

John Tebbutt, Australian Amateur Astronomer and his Observatories in Windsor, N.S.W.

by
Sammy Yousef
46 Delaney Drive
Doonside,
N.S.W. Australia 2767
syousef@bigfoot.com

This Essay was prepared as part of the requirements for the 2001 Astronomy Internet Masters Semester 2 “Topics in the History of Astronomy” run by the University of Western Sydney, Australia.

1 ABSTRACT

Beginning with the simplest of instruments instruments, John Tebbutt progressed to build amateur observatories on his land in the Peninsula, Windsor N.S.W., Australia, in order that he may pursue his passion for Astronomy. The first observatory was built shortly after Tebbutt's discovery of the first of two comets credited to him. (Orchiston W. 1988: 12) The observatories were constructed for his exclusive use in the pursuit of serious scientific work such as undertaken by few amateurs of his day. He lived in an era when a dedicated amateur could carry out much the same work as his professional counterpart, and his contributions to the science of Astronomy were thus significant.

The work undertaken at the observatories is so varied and rich that it has been described as a one man attempt at running "a Southern Hemisphere Greenwich Observatory". (White G. 1986 Op. Cit. Tebbutt J. 1986 reprint: vi). John Tebbutt's calculations of the orbit of Halley's comet were so precise that they were used by the European Space Agency (with other observational data) to compute the course of the Giotto spacecraft which rendezvoused with Halley during its next appearance. (White G. 1986 Op. Cit. Tebbutt J. 1986 reprint: xiii)

As a result of his remarkable life's work, John Tebbutt has become one of the legendary figures of Australian astronomy. A lunar crater was renamed in his honour in 1973 (Sydney Morning Herald 1973: 9 Op. Cit. Tebbutt J. 1986 reprint: back cover) and, in 1984, a print of the Australian \$100 note featured John Tebbutt portrayed in front of his observatory. (White G. 1986 Op. Cit. Tebbutt J. 1986 reprint: xix)

This paper presents a brief outline of John Tebbutt's life and work. His background, and motivation are examined, as are his involvements in scientific and astronomical politics.. Details of the location and construction of the Tebbutt observatories, and the instrumentation they contained throughout the years of the observatory's operation are described. John Tebbutt's achievements and publications in the popular press and scientific journals are also discussed. Finally, the relevance of Mr Tebbutt's observations to modern Astronomy, and the current status of the observatory site are presented.

2 INDEX

2.1 Contents

1	<i>Abstract</i>	2
2	<i>Index</i>	3
2.1	Contents	3
2.2	Table of Figures	3
3	<i>Introduction</i>	4
4	<i>Amateur Astronomer - John Tebbutt</i>	6
4.1	Early Development	6
4.2	Career and Nature	6
4.3	Legacy.....	8
4.4	Scientific Discoveries and Contributions	8
4.5	Recognition.....	9
5	<i>The Observatories</i>	11
5.1	Geographic Location.....	11
5.2	Construction.....	11
5.3	Instrumentation	15
5.4	Current Status of the Observatory.....	16
6	<i>Conclusion</i>	17
7	<i>Acknowledgements</i>	18
8	<i>References</i>	19
9	<i>Appendices</i>	21
9.1	Appendix 1 – John Tebbutt: A Timeline of Key Events	21

2.2 Table of Figures

Figure 1 - The John Tebbutt Observatories	4
Figure 2 - Medals Earned by John Tebbutt in his Own Lifetime	9
Figure 3 - John Tebbutt on the Australian \$100 Note	10
Figure 4 - John Tebbutt and His First Observatory	11
Figure 5 - Face of the Large Ornate Observatory of 1879.....	12
Figure 6 - Elevation Plans of the Main Observatory	13
Figure 7 – The Structure of 1894	13
Figure 8 - Floor Plan of the standing John Tebbutt Observatories	14
Figure 9 - A Telescope by Swift and Son, London, circa 1865	15
Figure 10 - John Tebbutt and the Grubb Equatorial	16

3 INTRODUCTION

Through the years, John Tebbutt built four observatory buildings on his estate, in the Peninsula, Windsor N.S.W., Australia. These were constructed primarily, and almost exclusively for his own personal use in pursuing serious scientific observation.

