

# Joseph Gurney Barclay and the 1860 10-inch Cooke refractor<sup>1</sup>

Charlie Barclay

Director, Blackett Observatory, Marlborough College

Joseph Gurney Barclay (1816-1898) F.R.A.S., was a partner in the banking firm of Barclay, Bevan & Co. He was, like his grandfather, Robert Barclay of Clapham<sup>2</sup>, a keen Astronomer who observed regularly at his home Knotts Green House in Leyton, Essex, England, and he was a frequent contributor to the *Monthly Notices of the Royal Astronomical Society*. Employing professional astronomers, he made many original observations, especially following the acquisition of a 10-inch Cooke refractor in 1860. Gifted to the Radcliffe Observatory, Oxford in 1885, the 'Barclay Equatorial' continued in professional use until 1935 when it was removed to Marlborough College in Wiltshire, England, where it is now in full computerized use following complete restoration.

Joseph Gurney Barclay (Figure 1), my great-grandfather's first cousin, was born in 1816 into a wealthy family, the great-great-grandson of David Barclay of Cheapside (1682-1769), the founder of what has become Barclay's Bank. Inheriting a large house and grounds and a huge personal fortune, it might be supposed that as an archetypal Victorian gentleman his interest in astronomy would be more social, and that the acquisition of a top-of-the-range telescope was therefore an article of one-upmanship and beauty, to show off to friends. On all counts this appears to have been far from the truth.



**Figure 1**

**Joseph Gurney Barclay as a young man**

Original picture is the property of David Barclay, by whose courtesy this image appears.

Joseph (hereafter identified as J.G.B.) was a keen observer, who took the running of his observatory and the friendship and working partnership of the professional astronomers he employed as seriously as his banking work, a carriage ride away in the City of London (he used to drive himself daily from Leyton to the City behind a Suffolk cob)<sup>3</sup>. His contribution to astronomy can be judged by his many papers, many of which included his own observing input<sup>4,5,6</sup>, published between 1862 and 1884 in the *Monthly Notices of the Royal Astronomical Society*. He had been elected a Fellow of the Royal Astronomical Society on 9 November 1855, supported by unusual numbers of the prominent names in astronomy at that time. Perhaps most notable was the description in 1863<sup>5</sup> of the detection of a faint, magnitude 10.5, companion to the bright star Procyon ( $\alpha$  Canis Minoris), which was not independently confirmed until 1896.

J.G.B. is described in the records of the Religious Society of Friends (the Quakers)<sup>7</sup>:

“ His deep Christian character in which humility was a marked feature manifested itself in a broad philanthropy and kindly consideration for all with whom he came in contact.”

This view is born out by his care for his astronomer assistants, and the eventual gift of the 10-inch refractor to the Radcliffe Observatory. He appears to have been somewhat a loner when it came to work, but he was very much a family man - he hosted many gatherings of his extended family and cousins (including Arthur Kett Barclay F.R.S. (1806-1869), who was also a keen astronomer with an 5.9-inch Troughton and Simms refractor)<sup>8</sup>. He also held public open days in his 'pleasure gardens' - his home, Knotts Green House (Figure 2).

Joseph Gurney Barclay



**Figure 2**

### **Open Day at Knotts Green House**

Image from the *Illustrated London News* dated 15 July 1865.

### **Robert Barclay, friend of William Herschel**

J.G.B.'s love of astronomy seems to have stemmed from an early age, and was probably stimulated by books and memories of his grandfather, Robert Barclay (1758-1816). Robert was interested in astronomy from childhood. He later constructed an observatory, and regularly observed from the grounds of The Elms, his large house in Clapham, where J.G.B. spent his childhood.

Robert's first cousin, Thomas Collinson, son of Jane Barclay of Clapham, was also a keen observer. Both were friends of, and regular correspondents with, William Herschel (1738-1822)<sup>9</sup>. After visiting Herschel in Datchet (to where he had moved in August 1782<sup>10</sup>) in December 1783, two years after the discovery of Uranus, Collinson wrote to Robert on 3 December an intriguing letter<sup>11</sup>. It indicates their interest the new field of astronomical research 'beyond the meridian', which had dominated observers in the early 18th century, and would continue to do so well into the 1800s:

