclusions

The 17 years during which Plummer worked at Orwell Park Observatory were fruitful. Obviously, his main contribution to Victorian astronomy was the observation and calculation cometary orbits, and highlighting the inaccuracies of contemporary star catalogues. In fact, it may have been this latter observation that led him to his post at Hong Kong Observatory, where he was instrumental, with William Doberck, in producing in 1905 a catalogue of right ascensions of 2120 southern stars<sup>34</sup>. More detail of Plummer's time at the Hong Kong Observatory has been published elsewhere<sup>35,36</sup>.



One enigma arising from Plummer's published work is the accuracy of his estimation of the position of the Orwell Park Observatory. Specifically, he needed to calculate the observatory's longitude to enable him to calculate the local sidereal time, and hence accurately to measure the position of stars and comets. As detailed above, to enable him to do this he had at his disposal a "small transit instrument". The first estimate he published in the *Monthly Notices of the Royal Astronomical Society* in 1875<sup>37</sup> was  $0^{\circ} 4' 55.8''$  east. Four years later he refined his estimate using the "Moon and culminators method", publishing the revised value in the *Monthly Notices of the Royal Astronomical Society*<sup>38</sup> as  $0^{\circ} 4' 57.75''$  east. He comments that this value was 2 seconds different from the Ordnance Survey value at that time.

This is an interesting result; the 2006 value derived from a global positioning system (G.P.S.) gives the longitude of the observatory as  $1^{\circ} 13' 50.0''$  east - more than 68 minutes difference! According to the Ordnance Survey map for Ipswich and Colchester (sheet 68) for 1838, Orwell Park Observatory is at longitude  $1^{\circ} 13' 58.8''$ , only about 8" different from the G.P.S. value.

What is the origin of the remarkable discrepancy? Was Plummer inept in his observational techniques, or in his calculations? The latter is unlikely, because during his time at Hong Kong Observatory he was congratulated for his mathematical skills in reducing stellar positions. Was there an editorial or printing problem at the Royal Astronomical Society? Again, this is unlikely, as he published similar values on two occasions four years apart. The spotlight of suspicion must now fall upon the accuracy, or otherwise, of the Orwell Park Observatory transit instrument, although this does not explain the comment about the 2 second discrepancy with the Ordnance Survey map. However, as already mentioned, in several of his annual reports, Plummer did comment on the inaccuracies of the transit instrument. It is also possible that the sidereal clock contributed to these anomalies. This mystery is still unresolved. It is planned to repeat Plummer's observations using the original transit instrument, which is still in the Orwell Park Observatory (Figure 4).

Plummer's 'fringe' activities such as apparent brightness measurement and lunar occultation effects did not appear as regular threads in his annual reports. Was this because he was thwarted by bad weather, or lack of equipment, or did he just lose interest?



**Figure 4**

#### **Orwell Park Observatory**

The tower containing the observatory is located at the end of the east wing (the Royal apartments) of the main house. The observatory itself is only the upper-most storey of this tower. The floor of the equatorial room is approximately at the level of ledge running around the building above the arched windows of the circular, terraced belvedere. The top of the dome is 77 feet above ground level. The transit room containing the Troughton and Simms, 1872, 3-inch transit telescope, is the upper storey of the small, attached octagonal building.

Photograph, looking north-west, published by courtesy of Mr K.G.Goward, Orwell Astronomical Society.

However, Plummer's reputation for orbital reduction analysis was obviously made and recognised during his early career at the Orwell Park Observatory. This presumably helped him gain a high position at the Hong Kong Observatory,, where he was to remain until his retirement in 1911. A detailed account of the difficult and sometimes humiliating time he had there from 1891 to his retirement, under the less than benevolent direction of August Wilhelm (William) Doberck, has been published by Professor Kevin MacKeown<sup>39</sup>.

John Isaac Plummer died in Oxshott, Surrey on 6 February 1925, at the age of 80 years<sup>40</sup>. He was married to Marion, and had a daughter, Beatrice Mary (born 1876) and a son, John Archibald (born 1878). In recent times Plummer's great grandson, Richard Bellamy-Brown, has been introduced to the place of his forebear's work.