The first was a simple pine and slate structure built on the land of his father's residence in 1863 and comprising a transit room, and a prime vertical room. He built this structure with his own hands. In 1874, Tebbutt added a circular equatorial building made of pine. The 1863 structure was superseded in 1879 by a larger, more substantial brick observatory. The largest of his observatory buildings, this 1879 building comprised a library, second floor equatorial room, meridian and transit rooms, and a computation room/office. (Tebbutt J. 1887 Op. Cit. Tebbutt J. 1986 reprint: 107-109). Finally the 1874 structure was replaced with a larger brick building with an iron roof in 1894. (Ragbir B. 1993: 50)



Figure 1 - The John Tebbutt Observatories

On the left we see a side-on view of the 1879 structure. The dome on the left and the library, towards the centre of the picture are most prominent. On the right we see the structure of 1894 Photo by the author. (2001/09/02)

As with the buildings themselves, the instruments housed became more expensive and elaborate as Mr Tebbutt gained the means to improve them. Beginning with 2 telescopes, 2 timepieces, a sextant and an artificial horizon, Tebbutt furnished the observatories with larger aperture instruments, culminating in an 8 inch equatorially mounted refractor by Grubb of Dublin - the observatory's largest main instrument. (Tebbutt J.1887 Op. Cit. Tebbutt J. 1986 reprint: 113).. Tebbutt was a practical man and took a lifetime to build to larger instruments, pushing the very limits of what could be done with what he had at any given time.

With these instruments, John Tebbutt was able to do work that rivalled that of professional astronomers of the day. Among his achievements are the discovery of 2 comets, the determination of the positions and calculation of the orbits of numerous comets with predictive accuracy that won him respect in the field, study of lunar

occultations and eclipses, the study of our moon and the moons of other planets, the observation of variable stars including the study of their light curves and periods, as well as the maintenance of accurate time and metrological services for the local community.

John Tebbutt's work spanned 60 years, over 400 scientific papers, and numerous articles in the popular press. He did much to bring astronomy to the public eye and earned international respect and recognition, within the astronomical community and beyond its boundaries. Though he died in 1916, he has continued to be honoured and for those with any knowledge of the field, his name is synonymous with great Australian Astronomy.

4 AMATEUR ASTRONOMER - JOHN TEBBUTT

4.1 Early Development

John Tebbutt was born in 1834 May 25th to John (senior – the family traditionally called the first born son John) and Virginia Tebbutt. His only other sibling, Ann, had died in her infancy leaving John to grow up an only son.

The family operated a supply store between 1834 around and 1843, which “ultimately became the main source of supply for the Hawkesbury district” (Tebbutt J. 1907 Op. Cit. Tebbutt J. 1986 reprint: 3). Tebbutt’s parents ensured he had a sound education, despite his growing up in the colonies. John began his schooling at the local Church of England Parish school where he was tutored by Edward Quaife. His tutor’s interest in astronomy and “good knowledge of its outlines” was a strong influence on a young John, leading to a long running correspondence between the two. (Ragbir B. 1993: 14)

At about the time his father sold the store and returned to the pursuit of farming. John was now schooled by a Rev. Mathew Adam, of the local Presbyterian church. About 2 years later, he was moved to a school consisting of 6 students, 4 of which were the children of the school master – Rev. Henry Tarlton Stiles. Stiles, who had a classical education, exposed his pupils to Latin, French, Algebra, and Euclidean geometry among other subjects. In these church schools John Tebbutt excelled in all areas of intellectual pursuit, though he did not fare well at sports. (Ragbir B. 1993: 13) The religious nature of his schooling was also to have a profound effect on Tebbutt.

Other early scientific interests were in mechanics and mathematics. As a boy he became familiar with farm machinery, steam engines and clockwork, learning the detail of the workings of each mechanism, driven by his own curiosity, and finding the mastery of the concepts exhilarating. In his memoirs Mr Tebbutt recalls that, in part due to study with globes he came to consider the Universe as the ultimate mechanism. To investigate, John secured a small marine telescope, a sextant and a copy of Noire’s *Epitome of Navigation*. Tebbutt’s passion for astronomy grew to the point where he eventually abandoned almost all other work for his endeavours in astronomical research, initially to the concern of his family. (Tebbutt J. 1907 Op. Cit. Tebbutt J. 1986 reprint: 4-5)

4.2 Career and Nature

Despite achieving notoriety early on, particularly for his popular accounts of cometary observations and calculation, Tebbutt remained an amateur by choice, having declined the post of Government Astronomer more than once. (Death of Mr. John Tebbutt 1916 Op. Cit. Tebbutt J. 1986 reprint: 145). Though his reasons are not recorded, there has been a great deal of speculation as to why. Firstly, he could enjoy the freedoms his amateur status offered him, being able to set his own program of observation and scientific study without having to answer to superiors with wider responsibilities and agendas. His choice may also fitted with his sense of duty to carry on the family farm, being the only son in the family. Also, with a young family of his own to raise - a young wife and 3 daughters at the time, he may have considered the

