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# From Amateur Astronomer to Observatory Director: The Curious Case of R. T. A. Innes

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**Abstract:** Robert Innes was one of a select band of amateur astronomers who made the transition to professional ranks towards the end of the nineteenth century. Initially he had a passion for mathematical astronomy, but after settling in Sydney he developed a taste for observational astronomy, specialising in the search for new double stars. He quickly became known for his success in this field and for his publications on solar system perturbations, and with John Tebbutt's patronage managed to secure a clerical position at the Royal Observatory, Cape of Good Hope. Once there he continued to observe in his spare time and to publish, and, with strong support from Sir David Gill, was appointed founding Director of the Transvaal Observatory. By the time he died in 1933, Innes had received an honorary D.Sc. from Leiden University, and had established an international reputation as a positional astronomer.

This paper provides an interesting case study of a well-known 'amateur-turned-professional', and an example of the ways in which patronage played a key role in nineteenth and early twentieth century Australian and South African astronomy.

**Keyword:** history of astronomy

## 1 Introduction

During the nineteenth century, amateur astronomers were particularly active in positional astronomy, and played a key role in the development of the 'new astronomy', astrophysics (e.g. see Ashbrook 1984; Chapman 1998; Clerke 1893). For the most part, amiable amateur–professional relations prevailed, at a time when amateurs were able to contribute in a meaningful way to forefront research, the popularisation of astronomy and the founding and growth of new astronomical societies (e.g. see Orchiston 1989, 1997a, 1998a).

Despite this record of achievement, some amateurs aspired to join the hallowed ranks of the professional astronomer — although comparatively few, worldwide, were successful (see Williams 1988). One who did succeed in making this transition was Robert Innes. A Scotsman with a passion for mathematical astronomy, Innes became an accomplished observer while living in Sydney, and in 1896 he accepted a post at the Royal Observatory, Cape of Good Hope. He went on to become founding Director of the Transvaal (later Union) Observatory in Johannesburg, and by the time he died in 1933 was recognised as an international figure in double star astronomy.

In this paper we examine Innes's remarkable development as an active astronomer in Sydney under the influence of Tebbutt and Gale, and trace that growing international reputation which guaranteed his Cape Observatory appointment. We also follow — albeit cursorily — his subsequent career path after his move to South Africa.

## 2 Robert Thorburn Innes: A Biographical Sketch

Robert Thorburn Ayton Innes (Figure 1) was born in Edinburgh on 1861 November 10. He went to school



**Figure 1** Robert Thorburn Ayton Innes, 1861–1933 (Courtesy: The South African Astronomical Observatory).

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in Dublin, and acquired an early interest in astronomy (Obituary 1933), showing such aptitude for mathematical astronomy that he was elected a FRAS at the age of 17 years 2 months (Obituaries 1933b).

Later he became enamoured with observational astronomy, particularly the study of double stars, and seemed to possess just the right combination of critical attributes. In 1904, the Director of the Royal Observatory at the Cape of Good Hope, Sir David Gill (Figure 2), had this to say:

‘Thus at the Cape Observatory, as has always been the case elsewhere, the subject of double star measurement on any great scale waited for the proper man to undertake it... It is a special faculty, an inborn capacity, a delight in the exercise of exceptional acuteness of eye-sight and natural dexterity, coupled with the gift of imagination as to the true meaning of what he observes, that imparts to the observer the requisite enthusiasm for double star observing. No amount of training or direction could have created the Struves, a Dawes, a Dembowski or a Burnham. The great double star observer is born, not made, and I believe that no extensive series of double star discovery and measurement will ever emanate from a regular observatory through successive directorates, unless men are specially selected who have previously distinguished themselves in that field of work and who were originally driven to it from sheer compulsion of inborn taste.’ (Gill 1905: Preface).

Gill (*ibid.*) then goes on to identify Innes as just such a man.

Throughout his life, Innes was well known for his unconventional views and ‘... his unaffected manner of



**Figure 2** Sir David Gill, Her Majesty’s Astronomer at the Royal Observatory, Cape of Good Hope (Courtesy: The Royal Astronomical Society Library).

expressing them made Innes a charming companion in daily life ...’ (Obituaries 1933a). His house was always open to young astronomers and their wives, particularly during his later years (Obituaries 1933b). An indication of this sense of sociability and his wonderful way with words is revealed in a letter he wrote to John Tebbutt in 1895 about an incorrect report which appeared in one of the Sydney newspapers:

‘Whilst the Reporter was in my cellar we found a severe local drought and irrigated accordingly and I fear between the wine, astronomy & meteorology the poor reporter got mixed up.’ (Innes 1895i).

Innes has been described as

‘... an extreme individualist, who did not yield an inch once he had made a decision or taken a stand.’

‘Once he decided never to wear a tie again, the Transvaal heat being what it was. Thereafter he wore open-necked shirts, and was even presented at the Dutch court wearing tails — without a tie.’ (Scientiae 1968).

He was also a man with strong socialist views and while in Sydney was active in party politics (Merfield 1895a). At one time Tebbutt made some comment about anarchy in one of his letters, and Innes (1894c) was summarily dismissive of this concept.

Innes married young and

‘... his marriage was a model of simple domestic happiness. The delight with which he and Mrs Innes watched the development of their [three] boys when they were growing up, and later their success in life, the atmosphere of quiet love and happiness that they created around them, made their house the ideal home, to which friends often came ...’ (Obituaries 1933b).

Robert Innes died suddenly from a heart attack on 1933 March 13 while visiting London, and was survived by his wife and all three sons (*ibid.*).

### 3 The Sydney Sojourn: Escapades in Observational Astronomy

On 1890 August 29 Innes and his wife sailed for Sydney (Innes 1890a), where he set up in business as a successful wine and spirit merchant. From the start, Innes was keen to reactivate his astronomical interests in his new land, and already knew of the astronomical work that had been carried out at the Windsor and Sydney Observatories. He came armed with a letter of introduction to Russell written by W. H. Wesley, the Secretary of the Royal Astronomical Society (Innes 1890b).

After visiting Sydney Observatory and meeting Russell (Innes 1890c) he wrote to John Tebbutt in order to establish contact (Innes 1890d). Just two days later he wrote again (Innes 1890e), asking to meet Tebbutt, and one week later wrote offering to assist him with the reduction of observations (Innes 1890f).

Early in 1891 January Innes (1891b) arranged to visit Tebbutt at Windsor, and this thoroughly enjoyable outing is described in a short article published in *The Observatory* (Innes 1891g). Innes was most impressed:

‘In a country where astronomy is but little thought of, it is pleasing to come across such a bright exception as Mr. Tebbutt . . . who truly loves astronomy for its own sake, and who has pursued it with unflagging devotion for now nigh on 30 years, and, as he modestly remarks, “doubtless with some service to the cause of Astronomy.”’

