

# **THE KING'S OBSERVATORY**

**OLD DEER PARK, RICHMOND**

**HISTORICAL REPORT**

**BY**

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**VOL. 1 TEXT**

# THE KING'S OBSERVATORY

## HISTORICAL REPORT

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# 1. CHRONOLOGY OF OCCUPANTS

1768-69	Observatory built
1769-1840	Directly in Crown hands
[1840-1842 negotiations with Royal Society]	
1842-71	British Association for the Advancement of Science (by 'grace & favour grant') (Kew Committee established 1849)
19.6.1871	Handed over to Kew Committee of Royal Society
1881-82	Office of Works finds that no official notification of the 1871 handover was given. The Queen's permission was given for continued occupation by the Royal Society, still on a grace & favour licence (but with 'acknowledgement' rent of 55 shillings p.a.)
30.11.1882	Licence to Royal Society issued: enrolled 22.12.1882
6.4.1883	Revised licence enrolled
1.1.1900	National Physical Laboratory (under auspices of Royal Society) takes over
1.7.1910	Meteorological Office (under auspices of Royal Society) takes over (1910-1913 – all NPL work transferred to Bushy House)
1920	Meteorological Office transferred to control of Air Ministry
1964	Air Ministry merged into Ministry of Defence
1980	Meteorological Office work at 'Kew' terminated.
1981	Observatory offered for sale or long lease by Cluttons estate agents on behalf of Crown Estate Commissioners.
22.11.1982	Tripartite agreement between Crown Estate Commissioners, J E Lesser & Sons ( Holdings) Ltd and Trustees of Royal Mid-Surrey Golf Club re. rights of access on access road etc.
21.12.1982	Lease to J. E. Lesser & Sons ( Holdings) Ltd for 99½ years from 5 July 1982
30.5.1985	Above lease extended by further 25½ years to expire 5 July 2107.
[1985-86?]	J E Lesser & Sons (Holdings) Ltd sell head lease to Hill Samuel Bank Ltd.
25.4.1986	Sub-lease to Solaglas Ltd and Solaglas Holdings Ltd for 25 years expiring 24 March 2011
27.5.1986	Lease registered in name of Autoglas Ltd (a division of Solaglas)
27.12.1989	Hill Samuel Bank Ltd sell head lease to Kew Holdings Ltd (Mr R J F Brothers)
1990	Autoglas Holdings (aftersale of building glass side of Solaglas)
1992	Autoglas change name to Belron

## **Responsible Government Agencies**

1782	Commissioners of Woods and Forests
1810	Commissioners of Woods and Forests and Land Revenues
1831	Commissioners of Woods, Forests, Land Revenues, Works and Buildings
1851	Split into new Office of Works and Public Buildings and Commissioners of Woods and Forests. [Office of Works and Public Buildings take over responsibility for work in Observatory buildings shortly before 1881, but Woods and Forests remain responsible for the land].
1924	Commissioners of Woods and Forests become Commissioners of Crown Lands.
1956	Commissioners of Crown Lands become Commissioners of Crown Estate
[ ? ]	Ministry of Works becomes Ministry of Public Buildings and Works (MPBW)
1967	MPBW merged into Department of Environment

## **2. EARLY HISTORY OF THE SITE**

The ground on which the Observatory stands was originally part of the demesne land of the manor of Shene (the old name of Richmond).

### **The Manor of Shene**

The earliest known historical reference to Shene is in the will of Theodred, Bishop of London, who died in 951 holding land at 'Sceon' (Shene) among other places – but where this was, or how much, remains unknown. At the time of Domesday Shene was a part of the royal manor of Kingston. King Henry I divided off the area of Shene and Kew and granted it as 'the Manor of Shene' to the Norman family of Belet. It came back into royal hands about 1314. King Edward III converted the manor house into a palace.