Windsor property a better environment for them. (Orchiston W. 1988(2)). In any case the farm could be more economically profitable in a good year than a government post. There is also his publicly recorded belief that science should be best carried out by “privately funded enterprise” doubtless also contributed to the decision. (Ragbir B. 1993: 17-18)

Nonetheless, Mr Tebbutt was an outspoken member of the community. He wrote often in the Sydney Morning Herald, beginning with observations of sunspots which first brought him public attention, and writing passionately about the comets he observed. He also wrote on religion and scientific as well as farming politics. When a subject he felt strongly about was deemed inappropriate for publication by the paper - it was not unknown for John Tebbutt to have pamphlets printed for distribution in and around Sydney at his own expense.

By nature, John Tebbutt’s standards were high. He was outspoken on issues of morality and highly religious, having written religious pamphlets on, amongst other things, the atheistic trend which swept science on wide circulation of Darwin’s *Origin of the Species*. He expected all appointments made with him to be kept and all loan items to be returned punctually. When this did not happen he would not be hesitant in expressing his displeasure regardless of his relationship with the offender. (Ragbir B. 1993: 33-39)

While his meticulous nature may have aided him in his work, these tendencies could isolate him from the amateur and professional astronomers of his day alike. For the professionals, this was exacerbated by the rivalries and squabbles that developed over science and the politics of science, and his refusal to take an official post no doubt also played a role as amateur and professional science began to differentiate themselves during Tebbutt’s lifetime.

A good example of a relationship with a professional astronomer strained by Tebbutt’s direct and outspoken nature, is the cooling of his friendship with Sydney Observatory’s third director, Henry Chamberlain Russell. The two began as fast friends who would spend time with one another at Sydney Observatory. where Tebbutt was a frequent guest of Russell’s. (Ragbir B. 1993: 20-28) As time passed petty differences: missed appointments, a lack acknowledgement of Tebbutt’s work by Russell, and Tebbutt’s view that Sydney Observatory was increasingly devoting its time to meteorology at the expense of astronomy; led to a situation often described as a feud, in which Russell and Tebbutt discredited or ignored each other’s work at every opportunity, ending only with Russell’s death. (Orchiston W. 2000)

The same diligence isolated him from amateurs of the day because few were as willing to take upon themselves the burdens of disciplined, methodical and consistent observation, which Mr Tebbutt rightly saw as vital to making any real contribution to science. Tebbutt’s early abortive involvement in trying to set up an Australian comet seeking society left him bitter and somewhat disillusioned. He could find no more than a handful of amateurs willing to commit to the required research, and those amateurs who indicated willingness did not indeed fulfil their obligations. For a long time Tebbutt retreated, contributing to scientific societies such as the Royal Society of New South Wales, but not taking a leadership role.

Eventually, the breakdown of Section A of the Royal Society of New South Wales, which concerned itself with astronomy among other subjects, due to bickering between amateurs and professionals within its ranks led to Tebbutt's involvement in the establishment of a New South Wales branch of the British Astronomical Association. His well established name meant that he became its first president. This post he held for 2 years, between 1895 and 1897, relinquished eventually along with all deep involvement when age and failing health made it more difficult to attend meetings in Sydney. (Ragbir B. 1993: 25-27)

4.3 Legacy

John Tebbutt died on 1916 November 29th, at the age of 82. His wife, Jane (maiden name Pendergast), who he had married in 1857 at St. Mathew's church, Windsor, and 3 daughters – Ann Elizabeth, Mary Alice and Victoria Suzannah pre-deceased him. He was survived by a son, John Thomas, and 3 daughters – Virginia Sarah, Emily Frances and Jane Margaret. (Nicholls M. ---- Op. Cit. Tebbutt J. 1986 reprint: 103).

John Tebbutt was buried in a lead coffin in the family vault at St Mathew's church Windsor. The vault was designed by him and built under his supervision around 1910, and commemorates his involvement in astronomy. (Tebbutt J. 1986 reprint: 143).

Little has been written about his family, but it has been noted that he was unfortunately the only member of his family with a passion for astronomy. The observatories he built therefore ceased operation with his death.

4.4 Scientific Discoveries and Contributions

Tebbutt's primary body of work was conducted between the years of 1853 and 1907, having built his first observatory at the age of 27 and ceased systematic work on his 70th birthday. Some further observation took place in 1910 and 1911 focusing this time on 2 comets (including Halley's comet) and variable stars.