"I ventured to pass Saturday night last with Herschel in the open space till midnight, in which situation I seldom suffer. His late finished great telescope [likely to be the 20ft] I turned to several parts of the heavens but found no place without stars not even near the horizon, a circumstance which distinguishes his instrument from any other hitherto made. The Moon appeared thro' it too light to be contemplated with safety to the eyes and we had too little time to put on the greater magnifying powers to diminish the splendour. We therefore contented ourselves with his first made large telescope [presumably the 7ft], which showed Orion gloriously and unified all we saw thro' yours. Double and double-double stars it showed us to great advantage and we beheld divers nebulae or radiant spots in the heavens so thickly sown with stars that they appeared like glittering dust. We also saw the new comet (Herschel) and the Georgian Sidus [Herschel's name for Uranus]. But instead of going on with telling you what I saw, it will be of more conse-

quence to inform you of what he has seen. In a small portion of the Galaxy, twelve degrees broad by 3 degrees long he counted forty-three thousand stars and in various other parts of the heavens there seem particular systems of stars which seem to have reference to each other. Then another system and so on without end. His discoveries of Mars are wonderful. He has not only ascertained its equatorial and polar parts but he has beheld this snow diminish and increase as each pole has been turned towards or from the Sun. White spots have likewise been visible in the tropical regions such as the snowy summits of our Andes would exhibit at great distance from our Earth. He has seen so much as to enable him to ascertain the diurnal revolution of Mars and to calculate the Sun's declination there. In Jupiter's belts and spots he has seen very extraordinary changes and peculiarities and distinguished one of Jupiter's satellites on his body, it happening to have a dark broad belt behind it, the shadow of this satellite appeared on the planet at the same time. On Saturn he has discovered belts and spots as on Jupiter."

This letter shows that at the time Herschel was beginning systematic sweeping with the 20-foot reflector, to augment Messier's catalogue of nebulae, he had come to the realisation that the stellar density distribution he had measured suggested the disc shape of our own galaxy. However, in the light of modern knowledge the wording could be read to imply that Herschel had also realised the nature of 'island' nebulae (now known to be independent galaxies).

On Collinson's advice Herschel also began to study the correlation between a star's visible spectrum and what later would be called its spectral type, having previously "... not thought much scientific worth could come of spectroscopy."<sup>12</sup>

### **From Clapham to Leyton**

Robert Barclay married Anne Ford, who gave birth to four sons and four daughters. The eldest son, Robert, who was born in Clapham in 1785, succeeded his father as partner in the banking company. Robert junior seems to have moved to Leyton by 1832. Essex records<sup>13</sup> show that 31 acres and Knotts Green House were acquired in 1821, but that Robert lived in the neighbouring 100-acre estate of Forest House at Whipps Cross, (Figure 3) where he lived until 1853<sup>14</sup>. He had three sons and six daughters. The eldest son, also named Robert, was born in 1815, married in 1842 and died, childless, six months later. J.G.B., the second son, was born in 1816 at 13 Russell Square, J.G.B. was educated at home, in Knotts Green House, because as a member of a long-standing Quaker family, he

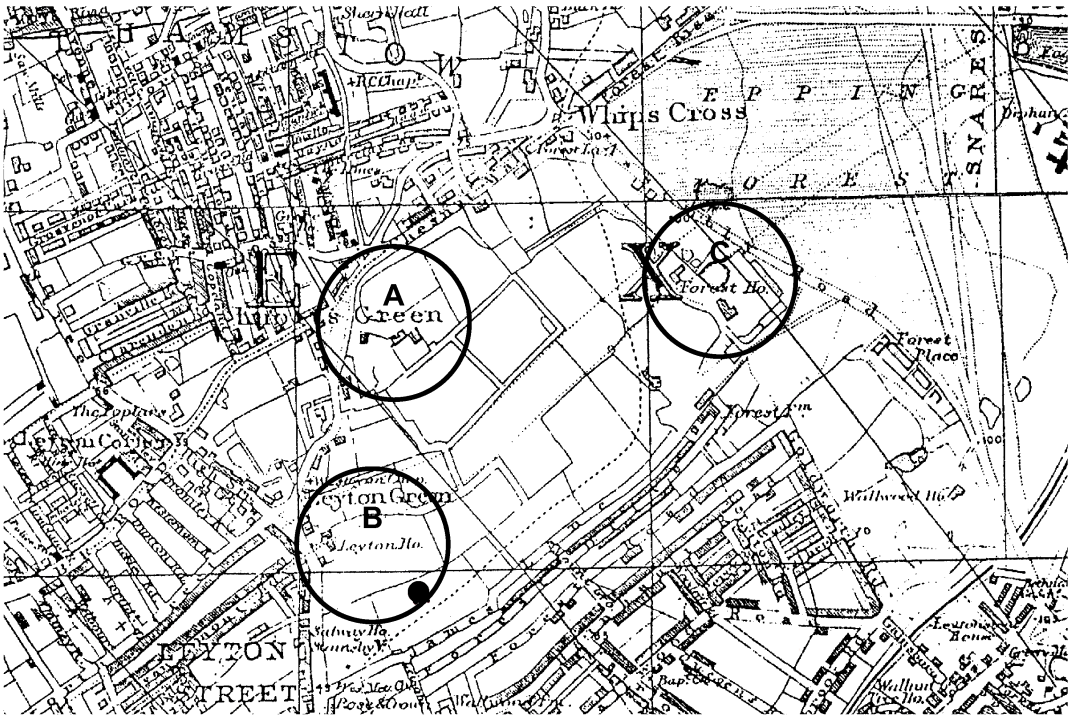


Figure 3

### The location of Barclay houses in Leyton, Essex

The circles show: A - Knotts Green House; B - Leyton House; C - Forest House.