### **The Charterhouse of Shene**

In September 1414 King Henry V founded the Carthusian monastery named the Charterhouse of Jesus of Bethlehem of Shene, granting to it from his demesne land ground on the north side of Shene Palace containing 1725 feet in length (from 'Hakelote by Diversbusshe' at the south to 'Ar nietislote' at the north) and 1305 feet 8 inches in breadth from east to west. In the following April a revised charter added more land on the north side: the north-south dimension was now to be 3125 feet from Hakelote as before on the south to 'the cross called Crossashe' on the north. ('Crossashe' would have been by the riverside, about where the former Isleworth Ferry Gate of Kew Gardens was situated). In the meantime the actual monastic enclosure had been laid out at the northern end of the original grant. Further royal grants of demesne land were added to the Charterhouse holding in 1442 and 1479. (Figure 1).

A plan of the Charterhouse enclosure c.1420 was published by John Cloake in 1977, subsequently slightly revised in 1990 and 1995 (Figure 2).

### **'West Sheen' and the Old Deer Park**

The Charterhouse was dissolved in 1538, refounded in 1556 and dissolved a second time in 1558. After the dissolution the site became first a nobleman's mansion called Sheen Place; then, with the addition of a few more large houses, the hamlet of 'West Sheen'. In 1604 King James I created a new park for Richmond Palace which included nearly all the former Charterhouse land outside the bounds of the actual monastic enclosure. (This park is today the Old Deer Park and a southern part of Kew Gardens). By the 18<sup>th</sup> century it was divided into many closes (Figure 3).

By the 1760s the whole hamlet of West Sheen within the old monastic boundary walls was divided between two main crown leases (with several sub-leases). King George III was embarking on a project to build a new palace in the Old Deer Park and in order to enhance the park and have clear views, he bought out the West Sheen leaseholders and in 1769-71 demolished the last traces of the hamlet including the boundary walls. (The sites of these walls can still be discerned in the grass after a very dry summer and are clearly visible in the aerial photograph of September 1929 (Figure 24).

The King had a keen interest in astronomy and wished to observe for himself the transit of Venus across the sun forecast for 3 June 1769. The observatory which had been built by Samuel Molyneux, Secretary to Prince Frederick, in the 'White House' at Kew about 1720 had fallen into disuse and disrepair, though the White House was still occupied by George

III's mother, Princess Augusta. So in 1768 the King instructed his architect, William Chambers, to build him a new observatory. This was sited in the Park about 60 yards to the north of the then still standing north wall of the West Sheen enclosure – and about half-way along it, as can be seen in the 1771 plan of Richmond Gardens (Figure 4).

The portion of the Park in which the Observatory was built had been, since the mid-16<sup>th</sup> century, a large triangular field of some 20 acres called originally 'Home Close' and by the early 18<sup>th</sup> century 'Triangle Close' (Figure 3). The base of the triangle was a lane at the south immediately outside the former monastery wall. The field was bounded on the north-east by 'Robin Hood's Walk' and on the north-west it was separated from the riverside 'Church Mead' by a ha-ha and raised walk built by Charles Bridgeman in the early 1720s. It included, on the south side, a pond of oval shape (about 135 feet by 100 feet), the nearest end of which was about 135 feet from the south-west corner of the new Observatory building. The pond was not shown in Bridgeman's plans nor in a plan of 'the Prince of Wales' estate' dated 1725-6. It makes its first appearance in John Rocque's map of Richmond Gardens dated 1734, so it was probably constructed in the late 1720s. The northern part of the present boundary fence on the west side of the Observatory compound roughly bisects the site of the pond. The pond is shown in the 1771 plan, but not in a plan of the mid 1780s or in any later plan, so was probably filled in at the time of the final demolition of West Sheen.