The work was diverse, though there was considerable focus on the observation of comets, and the calculation of their orbits. Tebbutt is credited with the discovery of 2 comets: Tebbutt 1861 II (C/1861 J1) and Tebbutt 1881 III (C/1881 K1) (Orchiston W. 2001). His cometary observation record is enviable and includes having plotted 700 comet and asteroid positions between 1880 and 1899, more than twice the total number produced by government observatories in Sydney, Melbourne and Adelaide over the same period. In total Mr Tebbutt published over 400 papers in scientific journals, and for several years his observatory put out a "business like" annual report . (Ashbrooke J. Op. Cit. Tebbutt J. 1986 reprint: 127)

His non-cometary work included the maintenance of a local time service - calculating the local mean time with an accuracy of half a second using transit instruments; a basic meteorological service; calculation of the precise the geographic location of the observatory; lunar eclipses and occultations; planetary satellite observation; and the study of variable stars - including observation and the calculation of their periods and plots of their light curves.

John Tebbutt's astronomical work is recognised for its accuracy and quality, with the data gathered remaining scientifically valuable to the present day, particularly since he would watch the same object on enough successive occasions to make the records worthwhile. For example the data he obtained on the orbit of Halley's comet was selected by the European Space Agency, along with other data, to calculate Halley's comet's orbit with the aim of ensuring the successful rendezvous of the Giotto spacecraft.

The brightness of Eta Carinae and R Carinae is another example. Tebbutt estimated the brightness of Eta Carinae on 241 nights between the years of 1854 and 1898. For R Carinae 450 estimates were made between 1880 and 1898 (Orchiston W. 2000(2)). This data gives today's astronomers a solid picture of the variability of these stars – an irreplaceable record that could only result in the meticulous work of such men as Tebbutt. This knowledge is crucial to our current understanding and modelling of such phenomenon.

4.5 Recognition

John Tebbutt was the first president of the New South Wales chapter of the British Astronomical Association. He was also a Fellow of the Royal Astronomical Society, London, a corresponding member of the Alliance Scientifique Universelle of Paris, Queensland Branch of the Royal Geographic Society of Australasia, and of the Sociedad Cientifica "Antonic Alzate" of Mexico, as he states in the subscript to the title of his memoirs.

In his own lifetime, he was awarded the Silver Medal of the Paris Exhibition in 1867 for a paper titled "*On the progress and present state of Astronomy in New South Wales*". In 1905 he received the Jackson-Gwilt Medal and Gift from the Royal Astronomical Society of London. (Tebbutt J. 1986 reprint: 132-133).



Figure 2 - Medals Earned by John Tebbutt in his Own Lifetime

The Silver Medal of the Paris Exhibition of 1867 and the Jackson-Wilt Medal of the Royal Astronomical Society of London. Taken from Tebbutt J. 1986 reprint, pages 132-133

More recently, a crater on the moon has been renamed after Mr Tebbutt (Sydney Morning Herald 1973 Op. Cit. Tebbutt J. 1986 reprint), and he has appeared on one face of the Australian \$100 note on March 26, 1984. (White G. 1986 Op. Cit. Tebbutt J. 1986 reprint: xix).

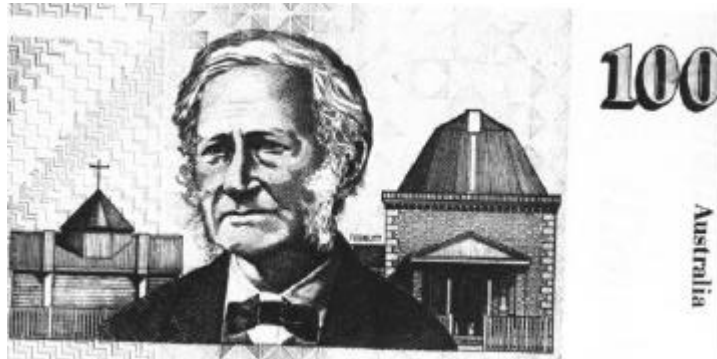


Figure 3 - John Tebbutt on the Australian \$100 Note

Australian \$100 note circa 1984 Note the Tebbutt Observatory in the background. Taken from Tebbutt J. 1986 reprint, page xix

5 THE OBSERVATORIES

5.1 Geographic Location

The Tebbutt observatories were built on the one property in the Peninsula, Windsor N.S.W., Australia. The site stands on a hill “about 50 feet above the local tidal level” and “surrounded by the courses of the Hawkesbury river”. (Tebbutt, J. 1887 Op. Cit. Tebbutt J. 1986 reprint: 107).