The coordinates of the observatory are marked by the small, solid circle within circle B.

This map is taken from: G.W.Bacon. Ordnance Atlas of London and Suburbs. London: G.W.Bacon. 1888.

was unable to enter Cambridge University, which was not yet open to Quakers<sup>15</sup>. J.G.B. married Mary Walker Leatham in 1841. In the next year his elder brother, successor to the family fortune, died. Thus it was that in 1853, on the death of his father, J.G.B. inherited the principal Barclay properties and the whole Barclay interest in Barclay, Bevan, Tritton and Co. Mary died in 1850 having given him two sons. He remarried in 1857, to Margaret Exton.

### The Observatory

J.G.B. set up his observatory in 1854 with a 7½-inch Cooke equatorial and a 4-inch Troughton and Simms transit circle. In late 1855 or early 1856, he began to study earnestly the star Procyon, following a letter (published 21 December 1855) to the Editor of *The Times* from John Russell Hind (1823-1895), who was then working at the Regent's Park observatory of George Bishop (1785-1861). This letter alluded to the suspected existence of a companion star to Procyon:

"... on 10<sup>th</sup> January 1856 I discovered a small star within the blaze of the light of the larger one, and which I roughly estimated at from 3 to 4 sec-

onds of time by the sound of the clock preceding Procyon in RA, and but little removed to the north in December." <sup>16</sup>

J.G.B. sent a "... rough sketch ..." of his observations to Hind, who raised the topic again in 1863, and J.G.B.'s observer, Mr Hermann Romberg, then used the 10-inch Cooke refractor to measure the position angle of the companion<sup>17</sup>.

J.G.B.'s own description of the Observatory is found in the Leyton Observations<sup>18</sup>:

" My observatory is erected in the midst of the pleasure-grounds which surround my residence at Leyton, in Essex, about six miles N.E. from the City of London; its position being 51° 34' 34" N. latitude and 0h 0m 0.87s W. longitude, and about ninety feet above the level of the sea. The building consists of a quadrangular room, sixteen feet square, surmounted by a wooden dome, covered with copper and lined with American cloth, which I found prevented the internal condensation of vapour; it revolves on gun-metal wheels connected by a ring. The shutter which covers an aperture of two feet, is opened by means of a cord passed through a hole to the interior, and runs on two iron rods fixed at tangents to the dome, by which arrangement it can be opened and shut with the greatest ease and rapidity, the



Joseph Gurney Barclay

dome being moved by a lever fixed to the wall, and working against iron pins screwed into the rim of the dome. Light falls into this room through four windows in the horizontal angles projecting beyond the circular base of the dome. The Refractor stands on a massive pier of brick-work, being 15ft 6in square at the base, 6ft 6in high, and set back in six ramps, on which is placed a circular slab of stone; the foundations being concrete, four feet thick, and drained below on solid gravel, the whole being covered with asphalt. On the west side is a second room, 12ft 6in square, which contains the Transit-Circle, the roof being flat, so as not to impede the view from the dome. The telescope is a powerful and handsome instrument made by T. Cooke & Sons of York, with an object-glass having a clear aperture of 10 inches and a focal length of 12 feet. It is mounted equatorially in the German fashion. The strong cast-iron pillar on which it is supported is in two parts. The lower part is 3 feet in height, with a diameter at the base of 3 feet 3 inches, and at the top 1 foot 6 inches; the upper part is 4 feet in height, the diameter at the top is 1 foot 1 inch. The two parts are bolted together with flanges and eight screw bolts and nuts. At this place there is a limited motion in azimuth, by which the Telescope is put truly into the meridian. The polar axis is 4 feet 2 inches long; the pressure on the upper bearing is relieved by two friction-wheels, the lower pivot is also relieved by two friction-wheels. At the lower end of the polar axis is carried the hour-circle, 13 inches in diameter, with two sets of divisions and verniers, graduated to 1m of time, and read off to 2s. The declination axis, 3 feet 2 inches in length, carries at one end the Telescope, at the other the counterpoise and the declination-circle, of 24 inches in diameter, which is graduated to 10' of space, and reads by the two verniers to 10" of arc. The Clock is driven by a heavy weight descending under the floor of the Observatory, and regulated by a double conical pendulum. The motion is communicated to the Telescope by a brass rod and wheels, and tangent-screw working into a strong ratcheted driving-wheel at the upper end of the polar axis. The instrument is provided with eye-pieces, magnifying from 50 to 1600 times. The view of the horizon is almost uninterrupted. The Telescope is furnished with a finder of 3 feet focal length and 3 inches aperture, which shows to the ninth magnitude."