‘The long list of contributions to the pages of the ‘Observatory,’ ‘Monthly Notices,’ and ‘Astronomische Nachrichten’ testify to this latter fact . . . We may remark, too, that not only has he equipped and kept up the observatory at his own expense, but he has also made all the observations and himself computed nearly all the reductions; and this, for an unbroken period of over a quarter of a century, and so far distant from those taking an interest in his pursuits that it creates, as he plaintively remarked, a feeling of isolation. . . .’

‘The amount of work accomplished by Mr. Tebbutt shows what private observers can do if their enthusiasm is tempered with system.’ (*ibid.*).

Not long before this visit, Innes (1891a) wrote to Wesley that ‘There are but few people here interested in Astronomy.’ but he gained a more realistic perspective four months later after attending a meeting of the Royal Society of New South Wales and meeting some of the local astronomical fraternity (Innes 1891c). It was at about this time that he became aware of the strained relations that existed between Russell and Tebbutt, which by this time had led to the estrangement of the Observatory from the local amateur astronomical community (e.g. see Orchiston 1998b, 2000, 2002).

One of these whom Innes met through the Royal Society of New South Wales was Walter Gale, and the two struck up an instant friendship. Born in Sydney on 1865 November 27, Gale was just four years younger than Innes. After completing his schooling he worked for five years in the insurance and commercial fields before joining the Savings Bank of New South Wales in 1888. Gale remained with the Bank until 1925, rising to the position of Manager and Chief Inspector at Head Office (Wood 1981). He inherited an early interest in astronomy from his father, but it was the Great Comet of 1882 (C/1882 R1) which catapulted him into a lifetime involvement in astronomy (Sun 1943).

In 1884 he made a 17.8 cm reflecting telescope (Gale 1928), which was destined to be the first of many (Wood 1981). The largest had an aperture of 30.5 cm (Obituary 1945). Gale was later to reminisce about ‘. . . how I had to strive for ten years of the best part of my young manhood to equip myself with a decent telescope, after “messaging about” with mirrors of my own grinding mounted on “bits of board”.’ (Gale 1928). Later he was to become one of Australia’s leading ‘telescope-brokers’

and reportedly ‘. . . knew the history and characteristics of every astronomical instrument in Australia, and could tell many anecdotes relating to them.’ (Obituary 1945). Over the years a large number of instruments passed through his hands (e.g. see Orchiston 1991, 1997b), and these ranged in aperture up to the ex-Tebbutt 20.3 cm refractor (Orchiston 1982b) and two 45.7 cm reflectors and a 50.8 cm reflector (see Orchiston & Bembrick 1995).

Gale was interested in observational astronomy and participated in a number of solar eclipse expeditions (Obituary 1945). He also was addicted to comet-searching and independently discovered seven different comets, three of which (C/1894 G1, C/1912 R1 and 34P/Gale) now bear his name (Wood 1946). Over the years, he used his telescopes for planetary studies, particularly of Mars, Jupiter and Saturn (Wood 1981), and he believed that the so-called ‘canals’ of Mars were genuine naturally-occurring surface features and that the planet ‘. . . may be inhabited by a race of sentient beings, perhaps not cast in the same mould as we are, but of a type suited to the conditions of the planet . . .’ (Gale 1921). He also discovered a number of double stars and a planetary nebula (Wood 1981), and experimented successfully with astronomical photography (Obituary 1945).

In 1935, Gale emulated Tebbutt by being awarded the Jackson-Gwilt Medal and Gift by the Royal Astronomical Society for ‘. . . his discoveries of comets and his work for astronomy in New South Wales.’ (Wood 1981). For twenty-eight years, he was on the Board of Visitors of the Sydney Observatory (Wood 1946). Walter Gale died from a heart attack on 1945 June 1 (Wood 1981), and was remembered by his many friends for his ‘. . . personal qualities of helpfulness, enthusiasm, kindness, tolerance and understanding . . .’ (Obituary 1945). It was these very qualities that Innes was to value so much.

Having settled in Sydney, Innes began to immerse himself in mathematical astronomy, and ended up producing a paper on the secular perturbations of the Earth on Mars which was published late in 1891 (Innes 1891f). In 1891 November he and Gale arranged a visit to the Windsor Observatory, which impressed both men. In his ‘thank you’ letter to Tebbutt, Innes (1891d) specifically mentions that ‘. . . the little lesson I had in practical astronomy will serve to complement my bookish theoretic.’ This really must have inspired him to consider doing some observational astronomy, for less than two weeks later he wrote Tebbutt that he planned to obtain a 21.6 cm altazimuth-mounted reflector through Gale, but would only use it ‘. . . for amusement as I prefer computation and analysis.’ (Innes 1891e). However, he had earlier remarked on the ‘intense purity’ of the Australian skies (Innes 1891g), and they were soon to seduce him and convert him into an observational astronomer.

Whether Innes actually acquired the afore-mentioned telescope from Gale or someone else is not clear, but by the beginning of 1892 May he was busy learning the constellations with the aid of ‘the telescope’ (Innes 1892b). On May 27 he wrote Tebbutt that he had been using it for comet-sweeping (Innes 1892c), and four days later



wrote about his recent observations of a meteor shower (Innes 1892d). This was quite a turn around for someone previously committed solely to mathematical astronomy, but he did publish a follow-up note to his earlier paper on secular perturbations (see Innes 1892g). He also decided to try his hand at computing the orbital elements of a comet (Innes 1892e), but his first attempt was unsuccessful (Innes 1892f). In November and December he observed what turned out to be periodic Comet 17P/Holmes, but was known colloquially at the time as 'Biela's Comet' or the 'Andromeda Comet' (Innes 1892a).

Innes's track record for 1892 shows that within a year of the visit to the Windsor Observatory with Gale, he had gained a great deal of practical experience in observational astronomy, and it was this new orientation which was to play a critical role in his eventual transfer to the ranks of the professional astronomer. But all this lay in the future.

Apart from these observational activities, during 1892 Innes also found time to team up with Gale in planning the formation of the Australian Astronomical Society (see Orchiston & Bhathal 1984). This initiative proved abortive, but if it had succeeded then Australia would have gained its first national, generalist (as opposed to specialised) astronomical society, following in the footsteps of Tebbutt's 1882 Australian Comet Corps (see Orchiston 1982a, 1998a).