### 3. THE OBSERVATORY BUILDING

There are no extant plans by Chambers for the Observatory building, and the only known accounts are bills presented directly to the King by William Kirby, the Clerk of Works, for some work done by Solomon Brown, bricklayer, James Arrow, joiner, John Devall, plumber and Mary Hartley, smith. These are in the accounts of Princess Augusta [Windsor RA55656-7], so it is possible that she financed the project. If not, it must have been paid for from the privy purse. As the total of these bills came to only £204.11s.1d, they obviously covered only a small part of the cost. Solomon Brown was a local builder. Originally from Shobden in Herefordshire, he married a girl from Kew in 1744 and settled in Richmond. From 1755 to 1760 he lived at No.4 Richmond Green, and from 1760 until his death in the 1800s at No.1 The Green. He is known to have also worked for Chambers on royal works at the White House at Kew and – notably – as the builder of the Kew Pagoda.

No doubt Dr Stephen Demainbray, appointed Superintendent Astronomer, worked with Chambers on the design of the Observatory, which was also influenced by the recent Swedish notion of placing the main telescope in a cupola on the roof. This concept was initiated by Celsius in building the Observatory at Uppsala in 1740 and developed at the Stockholm Observatory (built between 1746 and 1753). Both buildings were designed by Harlemann, an old friend of Chambers, who, with his strong Swedish connections, would certainly have been familiar with the plans. He had also been in correspondence with the Swedish Astronomer Royal, though there is no extant letter about this project.

The building itself was conceived as a small villa, similar to an earlier design by Chambers for a hunting pavilion ('casine') for Lord Bruce at Tanfield Hall in Yorkshire. It had a central block of two principal storeys, with canted central bays of full height on both north and south sides, containing pairs of connected octagonal rooms, with single-storey wings at east and west, all over a raised basement floor (which had high windows above ground level) and surmounted by the telescope cupola. The whole building was stuccoed (over brick). The main entrance was on the north side, with a double flight of steps. An artificial mound was built up around the building – probably as a protection against flooding. This is lower on the south side where a small porch gave direct access (down internal steps) to the basement level. (The top of the mound was about 12½ feet above the normal water level in the riverside ha-ha). Around the building, in the mound, and perhaps also conceived as flood defences or to give strength to the mound, are three rings of vaults.

Robert H. Scott FRS, in his 'History of the Kew Observatory, Richmond, Surrey' made the following comments on the materials used in the building and the vaults.

'The central part of the building stands upon vaulting constructed of bricks differing in character from modern 'stock' bricks, being soft, red, thinner and narrower. Similar bricks are to be found in the walls of Richmond Palace [a reference here to Crisp's\* comment that 'immense quantities of ancient masonry and brickwork lie under the surface of the Park'] and such have been mainly used in the construction of the basement of the Observatory, up to the stone course. 'The basement is surrounded by three successive square rings of vaulting, of which the innermost is 5 feet wide by 8 feet high, the second 8 feet by 6 feet high, and the third and last 6 feet 6 inches by 5 feet high. This vaulting is constructed of bricks similar to those used in the upper part of the building, which resemble the bricks of the present day.'

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\* Richard Crisp: Richmond and its Inhabitants from the Olden Times, Sampson Low, London 1866, p.123

It is probable that the old bricks were salvaged from the last remaining houses at West Sheen which had mostly been demolished just before the Observatory was built, not from the Charterhouse.

The vaults were inspected in July 1927 by Nathaniel Lloyd, an architect and author of 'A History of English Brickwork'. His report dated 14 July 1927 [BJ1/334] notes that most of the bricks are of 18<sup>th</sup> century type 'except a few (chiefly used at low level) which look like mediaeval bricks re-used'. The mortar varied in quality, some as hard as Portland cement mortar, some very soft. He concluded 'I have no hesitation in saying that none of the brickwork I saw is mediaeval, but that it is probably contemporary with the structure of the Observatory itself'. A plan of the vaults was made at this time by one J. C. Goodison of the Office of Works. [Figure 5].