Windsor lies about 60km North West of Sydney and the observatory has a Longitude of 10h 3m 20.8 East and Latitude of 33 degrees 36 minutes and 30.8 seconds South. These co-ordinates were initially derived by observing moon-culminations and the local occultations of stars, together with telegraphic signal from Sydney Observatory, and through the use of the observatory’s three inch transit telescope in 1881. (Tebbutt, J. 1887 Op. Cit. Tebbutt J. 1986 reprint: 116).

5.2 Construction

John Tebbutt’s first observatory of 1863 was small with pine walls and a slate roof. It stood on the western side of the Tebbutt residence, with an elevated equatorial tower and two additional rooms: a transit room with two meridian peers and corresponding openings in the wall and roof; and a prime vertical room (Tebbutt, J. 1887 Op. Cit. Tebbutt J. 1986 reprint: 107-109). The timber of the dome was covered by canvas, with both the inside and outside walls of the observatory painted white. Tebbutt proudly reports that in constructing this observatory he acted as “the carpenter, the bricklayer and the slater” and that the observatory was “wholly the work of my own hands”. The building was designed to be functional but not particularly ornate (in stark contrast to the government observatories of the day), with Tebbutt recognising the need to focus his limited funds on instrumentation. On completion of this original observatory, John Tebbutt stated that “I now regarded myself in a position to do something respectable for Astronomy”. (Ragbir B. 1993: 49).



Figure 4 - John Tebbutt and His First Observatory

The work of John Tebbutt’s own hands, this observatory no longer stands. Taken from Tebbutt J. 1986 reprint, page 151

Just over 10 years later in 1874, a second building was added. This was “a circular building of pine, twelve feet [3.65 meters] in diameter”. It was built a few meters south east of the original observatory and was to house his largest equatorial instrument. This building was also relatively plain and functional.

In 1879, the Tebbutt added his third and largest building. This building was constructed from brick and was built to inspire “a sense of beauty and permanence”. (Ragbir B. 1993: 51). Half of the building centred around a pier which passed through the roof of the ground floor office/computing room and into the equatorial room on the second floor. The roof was covered with six shutters, which when open allowed for horizon to horizon viewing. Surrounding this were a prime vertical room on the south, a meridian transit room on the east, and a library. This complex observatory, out of which Tebbutt was doing quality work, appeared in the ephemerides of the astronomical institutions of several countries including France, Britain and the United States. Most notably it was listed in the British Nautical Almanac. (Ragbir B. 1993: 51).



Figure 5 - Face of the Large Ornate Observatory of 1879.

Photo by the author. (2001/09/02)

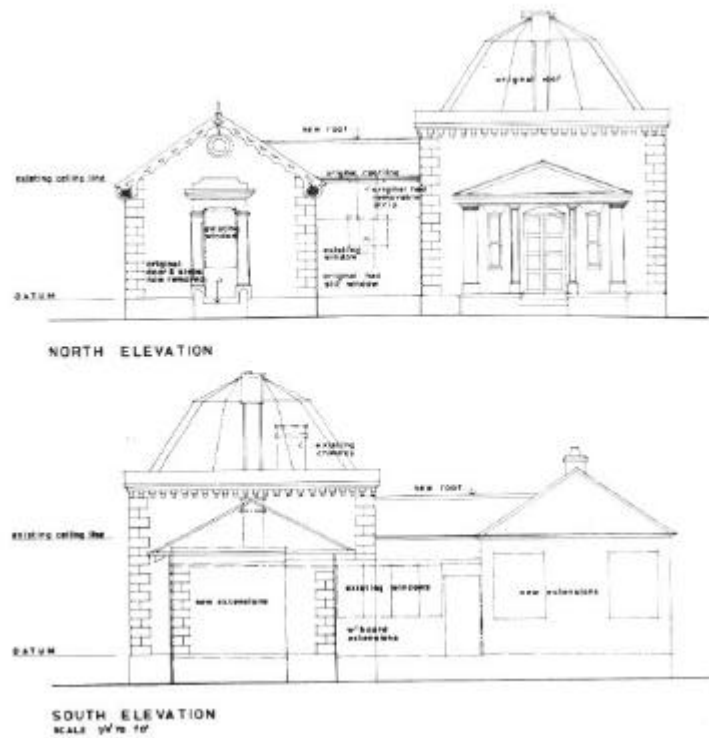


Figure 6 - Elevation Plans of the Main Observatory

Taken from Tebbutt J. 1986 reprint, page 118

Finally in 1894, the pine building of 1874 was replaced with a larger brick building of internal diameter 5.5 meters. The roof of this new equatorial room was also relatively elaborate. This was a 10 sided pyramidal galvanised iron structure, with 45.7cm diameter openings, which rotated on 10 wheels fixed to a track/rail. Tebbutt's main goal in the construction of this building was "the comfort of the observer", presumably becoming more important to his health in his later years. (Ragbir B. 1993: 50).