Little is heard of Innes's observational feats in 1893, but he did prepare a further paper on secular perturbations of the Earth, and this was also published in *MNRAS* (Innes 1893d). This was also the year when he had a philosophical difference of opinion with Tebbutt. Innes (1893a) wished to put Gale up for membership of the Royal Astronomical Society and asked Tebbutt if he would support the application. Tebbutt refused, for he believed that a FRAS should be reserved for someone who had already made a contribution to astronomy (whether by observational work or mathematical investigations), and he judged that Gale had not yet achieved this. From this perspective, Tebbutt was right, but Innes (1893c) thought this too myopic a viewpoint and he was not afraid to debate the issue with the master. He saw the Royal Astronomical Society as a group of men interested in astronomy who collectively wished to advance the science, although many of them did not end up doing so individually. He was convinced that Gale was a suitable candidate, and proceeded with his nomination (Innes 1893b) which was duly accepted.

Innes (1894j) published a further mathematical paper in 1894, but a real fillip for his mathematical interests came in the form of a new comet that was discovered on April 1 by his friend Gale. Four days later, Innes (1894d) wrote to Tebbutt asking for positional observations so that he could attempt an orbital computation. His elements were subsequently published in *Astronomische Nachrichten* (Innes 1894a), and on April 20 he advised Tebbutt that they were similar to those derived by Baracchi of Melbourne Observatory (Innes 1894e). Obviously he had mastered these calculations after an abortive start in 1892.

Late in the year, Innes and Gale were instrumental in forming the New South Wales Branch of the British Astronomical Association (Orchiston & Perdrix 1990), less than five years after the establishment of the parent body in London (see Kelly 1948; McKim 1990). During its early years, the new Branch was to prove a cohesive force for the large, vibrant amateur astronomical community in Sydney (see Orchiston 1988b, 1998a), but only later did the professional astronomers at the Sydney Observatory become active within its ranks. Innes was elected a founding Vice President, and Gale served as Secretary. John Tebbutt, the undisputed doyen of Australian astronomy at that time, was the first President.

During 1894 Innes also became immersed in observational astronomy once more, this time with a refractor loaned to him for two months by Gale. He reports that

'The telescope had a  $6\frac{1}{4}$ -inch [15.9 cm] object glass, made by T. Cooke, York, in 1851, and was mounted on a rough equatorial without circles. The eyepiece used gave a power of about 360.' (Innes 1895p).

Despite the poor mounting and lack of a drive (see Innes 1895b), Innes used the telescope to systematically search for new double stars during the months of October and November. He also observed an occultation of Antares during this time (see Innes 1895q), and prepared a newspaper report on a transit of Mercury (Innes 1894b, 1894f). In his letter to the Royal Astronomical Society accompanying the occultation paper, he expresses concern about the fact that he saw the companion of Antares at the time whereas Tebbutt apparently did not (see Tebbutt 1894), and concluded with the following P.S.: 'I hope it won't be thought that I am trying to discredit Mr Tebbutt's observation but the best of us are caught napping now & then.' (Innes 1895b). This gives some idea of Innes's visual acuity, for Tebbutt was known internationally as an experienced, careful and talented observer.

In 1894 December, Innes wrote to Tebbutt that he was busy preparing what he called his 'working catalogue' of southern double stars (Innes 1894h, 1894i), and this was published in 1895 in *MNRAS* (Innes 1895p). It was in fact a little research paper listing details of 26 different double stars that he had 'discovered' in the course of about 30 hours of systematic searching. But an addendum at the end of the paper reveals that shortly after submitting the manuscript Innes discovered that three of these stars had in fact been observed on earlier occasions by others. Wright later pointed out (see Innes 1896b) that a further Innes 'discovery' had in fact been noted as a double at Cordoba Observatory back in 1875.

As a result of these discoveries, Innes unintentionally became embroiled in local astronomical politics when R.P. Sellors at Sydney Observatory privately informed him that '... Mr Russell has instructed him not to measure any of them [i.e. Innes's new double stars].' (Innes 1895d). Innes took exception to this, hardly endearing himself to the Government Astronomer, but it had the desired outcome as several months later Russell

had a change of heart and Sellors was free to make the observations (Innes 1895f). When Innes had first become aware of the tension between Russell and Tebbutt he had realised that if he wished to pursue a career — even as an amateur astronomer — it would be almost impossible for him to remain neutral: he would have to take sides. Clearly he had more admiration for Tebbutt, despite their occasional differences, and as a corollary this made for strained relations with Russell.

The two months during which he had access to Gale's old refractor were a turning point for Innes, as he recognised that observational astronomy could sit comfortably alongside his earlier mathematical interests. Moreover, he had discovered his observational *forté* in the form of double stars, and had even prepared a research paper on them for a leading international astronomical journal. It was during this critical period that he for the first time began writing about the possibility of quitting his successful career in the liquor trade and becoming a full-time astronomer (see Innes 1894g).

Something else was equally clear: in the interim he needed a telescope of his own. On this score, he immediately commissioned one of his Sydney amateur astronomy colleagues, F. D. Edmonds, to construct a 42 cm reflector for him (Innes 1896b). On 1895 January 21 he triumphantly wrote to Tebbutt that: 'I got the 16½-inch telescope to work ... but unsilvered & not finally corrected.' (Innes 1895a). It did not take long to make the telescope operational (Innes 1895c), and after the 46 cm reflectors owned at the time by Gale and Madsen (see Orchiston & Bembrick 1995) this was the largest telescope in Sydney.

Innes then set about exploiting the increased light grasp in his search for new double stars (Innes 1895e), and the following year published a list of 16 new discoveries made with this telescope (Innes 1896b). To these should be added a later discovery made with this same telescope and published the following year (Innes 1897), bringing his total to 39. Years later, J. Nangle (originally an amateur astronomer in Sydney, and later the Government Astronomer of New South Wales) was to reminisce: 'Many of us ... remember the enthusiasm with which he [Innes] carried on his double star observations and we also remember our delight when he discovered new pairs.' (Nangle 1936).

The new telescope also proved valuable for other observations. On October 16 Innes discovered a 9th magnitude nebula measuring about 3 by 5 seconds of arc in size, which '... looks like a double star a little out of focus.' (Innes 1896a). In the paper reporting this discovery he also provided a description of three nebulae recorded by Schmidt in Corona Australis, and confirmed the variability of a star embedded in one of them on the basis of six observations that he made between October 7 and November 16.

But this was not the only observational astronomy Innes engaged in during 1895. Between January 8 and April 29 he made 50 naked eye observations of the well-known

variable star I Carinae, and also published these in the Innes 1896a paper. In addition to presenting a light curve, he used his own observations and those made earlier by others to discuss the magnitude range and the period. He derived a period of 35.506 days, which differs little from the currently-accepted value of 35.5225 days (Rowlands 1984) and was a significant improvement on the earlier values published by Gould and by Roberts.