The original appearance of the Observatory can be seen in various depictions:

1. (Figure 6) A copper engraving published in 1792 by T. Cadell, included in Lysons's History of Surrey (facing p.446).
- 1A. (Figure 7) An aquatint based on the above, also published by Cadell with the same date, but apparently sold as a separate item. [1+1A both from the SW]
2. (Figure 8) A watercolour marked 'c.1800' in the British Library (K Top XLI 16R) [from the N]
- 2A. (Figure 9) A watercolour copy of the above, in the Richmond Public Library local studies collection [ do.]
3. (Figure 10) A copper engraving by William Bernard Cooke from a drawing by Samuel Owen, dated 1809 and published in Cooke and Owen's The Thames (2 vols. 1811). [From the NE]
4. (Figure 11) A watercolour by George E. Papendiek, c.1820, now in the Mellon collection (reproduced in John Harris's Sir William Chambers. [from the NE]
- 4A. (Figure 12) A copper engraving by C. Hullmandel from the Papendiek painting included in Mrs Papendiek's Court and Private Life in the Time of Queen Charlotte [ do.]
5. (Figure 13) (A distant view including the southern pair of obelisks) – copper engraving by Frederick Smith from a drawing by George Barnard, published in W. B. Cooke's Views at Richmond 1831 [from the S]
6. (Figure 14) (A tiny vignette) in The Picturesque Pocket Companion to Richmond [etc.] 1842 [from the E].

Over the years the building sprouted various meteorological instruments, as first shown in the engraving by Francis Ronalds in the 1844 Report of the British Association for the Advancement of Science (Figure 15).

Responsibility for works on the building seems to have been transferred from the Commissioners of Woods and Forests to the Office of Works and Public Buildings shortly before 1881.

Apart from the meteorological instruments and the erection of screens for thermometers (originally on the entrance steps balustrade, then from 1867 onwards outside the north window of the west wing room) the only significant change made to the outward appearance of the building before 1888 was the building of the 'lens room' on the roof on the north side of the cupola. (This can be seen in the Strand illustration of 1891 – Figure 18). In 1888 in order to provide more space, a new upper storey was added to the east wing. The oddly asymmetric appearance that this created can also be seen in the Strand illustration. It was corrected by the similar addition of an upper storey to the west wing in 1892. The additions were designed by Mr Lennis, surveyor to the Office of Works and Public Buildings and were of course approved by the Office. (This development of the wings can be

compared to that of Asgill House by the riverside in the 1840s – happily restored to its original plan in 1967-70).

New staging was put up on the roof in 1913 to affix the Dines pressure-tube anemometer. This was removed in July 1934.

In 1930 the Robinson-Beckley anemograph (with revolving cups) was replaced by a larger Dines anemometer with vane.

Two large chimney stacks appear in the 1933 aerial photo (Figure 26). These were removed in the 1980s reconstruction.

A metal fire escape was erected on the outside of the west wing at some date before 1960. (It was probably a war-time precautionary measure). This also was removed in the 1980s reconstruction. The 'Lens Room' on the roof had been taken down by 1968.

A principal feature of the interior was the display cases, with glass-panel fretted doors, in the two main octagonal rooms (Figure 16). These were the work of James Arrow. Alterations to the interior are described elsewhere.

### Railings and Terrace

The early views of the Observatory (including the Cadell engraving and aquaprint of 1792) show railings around the building, and the Ordnance Survey map of 1868 (surveyed in 1866) shows a narrow margin around the building which presumably indicates the railings. The O.S. maps of 1894 and 1913 are similar. The Kew Committee report of 1884 notes that 'the iron fencing around the building' had been painted. The railings are very clearly shown in the Strand illustration of 1891 and appear identical both with those depicted by Cadell and Papendiek and with those existing today.

Aerial photographs of 1929 and 1933 (Figures 24 and 26) and the O.S. maps of 1933 and 1960 (Figures 25 and 29) show a new, wider, rectangular margin, well outside the railings, which seems clearly to be the terrace which still exists today. The Meteorological Office report for 1914 records the formation of a 'gravel terrace' round the building.