Figure 7 – The Structure of 1894

Note the metal roof, larger than the 1879 structure's but built along similar lines. Photo by the author. (2001/09/02)

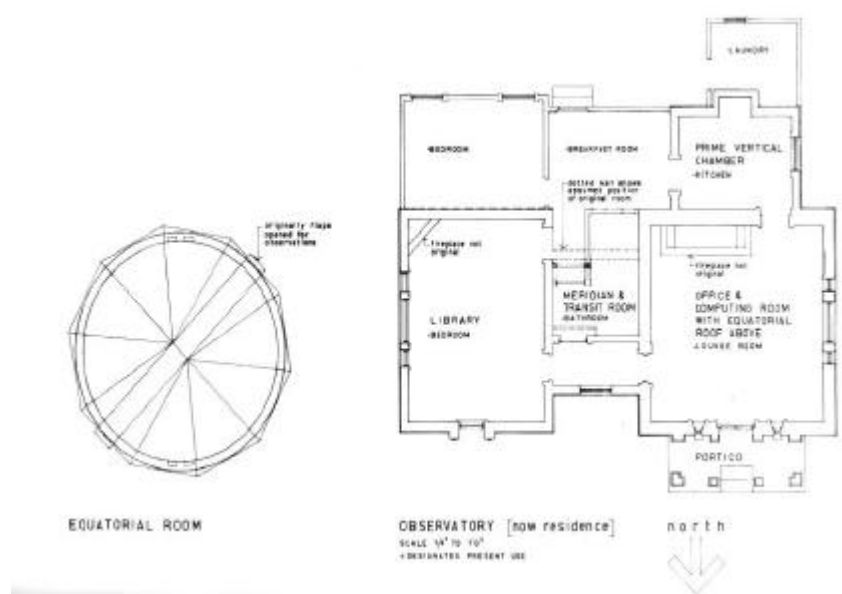


Figure 8 - Floor Plan of the standing John Tebbutt Observatories

Taken from Tebbutt J. 1986 reprint, page 122

At this point, John Tebbutt had three observatory buildings. His original observatory was somewhat redundant, and is the only one of the three that no longer stands.

5.3 Instrumentation

When John Tebbutt bought his first instruments in 1853 to begin observing astronomical phenomenon, they were simple and humble in nature – a sextant, a small marine telescope of 1 5/8-inches (4.2 cm) aperture, and a Scotch eight day grandfather clock with seconds pendulum. He initially observed from the veranda of his father’s house. The first observations on which he wrote publicly were observations of sunspots projected through his telescope, published in the Sydney Morning Herald. (White G. 1986 Op. Cit. Tebbutt J. 1986 reprint: 5). In 1861, a 3 ¾ inch (9.5 cm) aperture, 48 inch (122cm) focal length refractor manufactured by Jones was purchased. This telescope came complete with a finder and a range of six eyepieces with magnifying powers of 30 to 120. These were John Tebbutt’s instruments when he built his first observatory.



Figure 9 - A Telescope by Swift and Son, London, circa 1865

This telescope was reputed to belong to either Rev. Scott or John Tebbutt. Taken from Tebbutt J. 1986 reprint, page 152

Within a year of the observatory being built, John Tebbutt had added an eight day half seconds box chronometer by Parkinson and Frodsham (No. 1042), and a transit telescope made “expressly for the observatory” by A. Tornaghi of Sydney. Originally this was a 2.1 inch (5.3 cm) aperture 20 inch (50.8 cm) focal length refractor. The objective was however replaced when it was broken in 1871 by a 2 inch (5.1 cm) objective with longer focal length. The setting circle had was 5 ½ inches (14 cm) in diameter with divisions of 20’ and verniers of 20”. The stand for the instrument was converted from a heavy metal stand to a V-shaped one in 1867. (Tebbutt J. 1887 Op. Cit Tebbutt J. 1986 reprint: 7-8).