Innes also spent the first seven months of the year observing the bright red star N Velorum, and found that it varied between 3.2 and 3.8, but with no perceptible period: 'I regret I cannot trace any semblance of a period in this star's changes. That it does vary is undoubted, but it is very irregular.' (*ibid.*). In this same paper he included seven observations of a suspected variable, q Carinae, made between January 8 and July 2. These range between 3.3 and 3.8, confirming that the star was in fact a variable.

In early 1895 Innes also began an ambitious library-based project: to compile '... a very considerable catalogue of binaries from observations in the southern hemisphere with many original measures by Mr. Gale and himself, and a paper thereon.' (Double Star Section 1895; cf. Innes 1895g). When this was complete he forwarded it to the British Astronomical Association for publication, and must have been disappointed when they returned it to him. The problem was not the usefulness of the catalogue or the scholarship involved; it was simply too expensive for the Association to publish (see Double Star Section 1895; Merfield 1895b). For a short while, he thought of getting the newly-formed New South Wales Branch of the Association to publish it (Innes 1895h), but other more pressing matters intervened and he did not pursue this option. However, in the long run, all this work would not prove to be in vain, for his catalogue would eventually get published but through connections which at that time were only starting to enter his imagination. Meanwhile, as some small consolation, late in 1895 he prepared a research note on the proper motion of the known double star Lacaille 4336, and this was subsequently published in *MNRAS* (see Innes 1895r).

Despite his successful double star searches, Innes found the large altazimuth-mounted reflector difficult to use for systematic observational work and actually preferred the much smaller telescope loaned him earlier by Gale! Eventually he decided to sell the reflector and replace it with an equatorially-mounted refractor of smaller aperture. As it happened, at this time the well-known amateur astronomer, W.J. Macdonnell (Orchiston 2001), wished to move from Port Macquarie back to Sydney and substitute a smaller instrument for his 15.2 cm Grubb refractor (see Orchiston 1997b). On 1895 September 17 Innes (1895j) wrote to Tebbutt that he had negotiated the purchase: the price was £150, in the form of a £30 cash deposit and the balance in 24 monthly instalments. Innes (*ibid.*) thought this a very favourable deal, especially since this magnificently appointed telescope originally had cost 250 pounds. He then proceeded to advertise his large reflector, pointing out to Tebbutt that it

really was no use for double star searches (despite his obvious success!), ‘... but to the ordinary stargazing amateur it will be an efficient instrument.’ (*ibid.*).

While Innes was busy arranging to buy Macdonnell’s refractor and trying to publish his double star catalogue an opportunity arose which he thought offered the prospect of an appointment in professional astronomy. This came in the form of the founding Directorship of the Perth Observatory. The successful applicant would also serve as the Government Astronomer of Western Australia, following the pattern already set in both New South Wales and Victoria where the Directors of the Sydney and Melbourne Observatories, respectively, held dual titles. Western Australia was the last of the Australian colonies to establish a government astronomical observatory, although the limited facilities in both Tasmania and Queensland were devoted solely to meteorology and time-keeping (see Haynes et al. 1996; Orchiston 1988c). The initiative for the Perth appointment came from the Premier, Sir John Forrest, with support from the Government Astronomer of South Australia, Sir Charles Todd (Utting 1991).

Innes (1895i) was desperate to quit commercial life, and on September 13 he wrote to the Western Australian Government asking for information about the post and indicating that he would like to apply. He was brimming with confidence, as revealed in a letter to Tebbutt written at the time: ‘... such a post I believe I could fill with credit to the Colony and do much real work to advance our Science.’ (*ibid.*). He asked for and received Tebbutt’s support in the form of a letter of recommendation and he then sent this and his own letter of application off to Sir John Forrest (Innes 1895j, 1895k).

#### 4 Flight from Commercial Life: The Cape Appointment

Meanwhile, Innes had been considering other employment options. One of those he had contacted was Sir David Gill, Director of the Royal Observatory at the Cape of Good Hope in South Africa (see Forbes 1916; Warner 1979), who was later to write:

‘Mr Innes wrote to me from Sydney, expressing a strong desire to obtain a post under me.’

‘He explained that he was engaged in business, but his tastes were wholly for Astronomy and had always been so but he never had an opportunity to devote himself entirely to it.’

‘His name was familiar to me from several excellent papers published by him in the Monthly Notices of the RL Astronomical Society, proving not only competent theoretical knowledge, but practical skill as an observer. Mr Innes was obviously a man to keep an eye on.’ (Gill 1897).

Unfortunately, Gill had no scientific vacancies at the time — and at 34 years of age Innes was too old anyway to enter the South African Civil Service (see Innes 1895n). All Gill could offer was a lowly clerical post, but this

carried financial and other responsibilities and Gill was not certain that Innes was the man for this job. His interesting solution was to employ Tebbutt as referee and arbiter, and so he wrote a long letter to the Windsor astronomer on 1895 October 18.

He commences this letter by referring to the esteem in which he holds Tebbutt:

‘Although I have not the pleasure of knowing you personally I at least know enough of you and your work to form some notion of what manner of man you are, and I feel sure that I can implicitly trust you in a very delicate matter.’ (Gill 1895b).

Gill (*ibid.*) goes on to explain that all he can offer Innes is the post of ‘... Secretary & in charge of accounts, library and M.S.S ...’ although there would be opportunities to carry out astronomical work. He lists the qualities required for this post: Innes should have natural tact, possess business qualities, have the ability to remain silent on confidential matters, possess presentable manners and have a presentable appearance, be honourable and reliable, and finally, be sober, steady and industrious. This is quite an attribute list for a simple clerical position!

Gill (*ibid.*) points out that he has no doubts about Innes’s astronomical interests and background, but when it comes to personal qualities these can only be judged ‘on the spot’. He then goes on to assign the responsibility for this appointment to Tebbutt:

‘Is it too much to ask you whether you consider that Mr. Innes would be a suitable man for me in such a post.’

‘Under these circumstances I have ventured to enclose my letter for Innes to you. The letter is left open, and I wish you kindly to decide whether it should be delivered or not. If you believe Mr Innes to be the kind of man fitted to perform the duties there described, send my letter on to him — if you think otherwise then please destroy my letter to Mr Innes or return it to me.’

Gill (*ibid.*) concludes by stressing that if ‘... in a social and moral point of view his habits of life are beyond reproach, then he wd be just the sort of man I want.’ but if you have any doubts at all then return the letter of offer or else destroy it. Gill stresses that since Innes knows nothing of this matter Tebbutt’s ‘... hands are therefore perfectly free.’

Accompanying Gill’s letter to Innes was a short letter from a Mr J. Power (whose position Innes was being offered) supplying Innes with the name of a friend in Sydney who could provide details of living conditions and the cost of living in South Africa.