# Notes and References

1. The designation 'Colonel' was bestowed on Tomline by the Suffolk Militia, although he never undertook military training or service.
2. James Appleton. Web-published document entitled *John Isaac Plummer*. Ipswich: Orwell Astronomical Society. This document was compiled by James Appleton from articles by Roy Gooding, Ken Goward, Charles Radley and Paul Whiting in the Orwell Astronomical Society Journal. See [www.oasi.org.uk](http://www.oasi.org.uk).
3. Plummer, J. Colonel Tomline's observatory, Orwell Park, Ipswich. *Monthly Notices of the Royal Astronomical Society*. 1875, 35, 194-195.
4. Georg Merz (1793-1867) learned his trade as a lens crafter under Joseph Fraunhofer (1787-1826) in Munich, eventually taking over the latter's business after his death.
5. Reference 3. Page 195.
6. see Reference 2.
7. Plummer, J. Note on the Zodiacal Light. *Monthly Notices of the Royal Astronomical Society*. 1874, 35, 63-64.
8. Plummer, J. Observations of Comet V, 1874 (Coggia's) made at the Orwell Park Observatory. *Astronomische Nachrichten*. 1875, 85, 277-282.
9. Plummer, J. Colonel Tomline's Observatory, Orwell Park, Ipswich. *Monthly Notices of the Royal Astronomical Society*. 1876, 36, 172-173.
10. Reference 2.
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12. Plummer, J. Colonel Tomline's Observatory, Orwell Park, Ipswich. *Monthly Notices of the Royal Astronomical Society*. 1877, 37, 175-176.
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17. Plummer, J. On the Supposed Influence of a Mass of Brickwork upon the Errors of a Transit Instrument in its Neighbourhood. *Monthly Notices of the Royal Astronomical Society*. 1878, 38, 367-369.
18. Plummer, J. Results of Observations of Comets Made at

- the Orwell Park Observatory 1877. *Astronomische Nachrichten*. 1879, 94, 65-70.
19. Plummer, J. Colonel Tomline's Observatory, Orwell Park. *Monthly Notices of the Royal Astronomical Society*. 1879, 39, 253.
20. As Reference 19.
21. Plummer, J. Colonel Tomline's Observatory, Orwell Park, near Ipswich. *Monthly Notices of the Royal Astronomical Society*. 1880, 40, 231-232.
22. Plummer, J. Observations of Brorsen's Periodical Comet made at Orwell Park Observatory near Ipswich 1879. *Astronomische Nachrichten*. 1880, 96, 329-334.
23. Plummer, J. Colonel Tomline's Observatory, Orwell Park. *Monthly Notices of the Royal Astronomical Society*. 1881, 41, 209-210.
24. Plummer, J. Colonel Tomline's Observatory, Orwell Park, Ipswich. *Monthly Notices of the Royal Astronomical Society*. 1882, 42, 168.
25. Plummer, J. Colonel Tomline's Observatory. *Monthly Notices of the Royal Astronomical Society*. 1884, 44, 174.
26. Plummer, J. Colonel Tomline's Observatory. *Monthly Notices of the Royal Astronomical Society*. 1887, 47, 161.
27. Plummer, J. Observations of Comets. *Astronomische Nachrichten*. 1886, 115, 289-292.
28. Plummer, J. Colonel Tomline's Observatory, Orwell Park, Ipswich. *Monthly Notices of the Royal Astronomical Society*. 1888, 48, 197.
29. Plummer, J. Observations of Comets at Orwell Park Observatory. *Monthly Notices of the Royal Astronomical Society*. 1888, 48, 55-61.
30. Plummer, J. Colonel Tomline's Observatory, Orwell Park. *Monthly Notices of the Royal Astronomical Society*. 1889, 49, 204-205.
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35. Mckeown, K. William Doberck - A Stormy Career Founding the Hong Kong Observatory. *Journal of the Royal Asiatic Society, Hong Kong Branch*. 2004, 44., 5-39.
36. See Reference 2.
37. Reference 3. Page 195.
38. In Reference 19.
39. Reference 35.
40. Despite many searches, no formal obituary notice for Plummer has yet been located.