No images of the observatory or its instruments have yet been discovered. Furthermore, until late 2006, its exact position was uncertain, because the coordinates given by J.G.B. place it outside known extent of the grounds of Knotts Green House. However, it seems that that J.G.B. kept near-by Forest House after his father's death, and though living in Knotts Green House himself, he built the observatory on Forest House land. He also acquired Leyton House at Leyton Green, extending the Barclay estate even further.

It appears that when first used in 1862, not only was the 10-inch refractor one of the largest instruments to have been produced by Thomas Cooke and Sons of York from their new Buckingham Works, but it was also one of the largest in the Britain and Ireland. The larger refractors were the 13 $\frac{1}{3}$ -inch at the observatory of Colonel Edward Joshua Cooper (1798-1863) at Markree Castle, County Sligo, Ireland (which had fallen into disuse by 1860), the 11 $\frac{3}{4}$ -inch 'Northumberland' telescope at Cambridge and the ex-Sir James South (1785-1867) 11 $\frac{3}{4}$ -inch telescope at Dunsink, north-west of Dublin, which was transferred in 1862, but not installed until 1863<sup>19</sup>.

### The observers

Having purchased the 10-inch Cooke refractor, for about £1200<sup>20</sup> in 1860, J.G.B. realised that professional astronomers would be needed to maximise its use. His first observer, from 1862 to 1864, was H. Romberg (a pupil of, and successor to, Johann Franz Encke (1791-1865) of the Berlin Observatory. On his arrival in 1862 Romberg wrote<sup>21</sup>:

"It is proposed to measure, as far as practicable, the stars in W. Struve's last Pulkova Catalogue, Bessel's selected list, the known revolving double stars, and a number observed by Admiral Smyth in the Bedford Cycle. Observations of the fainter small Planets it is hoped to procure, with a new wire-micrometer provided with illuminated wires in a dark field."

In the same paper he also stated that he was going to use the meridian-circle:

"... not only for the common determination of time, longitude and latitude, but for observation of Planets, and later for ascertaining the positions of Comparison-Stars."

Following Romberg's return to Berlin, J.G.B., on the recommendation of Hind, employed Charles George Talmage (1840-1886), who trained at the Royal Observatory, Greenwich but was then the Director of Bishop's observatory (which by now had moved to Twickenham), where he had studied the Sun. J.G.B. and Talmage worked on projects including: double star measurements for Struve's catalogue<sup>22</sup>; observations of Jupiter and Saturn (Figure 4), Uranus and newly-discovered Neptune; and timing many lunar occultations. The work was published privately in the Leyton observations. J.G.B. sent Talmage to observe the 1882 transit of Venus in the West Indies, where he took successful timings. Afterwards his delicate health began to fail, and he died in 1886, whereupon activity at the observatory ceased.

### Oxford and the Radcliffe Observatory<sup>23</sup>

Since 1861 the work of the Radcliffe Observatory, Oxford, England had become increasingly incon-