Fortunately, Tebbutt made a copy of the enclosed letter from Gill to Innes, and this reveals more details of the position. It reads, in part:

‘I am now in a position ... to offer you employment here [at a] ... Salary £150, with the opportunity to earn from £30 to £50 for overtime or extra-computing, or other work, but I ought to add that I see no prospect of being

able to increase this. The post is not that of a covenanted servant . . . and I can hold out no prospect whatever of your getting an appointment on the permanent staff or of pension. The duties . . . beyond a knowledge of bookkeeping and general knowledge of Astronomical literature involves no special qualifications . . .’

‘I think that you have the qualities and qualifications necessary. I do not know whether the terms I have offered are sufficient to induce you to come but they are the only ones in my power to offer you.’ (Gill 1895a).

This letter also reveals that Innes wrote to Gill on three earlier occasions (1894 November 20 and 1895 June 1 and 16) but that Gill had nothing to offer him at these times. Gill (*ibid.*) also suggests that if Innes does accept the post then he should endeavour to reach Cape Town by the end of the year. Since Tebbutt only received these letters on November 18, this was obviously a logistical impossibility.

Tebbutt was placed in a delicate position for, as it was to turn out, Innes’s future was literally in his hands. After carefully considering this matter, he passed the letter of offer on to Innes. Its arrival proved most opportune for Innes (1895m) had just heard that W. E. Cooke was offered and had accepted the Perth post. William Ernest Cooke was two years Innes’s junior and had served as Todd’s assistant at the Adelaide Observatory. He went on to distinguish himself at Perth Observatory (see Hutchison 1980, 1981; Utting 1989, 1992) and later as the Government Astronomer of New South Wales while at the Sydney Observatory (Orchiston 1988d; Wood 1958).

This unsatisfactory outcome, from Innes’s point of view, must have decided the matter, even though the Adelaide Observatory vacancy would soon be available. Any job in astronomy—no matter how tenuous—was preferable to none at all, as Innes’s response to Tebbutt demonstrates:

‘Dr Gill’s offer is not as you remark “very encouraging” but if Mr Power’s friend tells me that living is not more expensive there than here I will accept it. I am very anxious to have an Astronomical life and money is not of much account to me, I mean I don’t care for it, not that I have a lot. And if I please Dr Gill he may help me to some position elsewhere.’ (Innes 1895m).

At the time, Innes could not have imagined just how prophetic this last sentence would prove to be. In the meantime, Innes (*ibid.*) thanked Tebbutt for his support while, for his part, Tebbutt (1895) wrote to Gill about his action in the matter:

‘I have known Mr. Innes for five years and I have always found him a worthy member of society. He has . . . I believe, from his youth been accustomed to accounts. I believe he may be trusted in the confidential post which you have offered to him. He is a fair mathematician, has a good knowledge of astronomy and is exceptionally anxious to quit his present occupation and to fill some position in which he can engage in astronomical work.

He has not had many opportunities for observational work, but any deficiency in this respect I feel assured he would soon make up. As I feel satisfied he will turn out to be a suitable man for the post which you offer I have handed to him the letters which you have enclosed to me. After some hesitation he expressed his willingness to accept the offer, but he finds it impossible to reach the Cape by the close of the year. . . .’

‘I heartily wish him every success in his new undertaking and I trust that you yourself will have no cause to regret having accepted his services.’ (Tebbutt 1895).

As it was too late to catch the next ship for South Africa, Innes undertook to reach Cape Town by 1896 March 30 (*ibid.*).

Now came the frantic preparation for a new life, and over the next two months Innes was faced with winding up the partnership in the business, arranging for the transfer of his family’s effects and belongings to South Africa, and preparing for employment in a professional observatory. And as he told Wesley in a letter dated 1895 December 14 he also had to renege on the purchase of Macdonnell’s Grubb refractor:

‘Well on the very day I was going to send him a cheque, I received an offer of a minor appointment from Dr. Gill, through Mr. Tebbutt. I cannot say I dislike commerce but I began to feel with each succeeding year that I was not doing right to Astronomy . . . I may say that Mr. MacDonnell very kindly released me from my bargain.’ (Innes 1895n).

As it turned out, six months later Macdonnell sold the telescope to Gale (Brooks 1896), and it was later to do excellent service in the hands of E. H. Beattie (see Baracchi 1914).

During the busy time leading up to his departure, Innes somehow also found opportunities for further observing. His focus, on this occasion, was again variable stars, and between November 30 and February 22 he used the naked eye, binoculars and when necessary the large reflector to carry out a great many observations of  $\iota$  Carinae, R Carinae, R Doradus,  $\epsilon$  1 Hydri,  $\epsilon$  Leporis and N Velorum, and a few of Brisbane 2371, Gould 14766,  $\epsilon$  Muscae and  $\rho$  Phoenicis (see Innes 1896d). He also observed the star Lac. 3904 and discovered that it was variable: between 1896 January 9 and February 22 it ranged between 6.5 and 7.1, but with no clear evidence of periodicity (*ibid.*).

Innes completed one further research paper in Sydney after hearing of his South African appointment, and this was a mathematical treatment of achromatic telescope lenses which subsequently appeared in an 1896 issue of *Journal of the British Astronomical Association* (Innes 1896c).

At the end of 1896 February, Robert Innes was farewelled by friends from the local astronomical community before he set sail for Cape Town and a new career. An article in the *Sydney Morning Herald* reports that a banquet was held for him in Mr Quong Tart’s rooms in King



Street, and was attended amongst others by Dr Megginson and Messrs Bedford, Craven, Edmonds, Furber, Knibbs, Merfield, and Wright, all prominent members of the New South Wales Branch of the British Astronomical Association. After Knibbs (as Vice-President) proposed a toast, Innes was called upon to reply. His response was brief:

‘He decried the encomiums of the chairman, so far as he was concerned, and endeavoured to show that many members of the local branch of the association had done as much or more in the interests of astronomical research as he had.’ (Sydney Morning Herald 1896).

It was later suggested (Obituary 1933) that Innes sought employment at the ‘Cape Observatory’ because he wanted access to bigger instruments than the two ‘small’ telescopes he was using in Sydney. In fact, all he wanted was an opportunity to work in a professionally observatory, and while the mounting of his large reflector may have left much to be desired, its light grasp was only marginally inferior to the largest telescope then at the Cape, the 46 cm McClean refractor.

After Innes left Sydney he was sadly missed by many of the local astronomers. This is apparent from a letter written to Tebbutt on 1896 September 19 commenting on the apathetic attitude of members at the latest local branch meeting of the British Astronomical Association:

‘We need a real live man among us in Sydney, who will work and induce others to do the same. In Mr. Innes we lost such a man, and the breach has not yet been filled.’ (Wright 1896).