The pine circular building of 1874 was built and the Jones refractor moved to it, and mounted on a central pier equatorially. In 1870, a larger telescope was again bought. This time a 4 ½ inch (11.4 cm) refractor of 70 inches (178 cm) by Cook and Sons of York. As the primary instrument it was mounted in the circular secondary building, and the older telescope moved to the main building. Finally, in 1886, this telescope was replaced by an 8 inch (20.3 cm) refractor focal length 9 feet 7 inches (292 cm) made by Grubb of Dublin, and originally imported by another amateur, Dr Bone of Victoria, who had passed away. It was purchased for “400 pounds, or about two-thirds of the original cost” says Tebbutt in his memoirs. (Tebbutt J. 1887 Op Cit. Tebbutt J. 1986 reprint: 113).



Figure 10 - John Tebbutt and the Grubb Equatorial

John Tebbutt with his largest Telescope – the 8”
Equatorial refractor by Grubb of Dublin. Taken from
Tebbutt J. 1986 reprint, page 117

The instrumentation of the Tebbutt observatories was as diverse as the work required and only some of the major instruments have been outlined here. Additional equipment such as “a complete set of meteorological instruments, which included a barometer, a hygrometer and nine different thermometers, a rain gauge and two evaporimeters” was bought to furnish the observatory. Tebbutt also “constructed his own anemograph, which was installed in the equatorial tower of the 1863 observatory.” (Ragbir B. 1993:52)

5.4 Current Status of the Observatory

Today the 1879 and 1894 buildings still stand. They have been heritage listed since 1975, with the larger structure of 1879 is known as Peninsula house. (Sydney's Hills & Hawkesbury districts Online). The observatories are owned by Mr Tebbutt's descendants and are run as a hire site for wedding photography. A local museum is partly complete and the stated intent of the family is to open it for the public when it is complete and when the site isn't being used for wedding photography. (Fairfax Walkabout). The observatory has not operated since the death of Mr Tebbutt, since no other member of the family had John Tebbutt's passion for Astronomy.

6 CONCLUSION

John Tebbutt and his amateur observatories played an important and unique role in the Australian Astronomy of the 19th and early 20th Centuries. At this time, an amateur astronomer could do much the same work as his professional counterpart – few however did, and none as much as Tebbutt. The systematic observation and analysis of data required to do such serious work were generally too much of a burden to the casual amateur. Not so for John Tebbutt, who worked tirelessly, single handedly running “a Southern Hemisphere Greenwich Observatory”. (White G. 1986 Op. Cit. Tebbutt J. 1986 reprint: vi)

Tebbutt took the time to develop his skills, build his first observatories by hand, build and purchase equipment, and study a wide variety of astronomical phenomenon. He worked alone and published a wealth of scientific data and popular accounts of the astronomical events he observed. This led to fame and recognition amongst his peers and the public, in both local and international circles.

His work was diverse ranging from meteorological examination and timekeeping to solar and planetary observation, and the observation of natural satellites, to his first love - the observation of comets, and extending beyond the solar neighbourhood to the observation of variable stars. He often outdid his professional colleagues in the accuracy and quantity of data he collected and reduced – much of this data is still scientifically valuable today.

Astronomy has evolved and progressed. Most of the breakthroughs in astronomy are made with sophisticated equipment and require in depth knowledge of “the new Astronomy” - Astrophysics. This makes it more difficult for today’s amateur to contribute to astronomy in the way John Tebbutt did. Other avenues are opening up for the amateur such as the use of professional data and software on home PCs. Some of the data collected by professionals cannot be analysed due to funding restrictions. However, the state of the science make it impossible that Australian astronomy will see the same kind of amateur as John Tebbutt again – an all rounder who does it all by himself, from observation to the analysis, reduction and interpretation of data, and the publication of is results . John Tebbutt did this and did it well – his accuracy, and the quantity of data he collected was to rival any professional of his time. For the foreseeable future, John Tebbutt’s unique place in Australian Astronomical history remains secure.

7 ACKNOWLEDGEMENTS

In gathering information for this work an number of people have been very helpful.

For allowing me to photograph the outside of the Tebbutt observatory, I thank the Tebbutt family, current owners of the observatory.

I would like to thank the staff of the N.S.W State and Mitchell libraries for helping me get access to a copy of the biography by Ragbir, and the staff of the Windsor library N.S.W. for providing me with a copy of the 1986 reprint of the Astronomical Memoirs of John Tebbutt.

For his support as the lecturer of History of Astronomy at U.W.S. and for providing me with copies of his numerous published work on John Tebbutt, I would like to thank Dr. Wayne Orchiston.

I would also like to thank Alex Hons for his continued support throughout the AIM program.