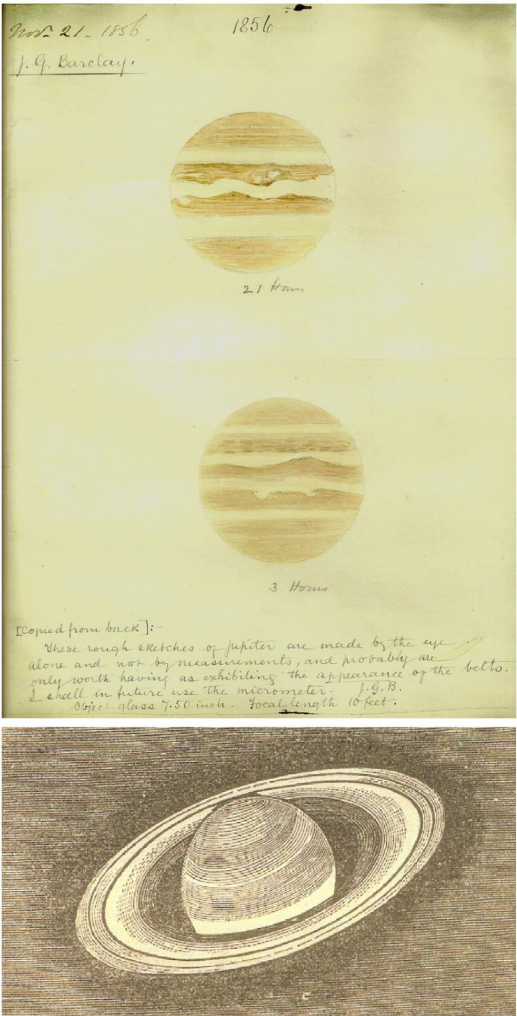


Figure 4

#### Planetary observations by J.G. Barclay

**Jupiter drawing:** Text at the top of page : "1856 Nov 21 1856. J.G. Barclay." Text at bottom of page: "[Copied from back]:- These rough sketches of Jupiter are made by the eye alone and not by measurements, and probably are only worth having as exhibiting the appearance of the belts. I shall in future use the micrometer. J.G.B. Object glass 7.50 inch. Focal length 10 feet."

**Saturn image:** This is from: R.J.Mann. *Dr Mann's Guide to Astronomical Science*. Norwich: Jarrold. No date (probably mid-to late 1800s. Page 253.

sequential because it lacked a first-class instrument. The situation became worse in 1875, when, only half a mile from the Radcliffe Observatory, the University Observatory was established in the 'Parks'. The Savilian Professor of Astronomy, Revd Charles Pritchard (1808-1893), accepted for the University Observatory the gift of a 13-inch photographic reflector from his friend Warren De La Rue (1815-1889). This telescope was already 21 years old, and the mirror was of speculum metal, not the 'modern' silvered glass.

Whereas benefactors were attracted to the University Observatory, the Radcliffe Observatory commanded no such support<sup>24</sup>. Thus, when Edward James Stone (1831-1897) became Radcliffe Observer in 1879<sup>25</sup>, he was shocked by the state of the Observatory, which had a barely-adequate budget and no funds to renovate or to acquire decent instruments. Stone originally made a plea to the R.A.S. for loan of an equatorial telescope, but during the course of frequent encounters with J.G.B. at R.A.S. meetings, persuaded him to donate his 10-inch Cooke refractor to Oxford and the Radcliffe Observatory. In view of J.G.B.'s age (he was by then 63 years old) and the lack of a professional observer at his observatory, J.G.B. agreed. He gave his transit instrument to the University Observatory<sup>26</sup>. Despite the growth in apertures, especially of reflector telescopes, Barclay's 10-inch refractor, with its superb Cooke lens, made a very welcome addition to the instruments at the Radcliffe Observatory.

The Barclay telescope was installed in the north-west corner of the Radcliffe Observatory grounds in a wooden shed with a sliding, corrugated-iron roof (Figures 5 and 6). There it remained until 1907, when it was transferred to the former heliometer building (Figure 7), from which the instrument had been removed. It was used regularly to observe M31 (the Andromeda galaxy) and immediately gave the Observatory better capability for observing comets, novae and minor planets. On 31 August 1885, the nova in M31 (now recognised as a supernova) was announced, and using the Barclay telescope Observatory staff recorded visual magnitude estimates until 10 December, longer than any other observatory in the Britain and Ireland. The rate of fading of the light curve enabled bounds to be set on the supernova's energy output and scale of such events in the 1950s theories of nucleosynthesis.

The Barclay telescope was the main non-transit instrument at the observatory for 10 years, until 1897, when the next Radcliffe Observer, Arthur Alcock Rambaut (1859-1923), persuaded the Radcliffe Trustees to refurbish and re-equip the Observatory with a 24-inch/18-inch photographic/visual double refractor by Grubb of Dublin. This telescope was installed in its own large dome in 1903 (Figure 7)<sup>27</sup>.

J.G.B. was above all a calm man, and this, combined with his generosity and business acumen, saved the Bank in the financial crisis of 1866. He retired in 1896 after converting the old firm into Barclay and Co. Ltd, and died on 25

Joseph Gurney Barclay

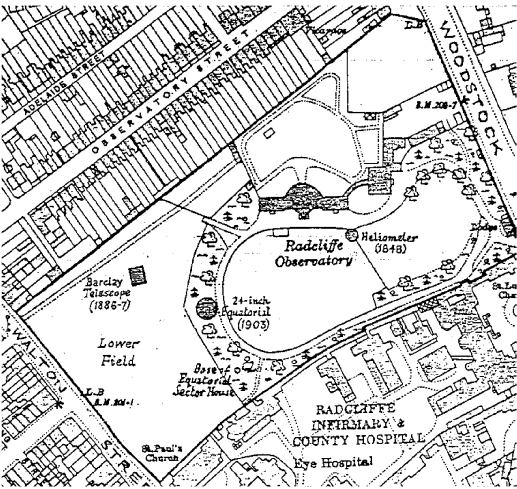


Figure 5

**Site of the Barclay 10-inch Cooke refractor at the Radcliffe Observatory, Oxford**

This is an extract from the Ordnance Survey 1887 survey. North is at the top. The scale is not known.