Although his letters to Tebbutt were infrequent after moving to South Africa, Innes continued to see him as an inspiration and just three years before Tebbutt’s death wrote: ‘... you know what a high opinion I have always had of your astronomical work and of your invaluable services to astronomy in Australia.’ (Innes 1913). It was partly as a result of those ‘invaluable services’ that Innes ended up in the ranks of the professional astronomer.

## 5 A Post at a Professional Observatory: Secretary-Astronomer at the Cape

By international standards, the Royal Observatory at the Cape of Good Hope was a major one, and in scale it far surpassed any of the Australian observatories. Although Innes’s post was a clerical one, he devoted all his spare time to observational astronomy, focusing on double stars, lunar occultations of stars, comets and variable stars (Obituaries 1933b). He was involved in the revision of the Cape Photographic Durchmusterung, a mammoth project, and in the process discovered some new double and variable stars (Obituaries 1933a). He also found time to prepare his *Reference Catalogue of Southern Double Stars*, which included his own Sydney observations and those by Australian amateur and professional astronomers, and this was published by the Cape Observatory (Innes

1899). In the Preface to this 328 page opus, Sir David Gill speaks in glowing terms of Innes’s achievement:

‘Mr R.T.A. Innes, the author of the present work, joined the staff of the Cape Observatory in 1896 as Secretary, Librarian, and Accountant. It formed no part of his official duties either to engage in astronomical observing or to contribute in any way to the publications of the Cape Observatory. But previous to his arrival at the Cape ... he had discovered about forty new double stars, and published their estimated distances and position angles. He had also made some progress in the preparation of a card catalogue of reference to the known double stars of the Southern Hemisphere. This catalogue he has not only completed within the past two years in the intervals of his leisure time, but he has discovered upwards of 280 new double stars with the 7-inch equatorial ...’

One of the most valuable aspects of Innes’s catalogue, the first ever prepared for southern hemisphere double stars, is the 41-page chronologically-arranged Bibliography at the end of the volume.

Innes’s catalogue was very well received by his former colleagues in Australia (e.g. see Merfield 1900; Roseby 1901), and for many years remained the standard reference work in this field.

## 6 A Professional Appointment at Long Last: The Transvaal Directorship

At the end of the Boer War the South African government decided to found an observatory at Johannesburg ‘... which, in the first place at least, was to be devoted to meteorology; but it necessarily included a time department which, in energetic hands, could be developed into a regular astronomical observatory.’ (Gill 1913). Moreover, the location was particularly favourable for an astronomical observatory: it was at altitude, had an ideal climate and offered excellent seeing (see Evans 1950).

With strong support from Gill (e.g. see Gill 1897), Innes was appointed Founding Director of the new Transvaal Observatory, and in 1903 he left Cape Town for Johannesburg. At first the Observatory was solely devoted to meteorology, as anticipated, but this changed in 1907 with the erection of a 22.9 cm Grubb refractor. Then in 1909 the Observatory received a 25.4 cm astrograph as a gift from Mr J. Franklin-Adams. This same year, the local Minister of Lands approved the purchase of a 66 cm Grubb refractor (though because of production problems and the intervention of WWI this did not become operational until 1925). In 1912 a further change took place when the Government set up a separate meteorological branch, and the Observatory became a purely astronomical institution and was renamed the Union Observatory (see Hers 1987; Moore and Collins 1977).

From its start, the Union Observatory specialised in the study of proper motions of stars; the observation and theoretical study of double stars; and the observation of Jovian satellite phenomena (Obituaries 1933b). Innes discovered about 1500 new double stars in the course of his

life, but perhaps his most notable discovery was Proxima Centauri, in 1917 (Obituaries 1933a). It may have been this observational focus which prompted one writer to characterise Innes as a ‘typical amateur’ and point out that he effectively remained one ‘... even when he was a professional astronomer and head of a government observatory.’ (Obituaries 1933b). Yet despite this penchant for observing, Innes (Figure 3) described himself as an observer by necessity but a mathematical astronomer by choice. However, he was seen by many as an exceptional observer with a very keen eye (*ibid.*).

In addition to his research contribution, Innes enriched the local professional astronomical community in Johannesburg by inviting many overseas astronomers to the Union Observatory (Scientiae 1968), and he also made a very substantial national contribution to astronomy:

‘... it seems certain that the very important position that South Africa occupies in the astronomical world to-day is due in great part to Innes, to his persistence in drawing attention to the splendid climate, and to his influence in persuading the authorities to welcome the foundation of southern stations by northern observatories. He was formerly convinced that the interests of astronomy urgently demanded more *observations* in the southern hemisphere.’ (Obituary 1933b).

In addition, he played a leading role in the Astronomical Society of South Africa, as a foundation member, one-time President, and Director of the Computing Section (Obituary 1933).



**Figure 3** Robert Innes, as Director of the Union Observatory (Courtesy: The South African Astronomical Observatory).

## 7 Concluding Remarks

Robert Thorburn Ayton Innes was one of a number of distinguished amateur astronomers worldwide who made the transfer from amateur to professional ranks during the nineteenth and early twentieth centuries. When he arrived in Sydney in 1891 he already had a passion for mathematical astronomy, but armed with inspiration from Tebbutt and under the guidance of his new-found friend, Walter Gale, he quickly acquired consummate observing skills, using at first an old refractor loaned by Gale and later a locally-made reflector that was the third-largest instrument of this kind in Sydney. Although he had catholic observational tastes, his primary focus became the search for new double stars, a quest that was fashionable at this time with southern hemisphere professional observatories.

Meanwhile, Innes continued to pursue his mathematical interests, and he made a point of publishing his work in the leading astronomical journals of the day, *Astronomische Nachrichten* and *MNRAS*. By the time that he reached Cape Town he had nine papers in these journals and in *The Observatory*, publications which brought his name before the professional astronomical community. Four of his papers were on aspects of mathematical astronomy; one reported cometary orbital elements (thereby combining this interest and his new-found penchant for observing); one reported his double star discoveries; one dealt with the proper motion of a known double star; and another paper discussed an occultation of Antares. The last remaining paper, in *The Observatory*, reported on a visit to the Windsor Observatory and drew further international attention to Tebbutt's pre-eminent place as the doyen of Australian astronomy (see Orchiston 2002).

With his long and intense involvement in astronomy and his magnificent publications record, John Tebbutt was an ideal role model for those Australian-based amateur astronomers wishing to engage in serious astronomy. His impact was most marked during the 1890s when a large and active group emerged in Sydney, the majority of whom were involved in the affairs and activities of the fledgling New South Wales Branch of the British Astronomical Association.