8 REFERENCES

Ragbir B. 1993. *Australian Astronomer John Tebbutt. The life and World of the Man on the \$100 note*

Kangaroo Press Kenthurst New South Wales
ISBN 0864175221

Orchiston W. 1988. *John Tebbutt: An Australian Astronomer of Note*

Astronomy Now Magazine 1988 volume 2(5) pages 11-16

Orchiston W. 1988(2). *Illuminating incidents in antipodean astronomy: John Tebbutt and the Sydney Observatory directorship of 1862.*

Australian Journal of Astronomy 1988 October, pages 149-158

Orchiston W. 2000. *Politics and personalities in Australian astronomy: the Russell – Tebbutt feud.*

Anglo-Australian Observatory Newsletter Number 95. November 2000, pages 8-11.

Orchiston W. 2000(2). *John Tebbutt of Windsor, New South Wales: A Pioneer Southern Hemisphere Variable Star Observer*

Orchiston W. 2001. *Sentinel in our Southern Heavens: The Windsor Observatory of John Tebbutt*

Journal of the Antique Telescope Society 2001, page 24

Tebbutt J. 1986 reprint, *Astronomical Memoirs*

Windsor N.S.W Australia: Hawkesbury Shire Council

1986 reprint, including additional material

ISBN 0 949694 08 8

This publication contains:

----, 1973. *Australian Wins Place on the Moon*

Sydney Morning Herald

1973 August 28th, p. 9

----, 1916. Obituary: *Death of Mr. John Tebbutt, Famous Australian Astronomer*

Windsor and Richmond Gazette

1916 December 8, Friday

Ashbrooke, J., ----. *John Tebbutt, His Observatory, and a Probable Nova*

Kimpton, C. 1980. *John Tebbutt – Amateur Astronomer*

9th National Australian Convention of Amateur Astronomers.

Host Organization: Astronomical Society of Geelong

Nicholls M. ----. *Extract of the Tebbutt Family Tree*

Tebbutt, J. 1887. *History and Description of Mr Tebbutt's Observatory, Windsor New South Wales*. Joseph Cook and Co.: Sydney, N.S.W Australia:

Tebbutt, J. 1908. *Astronomical Memoirs*
Frederick W. White: Sydney, N.S.W Australia

White G. 1986. *Introduction* [to the Tebbutt Memoirs.]

Bright Sparcs

Taken from the History of Australian Science and Technology Bibliography

Tebbutt, John (1834 - 1916)

<http://www.asap.unimelb.edu.au/bsparcs/bsparcshome.htm>

<http://www.asap.unimelb.edu.au/bsparcs/bib/P000826p.htm>

Revised: 1999 November 8th

Fairfax Walkabout Australian Travel Guide

Locations: N.S.W.: Hawkesbury: Windsor

<http://www.walkabout.com.au/fairfax/locations/NSWWindsor.shtml>

Peninsula House, Tebbutt's Observatory

http://www.interimtechnology.com.au/heritage/inventory/search/item_view.cfm?itemid=5045697

Revised: 1997 September 30th

Sydney's Hills & Hawkesbury districts Online

Heritage listed sites

<http://www.loom.net.au/home/tiger/hills/history2.htm>

9 APPENDICIES

9.1 Appendix 1 – John Tebbutt: A Timeline of Key Events

Date	Event
1834 May 25 th	John Tebbutt born.
1843	Family supply store sold. John's family returns to farming.
1854	Earliest Publication in the Sydney Morning Herald on Sunspots.
1857	Married to Jane Pendergast.
1861	Discovery of first comet - Tebbutt 1861 II (C/1861 J1) - The Great Comet of 1861.
1861	Purchase of 3 ¾ inch Jones refractor.
1863	First observatory built.
1867	Awarded Silver Medal of the Paris Exhibition Commissioners.
1870	Purchase of 4.5 inch Cook and Sons refractor.
1873	Elected fellow of the Royal Astronomical Society of London.
1874	Second observatory building constructed from pine.
1879	Main (largest) observatory built.
1881	Discovered second comet - Tebbutt 1881 III (C/1881 K1)
1886	Purchase of 8 inch Grubb refractor.
1894	1874 structure replaced with a larger brick structure.
1895-1897	President New South Wales branch of the British Astronomical Association.
1907 May 25 th	Ceases systematic work.
1905	Receives the Jackson-Gwilt gift and medal of the Royal Astronomical Society of London.
1908	Publishes Astronomical Memoirs.

1910	Observation of Halley's comet.
1916 November 29 th	John Tebbutt deceased.
1975	Standing observatories heritage listed.
1973	Moon crater renamed after Mr. Tebbutt
1984	John Tebbutt and his observatories appear on the Australian \$100 note
1986	Giotto rendezvous with Halley's comet. Tebbutt's data included with other data for planning the mission.