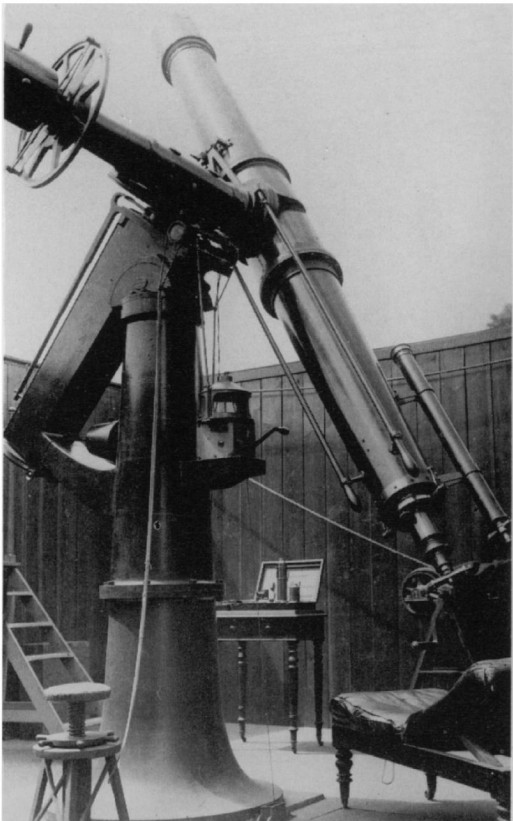


Figure 6

**The Barclay refractor circa 1900 in the wooden shed with a sliding roof**

Radcliffe Trust papers (Bodleian Library).  
Accession Number DD Radcl. D43.

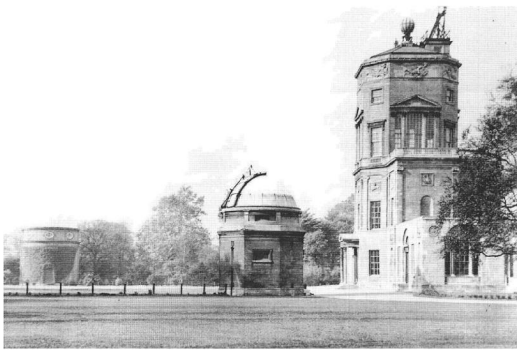


Figure 7

**The Radcliffe Observatory circa 1922**

The heliometer, was housed in the octagonal building in the centre foreground. The building in the left background housed the 24-inch equatorial.

Reproduced by courtesy of the Bodleian Library.

April 1898, aged 81, at Exton House, Brighton<sup>28</sup>. His Knotts Green property was submerged in the advancing tide of London suburbs and became Livingston College, for training missionaries in basic medicine before they left for the tropics.

**The move to Marlborough College**

In 1935 the Radcliffe Observatory site was sold, and the Observatory moved to South Africa. It appears that Sir Basil Philpott Blackett (1882-1935)<sup>29</sup> heard that the Radcliffe Observer was seeking good homes for the Observatory's instruments. Marlborough College aspired to establish a good teaching Observatory and to expand its existing Natural History Society (which had been carrying out observations and publishing them internally, with an 1880 4-inch Cooke refractor). The sum of 800 guineas was raised by the Marlburian Club, of which Sir Basil was President, to build the Observatory and to purchase a copper dome from a private observatory in Torquay. The Observatory was opened in 1935 by the last UK based Radcliffe Observer, Harold Knox-Shaw (1885-1970), and was named in honour of Sir Basil, who died in a road accident some six months before.

From 1935 the Barclay telescope was used by successive generations of Marlburian pupils under the supervision of enthusiastic teachers and members of the pupil-led Radcliffe Society, mainly for planetary observation, but also for solar work (using projection methods). However, over time the motor drive became damaged, and despite in-house attempts to keep the instrument going it had largely fallen into disrepair and was not being used to anything like its full potential.

On being appointed the Head of Physics at Marlborough College in 1997, I took responsibility for the Observatory. Unaware of the name of the



telescope, its provenance or family connection, I began overseeing its restoration and modernisation by astronomer, designer and engineer Mr Norman Walker, who formerly had been employed at the Royal Greenwich Observatory, Herstmonceux. The restoration (funded by the College) was completed in 2002 (Figure 8). Professor Joe Silk F.R.S., the current Savilian Professor of Astronomy at Oxford, reopened the Observatory (Figure 9). In September 2004, I became the first Director, with responsibility for outreach and education.