Clearly, Innes was inspired by Tebbutt, and his visit to the Windsor Observatory in 1891 can be seen to mark the start of a relationship that led ultimately to his Cape Town appointment (and Tebbutt, incidentally, was no stranger to such appointments, having refused the post of Government Astronomer of New South Wales which was offered to him back in 1862 — see Orchiston 1988a). The whole question of patronage in Australian science, particularly within the context of the amateur–professional nexus, is an interesting one and deserves further attention from researchers (but see Orchiston & Bembrick 1997).

Once ensconced in a clerical position at the Royal Observatory, Cape of Good Hope, Innes took advantage of instruments made available to him in his spare time to continue his double star work, and complemented this by publishing further papers and a definitive southern double

star catalogue that was well-received and much appreciated by colleagues around the world. He also enjoyed Gill's support and patronage, which led to his first professional appointment, as founding director of the Transvaal (later Union) Observatory. Once in Johannesburg, Innes was able to pursue uninterrupted his research interest in positional astronomy, thereby consolidating his status as a leading southern hemisphere observational astronomer. What he did not do, despite the opportunity, was decided to commit the Observatory to astrophysical research.

In spite of this, Leiden University recognised his lifelong astronomical work in 1923 by awarding him an honorary D.Sc. He retired from the Union Observatory at the end of 1927 and less than six years later he was dead (Obituaries 1933b), bringing to an end the remarkable career of a one-time amateur astronomer who turned professional and made an impact in both Australia and South Africa.

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### References

- [The following abbreviation is used: TL = Letters to J. Tebbutt. Volumes of bound letters in the Mitchell Library, Sydney]
- Ashbrook, J. 1984, *The Astronomical Scrapbook: Skywatchers, Pioneers, and Seekers in Astronomy* (Cambridge, Mass.: Sky Publishing)
- Baracchi, P. 1914, in *Federal Handbook Prepared in Connection with the Eighty-fourth Meeting of the British Association for the Advancement of Science, held in Australia, August, 1914*, ed. G. H. Knibbs (Melbourne: Government Printer), p. 326
- Brooks, J. 1896, Letter to John Tebbutt, dated 4 July, in TL
- Chapman, A. 1998, *The Victorian Amateur Astronomer. Independent Astronomical Research in Britain 1820–1920* (Chichester: John Wiley)
- Clerke, A. 1893, *A Popular History of Astronomy During the Nineteenth Century* (London: Black)
- Double Star Section 1895, *J. Brit. Astron. Assoc.*, 5, 500
- Evans, D. S. 1950, *Endeavour*, 9, 45
- Forbes, G. 1916, *David Gill Man and Astronomer. Memories of Sir David Gill, K.C.B., H.M. Astronomer (1879–1907) at the Cape of Good Hope* (London: Murray)
- Gale, W. F. 1921, *Trans. Sydney Lodge of Research*, 8, 1
- Gale, W. F. 1928, Letter to Mr Longbottom, dated 8 May, in BAA Letter Archives
- Gill, D. 1895a, Letter to R.T.A. Innes, dated 18 October, copy in TL
- Gill, D. 1895b, Letter to John Tebbutt, dated 18 October, in TL
- Gill, D. 1897, Mr R.T.A. Innes, document dated March 11 in Royal Greenwich Observatory Archives (RGO 16/103/376r)
- Gill, D. 1905, *Annals of the Cape Observatory*, 2(4)
- Gill, D. 1913, *A History and Description of The Royal Observatory, Cape of Good Hope* (London: HMSO)
- Haynes, R., Haynes, R., Malin, D., & McGee, R. 1996, *Explorers of the Southern Sky. A History of Australian Astronomy* (Cambridge: Cambridge University Press)
- Hers, J. 1987, *Mon. Not. Roy. Astron. Soc. S. Afr.*, 46, 17, 39, 75
- Hutchison, D. 1980, *Early Days*, 8, 93
- Hutchison, D. 1981, *Hist. Records Aust. Sci.*, 5, 58
- Innes, R. T. A. 1890a, Letter to W.H. Wesley, dated 4 June, in RAS Letter Archives
- Innes, R. T. A. 1890b, Letter to W.H. Wesley, dated 28 August, in RAS Letter Archives
- Innes, R. T. A. 1890c, Letter to W.H. Wesley, dated 19 November, in RAS Letter Archives
- Innes, R. T. A. 1890d, Letter to John Tebbutt, dated 10 December, in TL
- Innes, R. T. A. 1890e, Letter to John Tebbutt, dated 12 December, in TL
- Innes, R. T. A. 1890f, Letter to John Tebbutt, dated 19 December, in TL
- Innes, R. T. A. 1891a, Letter to W.H. Wesley, dated 9 January, in RAS Letter Archives
- Innes, R. T. A. 1891b, Letter to John Tebbutt, dated 10 January, in TL
- Innes, R. T. A. 1891c, Letter to John Tebbutt, dated 15 May, in TL
- Innes, R. T. A. 1891d, Letter to John Tebbutt, dated 26 November, in TL
- Innes, R. T. A. 1891e, Letter to John Tebbutt, dated 6 December, in TL
- Innes, R. T. A. 1891f, *MNRAS*, 52, 80
- Innes, R. T. A. 1891g, *The Observatory*, 14, 156
- Innes, R. T. A. 1892a, *Australian Star* (newspaper), 8 December
- Innes, R. T. A. 1892b, Letter to John Tebbutt, dated 7 May, in TL
- Innes, R. T. A. 1892c, Letter to John Tebbutt, dated 27 May, in TL
- Innes, R. T. A. 1892d, Letter to John Tebbutt, dated 31 May, in TL
- Innes, R. T. A. 1892e, Letter to John Tebbutt, dated 24 November, in TL
- Innes, R. T. A. 1892f, Letter to John Tebbutt, dated 5 December, in TL
- Innes, R. T. A. 1892g, *MNRAS*, 52, 479
- Innes, R. T. A. 1893a, Letter to John Tebbutt, dated 4 January, in TL
- Innes, R. T. A. 1893b, Letter to W.H. Wesley, dated 30 January, in RAS Letter Archives
- Innes, R. T. A. 1893c, Letter to John Tebbutt, dated 2 February, in TL
- Innes, R. T. A. 1893d, *MNRAS*, 53, 353
- Innes, R. T. A. 1894a, *Astronomische Nachrichten*, 135, 263
- Innes, R. T. A. 1894b, *Daily Telegraph* (newspaper), 12 November
- Innes, R. T. A. 1894c, Letter to John Tebbutt, dated 21 February, in TL
- Innes, R. T. A. 1894d, Letter to John Tebbutt, dated 4 April, in TL
- Innes, R. T. A. 1894e, Letter to John Tebbutt, dated 20 April, in TL
- Innes, R. T. A. 1894f, Letter to John Tebbutt, dated 11 November, in TL
- Innes, R. T. A. 1894g, Letter to John Tebbutt, dated 16 November, in TL
- Innes, R. T. A. 1894h, Letter to John Tebbutt, dated 7 December, in TL
- Innes, R. T. A. 1894i, Letter to John Tebbutt, dated 10 December, in TL
- Innes, R. T. A. 1894j, *MNRAS*, 54, 289
- Innes, R. T. A. 1895a, Letter to John Tebbutt, dated 21 January, in TL
- Innes, R. T. A. 1895b, Letter to W.H. Wesley, dated 25 February, in RAS Letter Archives
- Innes, R. T. A. 1895c, Letter to John Tebbutt, dated 13 March, in TL
- Innes, R. T. A. 1895d, Letter to John Tebbutt, dated 17 March, in TL
- Innes, R. T. A. 1895e, Letter to John Tebbutt, dated 1 May, in TL