**Figure 8**

**The restored Barclay Equatorial in the Blackett Observatory of Marlborough College**

Photograph by the author September 2005

The telescope's prime function is to enable direct viewing at the eyepiece, primarily within the College to support the flourishing General Certificate of Secondary Education Astronomy course, but also to support local groups, primary schools and teachers. Work focuses on lunar detail, planetary observations including Uranus and Neptune, polar cap variations on Mars, and changes in cloud features on Jupiter and timings of shadow transits of the Galilean moons. Solar filters have been added, and direct observation of the Sun, including use of a crystal-based H-alpha filter, enables fine detail of penumbral filaments and of prominences to be seen and drawn. In June 2004 we were able to measure the Astronomical Unit to incredible accuracy, thanks to the European Southern Observatories programme devised for the transit of Venus, when contacts were timed to 10th second, and witnessed by some 450 visitors. The original Cooke optics are, by acclaim of experienced visitors, astounding, and allowed in September 2005 observation by eye of Pluto near the theoretical magnitude limit of the instrument.

The link with Oxford University has been maintained; as an Academic Visitor to the Astrophysics department, and a member of Green Col-



**Figure 9**

**Professor Joe Silk, F.R.S. (on the left) and Mr Norman Walker at the 2002 opening of the restored Barclay telescope**

Photograph taken by, and reproduced with the permission of, Mr S Ellis, Marlborough College.

lege Common Room, I am linking public outreach at the former Radcliffe Observatory site with one of its original instruments. In Summer 2006 we launched at Green College a series of astronomy lectures for the Public Understanding of Science, including lectures by Professor Roger Davies, Chair of Physics, Philip Wetton Professor of Astrophysics in Oxford University and Professor Jocelyn Bell-Burnell C.B.E., F.R.S. With Heritage Open Days attracting 700 visitors, the history, significance and work of the former Radcliffe Observatory is being brought back into the public eye.

### Acknowledgements

I must acknowledge the help and assistance given by Peter Hingley (R.A.S. Library), Professor Roger Davies (Oxford Astrophysics), Dr Roger Hutchins (Magdalene College Oxford), Anne Charles (ex Radcliffe Infirmary), Dr Terry Rogers (Marlborough College Archivist), 'Kisty' Creighton (née Barclay, great-granddaughter of J.G.B., and possibly the last to have known his children), and for his research, leading to the Paragraph t the foot of column 1 on Page 14, Dirk Pelly (formerly Director of Barclays Bank International and a distant cousin). I am also grateful to Mr Ken Goward (Treasurer of the Society for the History of Astronomy) for corroboration of the details of the Leyton Observatory and for supplying information about the image of Saturn shown in Figure 4. Special thanks are due to Dr Roger Hutchins for his time and care taken in reviewing and editing the draft paper.

## Notes and References

1. The topic of this paper was presented at the second Autumn Conference of the Society for the History of Astronomy, held at the Birmingham and Midland Institute, in Birmingham, England on 8 October 2005.
2. In researching this paper I have realised that Robert Barclay of Clapham (1758 – 1816) my direct antecedent is an important character in this family story. At present, details of his observatory (where Thomas Collinson, his half-cousin was his co-worker) and its instruments remain undiscovered, and will be the topic of future research.
3. H. Barclay and A. Wilson-Fox. *A History of the Barclay Family*. London: St Catherine Press. 1934. Pages 264, and 253-254. The authors do not cite the location of the primary sources. Hereafter this is referred to as: Barclay and Wilson-Fox. *The Barclay Family*.
4. Hermann Romberg. Observations of Comet II. 1862 taken at the observatory of J. Gurney Barclay, Esq., at Leyton, Essex, and communicated by him. *Monthly Notices of the Royal Astronomical Society*. 1863, XXIII (3), 92-94.
5. J. Gurney Barclay. Note on a small companion of Procyon, &c. *Monthly Notices of the Royal Astronomical Society*. 1863, XXIII (6), 196-197. This paper includes, on page 197, a note authored by Hermann Romberg: Measures of the small star near Procyon. I have been unable to trace any other acknowledgements of these Leyton observations. The next independent observation seems to be that of W. Struve on 19 March 1873 (*Monthly Notices of the Royal Astronomical Society*. 1873, XXXIII, 430-433, and subsequently *Monthly Notices of the Royal Astronomical Society*. 1874, XXXIV, 555-559. However, the confirmation was credited to J.M Schaeberle in 1896 using the 36-inch refractor at Lick Observatory (Patrick Moore. *Brilliant Stars*. London: Cassell Publishers Ltd. 1996. Page 85).
6. C.G. Talmage. Occultations of Neptune and  $\nu^2$  Cancri, observed at Mr. Barclay's observatory, Leyton. *Monthly Notices of the Royal Astronomical Society*. 1874, XXXIV (5), 273-273.
7. *Dictionary of Quaker Biographies* (unpublished document) held at Friends House, London. At this time the whole banking branch of the Barclay family were committed Quakers, and had been since Robert Barclay (1648-1690) (J.G.B.'s Great-great-great-grandfather), later known as the 'Apologist', joined the 'Friends' movement in its earliest days in 1664. The origins of the London banking fraternity Barclays, Bevans, Trittons, etc. arose from the gatherings and business conducted by the main Quaker families in London in the mid-18th century. J.G.B.'s grandfather in Clapham was at the centre of Quakerism there, and J.G.B. himself became an 'Overseer' in the movement.
8. Derek Howse. The Greenwich list of observatories: A world list of astronomical observatories, instruments and clocks, 1670-1850. *Journal for the History of Astronomy*. Number 51. November 1986, 17 (4), i-iv, 1-100, (page 69). Also see the amendment to this entry in: Derek Howse. The Greenwich list of observatories: Amendment list No. 1. *Journal for the History of Astronomy*. Number 80. August 1994, 25 (3), 207-218, (page 215).
9. Barclay and Wilson-Fox. *The Barclay Family*. Reference 3. Page 253.
10. Michael Hoskin (Editor). *Caroline Herschel's Autobiographies*. Cambridge, England: Science History Publications. 2003. Pages 66-67.
11. Barclay and Wilson-Fox. *The Barclay Family*. Reference 3. Page 253.
12. D. Malin and P. Murdin. *Colours of Stars*. London: Cambridge University Press. 1984. Page 11.
13. *The Victoria History of the County of Essex*. Volume VI. Updated 1973.
14. Forest House was demolished in 1898 to build Whipps Cross Hospital.
15. Barclay and Wilson-Fox. *The Barclay Family*. Reference 3. Page 264. See, too, Reference 7.
16. J. Gurney Barclay. Reference 5. Page 196.
17. Hermann Romberg. In: J. Gurney Barclay. Reference 5. Page 197.
18. J.G. Barclay. *The Leyton Observations*. These were privately published volumes containing the combined observations of J.G.B. with his observers - first Romberg, then Talmage. Copies of Volumes I, II, III and IV are held in the R.A.S. library. (Volume V was not published.)
19. <http://12.1911encyclopedia.org/O/OB/Observatory.htm> "Observatory". LoveToKnow 1911 Online Encyclopedia ©2003, 2004. Accessed September 2006.
20. J.G. Barclay. *The Leyton Observations*. Reference 18.
21. Hermann Romberg. Reference 4, Page 94.
22. J.G. Barclay. *The Leyton Observations*. Reference 18.
23. For additional detail see Jeffery Burley and Kristina Plenderleith (Editors). *A History of the Radcliffe Observatory Oxford*. Oxford: Green College. 2005.
24. Ivor Guest. *Dr John Radcliffe and his Trust*. Oxford: The Radcliffe Trust. 1991. Pages 287-288.
25. When installed, this telescope was the 3rd largest refractor in Britain. It was used to take the first British photograph of the newly-discovered Pluto in 1930 (see Burley and Plenderleith, 2005. Reference 23. Page 15). It is now restored and in use at the University of London Observatory at Mill Hill.
26. No record of the fate of the 4-inch transit instrument has yet been found, but Dr Roger Hutchins (Magdalene College, Oxford) has informed the author of a 4-inch lens in storage under the Clarendon Laboratory in Oxford, so perhaps part of this instrument has survived.
27. A.D Thackery (Radcliffe Observer). The Radcliffe Observatory 1772-1972. Oxford: The Radcliffe Trust. 1972.
28. Anonymous. Obituary - J.G.Barclay. *Monthly Notices of the Royal Astronomical Society*. 1898, 59, 218-219.
29. Sir Basil Phillott Blackett, K.C.B., K.C.S.I. (Marlborough College 1893-1900) was Controller of Finance at the Treasury after World War I, then served for five years in India as financial member of the Viceroy's Executive Council. On his return to Britain he became a Director of the Bank of England. He died in a motoring accident in Germany in August 1935. See his obituary in: *Journal of the Royal Statistical Society*. 1936, 98 (4), 775-777.

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#### Note added in proof

As this paper was in its proof stages, information was found to confirm that the Barclay family held a total estate of about 100 acres (42 hectares) in the Leyton area, including Knotts Green House, Leyton House and Forest House. On an 1882 Ordnance Survey map, Essex Survey Sheet 073 Scale 1:10,560, is marked a rectangular building at the coordinates given by J.G.B. in Reference 18. See page 13 of this paper for J.G.B.'s text, and Figure 3 showing the location. It seems as if the observatory has, at last, been located.