- Innes, R. T. A. 1895f, Letter to John Tebbutt, dated 1 June, in TL
- Innes, R. T. A. 1895g, Letter to John Tebbutt, dated 3 September, in TL
- Innes, R. T. A. 1895h, Letter to John Tebbutt, dated 5 September, in TL
- Innes, R. T. A. 1895i, Letter to John Tebbutt, dated 13 September, in TL
- Innes, R. T. A. 1895j, Letter to John Tebbutt, dated 17 September, in TL
- Innes, R. T. A. 1895k, Letter to John Tebbutt, dated 23 September, in TL
- Innes, R. T. A. 1895m, Letter to John Tebbutt, dated 24 November, in TL
- Innes, R. T. A. 1895n, Letter to W.H. Wesley, dated 14 December, in RAS Letter Archives
- Innes, R. T. A. 1895p, MNRAS, 55, 312, 544
- Innes, R. T. A. 1895q, MNRAS, 55, 343
- Innes, R. T. A. 1895r, MNRAS, 56, 72
- Innes, R. T. A. 1896a, J. Brit. Astron. Assoc., 6, 257
- Innes, R. T. A. 1896b, J. Brit. Astron. Assoc., 6, 261
- Innes, R. T. A. 1896c, J. Brit. Astron. Assoc., 6, 483
- Innes, R. T. A. 1896d, J. Brit. Astron. Assoc., 6, 486
- Innes, R. T. A. 1897, MNRAS, 57, 456
- Innes, R. T. A. 1899, Annals of the Cape Observatory, 2(2)
- Innes, R. T. A. 1913, Letter to John Tebbutt, dated 2 July, in TL
- Kelly, H. L. 1948, The History of the British Astronomical Association. The First Fifty Years (London: British Astronomical Association, Historical Section Memoir, Volume 36, Part 2)
- McKim, R., 1990, J. Brit. Astron. Assoc., 1000, 166
- Merfield, C. J. 1895a, Letter to John Tebbutt, dated 21 July, in TL
- Merfield, C. J. 1895b, Letter to John Tebbutt, dated 4 September, in TL
- Merfield, C. J. 1900, Letter to John Tebbutt, dated 28 March, in TL
- Moore, P., & Collins, P. 1977, The Astronomy of Southern Africa (London: Hale)
- Nangle, J. 1936, Brit. Astron. Assoc. NSW Branch Bulletin, 162, 3
- Obituaries 1933a, J. Brit. Astron. Assoc., 43, 260
- Obituaries 1933b, MNRAS, 94, 277
- Obituary 1933, J. Astron. Soc. South Afr., 3, 125
- Obituary 1945, J. Brit. Astron. Assoc., 56, 18
- Orchiston, W. 1982a, J. Astron. Soc. Vic., 35, 70
- Orchiston, W. 1982b, Southern Stars, 29, 215
- Orchiston, W. 1988a, Austr. J. Astron., 2, 149
- Orchiston, W. 1988b, J. Brit. Astron. Assoc., 98, 75
- Orchiston, W. 1988c, Search, 19, 76
- Orchiston, W. 1988d, Vistas Astron, 32, 49
- Orchiston, W. 1989, Search, 20, 16
- Orchiston, W. 1991, Southern Stars, 34, 277
- Orchiston, W. 1997a, Austr. J. Astron., 7, 33
- Orchiston, W. 1997b, Austr. J. Astron., 7, 89
- Orchiston, W. 1998a, Hist. Records Austr. Sci., 12, 163
- Orchiston, W. 1998b, in Highlights of Astronomy as Presented at the XXIIIrd General Assembly of the IAU (Volume 11B), ed. J. Andersen (Dordrecht: Kluwer), 741
- Orchiston, W. 2000, AAO Newsl., 95, 8
- Orchiston, W. 2001, J. Brit. Astron. Assoc., 111, 13
- Orchiston, W. 2002, in History of Oriental Astronomy, ed. S. M. R. Ansari (Dordrecht: Kluwer, IAU Joint Discussion 17), in press
- Orchiston, W., & Bembrick, C. 1995, Austr. J. Astron., 6, 53
- Orchiston, W., & Bembrick, C. 1997, Austr. J. Astron., 7, 1
- Orchiston, W., & Bhathal, R. 1984, PASA, 5, 422
- Orchiston, W., & Perdrix, J. 1990, Austr. J. Astron., 3, 163
- Rowlands, S. J. 1984, Indexes to Charts of Variable Stars (Melbourne: printed by the author)
- Roseby, T. 1901, Letter to John Tebbutt, dated 3 May, in TL
- Scientiae 1968, 9(10), 7
- Sydney Morning Herald (newspaper), 26 February 1896
- Sun (newspaper), 25 May 1943
- Tebbutt, J. 1894, MNRAS, 55, 83
- Tebbutt, J. 1895, Letter to Dr. Gill, dated 5 December, in Royal Greenwich Observatory Archives (RGO 16/127/832r)
- Utting, M. 1989, Cooke's Perth Observatory (Perth: Perth Observatory)
- Utting, M. 1991, Windows to the Southern Skies (Perth: Murdoch University and Perth Observatory)
- Utting, M. 1992, Astronomy in Western Australia. Volume 1: 1896 to 1912 (Perth: Perth Observatory)
- Warner, B. 1979, Astronomers at the Royal Observatory Cape of Good Hope. A History With Emphasis on the Nineteenth Century (Cape Town: Balkema)
- Williams, T. 1988, Sky and Telescope, 76, 48
- Wood, H. 1946, MNRAS, 104, 29
- Wood, H. 1958, Sydney Observatory 1858 to 1958 (Sydney: Government Printer)
- Wood, H. 1981, in Australian Dictionary of Biography Volume 8: 1891–1939 Cl-Gib, eds. B. Nairn and G. Serle (Melbourne: Melbourne University Press), 609
- Wright, H. 1896, Letter to John Tebbutt, dated 19 September, in TL