## 4. THE OBSERVATORY COMPOUND

### The Land

As long as the Observatory remained directly in royal hands, it stood in the Old Deer Park with no external boundaries. As it was itself intended as an appendage to the existing Richmond Lodge and the proposed new royal palace (planned and started, but never completed) on a site some 600 yards to the north, the Observatory had no outside servants' quarters, stables or other outbuildings.

The royal grant to the British Academy in 1842 did not include any land beyond the site of the building itself.

In 1854 'two acres of ground contiguous to the Observatory' were acquired as a 'garden'. This new enclosure, stretching southwards on the west side of the Observatory building, is shown in the 1868 Ordnance Survey map surveyed in 1866 (Figure 17). The Strand illustration of 1891 (Figure 18) shows the new ground apparently enclosed by hurdles, but by 1911 there was a thin hedge on each side (Figure 22) and this is clearly marked in the Scrase plan (Figure 27). Some 40 yards of this hedge on the west side and 15 yards on the east side still existed in 1981 (figures 22b and 27). In 1911 the north side was also hedged right across to the Observatory.

After the Kew Committee expressed concern in 1893 about the protection of the Observatory given the new tenancies in the Old Deer Park (Cricket and Athletic Associations 1885 and 1889, the Richmond Golf Club 1892 then the Mid-Surrey Golf Club 1893, proposal for civic recreation ground 1893), an area of grassland of 5 acres surrounding the Observatory and its garden was leased to the Committee by the Office of Woods and Forests in 1894 at a rental of £27 per annum, on condition that it be enclosed by a 6 foot oak paling. The fence was erected at the cost (£350) of Sir Francis Galton. The new compound is not shown in the O.S. map of 1984, but is on the Chree plan of 1896 (Fig. 21).

The extra land was initially sub-let to the Golf Club for the pasturing of horses, and part of it was used as 'allotments' by the Observatory staff; but about 1914 the Director had a chestnut paling erected around the east and north sides of the Observatory, and a border 10 feet wide outside this planted as a shrubbery (many of the plants were provided by Kew Gardens). The shrubbery is clearly shown on the Scrase plan (Figure 27). It started a little to the north-west of the 'Clinical House' (no.2 on site plan), ran north for about 15 yards, then turned to the east for some 80 yards, right round the north side of the Observatory building, then south (but leaving a gap for the entrance) for 95 yards, and finally west for 45 yards to meet up with the garden hedge. Some traces of it on the north side still survive today. (The aerial photograph of 1929 (Figure 24) also shows an apparently short-lived semi-circular hedge enclosing on the south side the bit of land contiguous to the end of the garden, on which the 'new Magnetic Hut' had been built.

These lands together make up the present Observatory compound of 6.35 acres.

### The Garden Path

A gravelled path was made 'in the garden' in 1877 to give better access from the Observatory to the rain gauges set up in the garden and to the 'Magnetic Hut'.

Chree's plan of 1896 (Figure 21) shows this path as starting from the foot of the west flight of the north entrance steps, then leading to the 'Experimental House' (D on his plan, 6

on site plan), with little branches off to doors at both north and south ends of the 'Clinical House' (B/2). From just north of D/6 the path continues round the east side of that building to the original 'Magnetic Hut' (F/13). [See 1911 photo Figure 22].

The aerial photos of both 1929 and 1980 (Figures 24 and 36) show a modification of this layout. A path leads straight from the west side of the Observatory building to the north end of B/2. Another curls round from the south-west corner of the Observatory to the south side of B/2, with a branch off to D/6. Then from the south-east corner of B/2 a path curls to the north side of the Workshop (C/8) and half-way along it a branch bends back slightly westward to connect with the straight path to Magnetic Hut (F/13) and round it to the new Magnetic Hut (E/14).

### The access road to the Observatory

A narrow track leading from the NW corner of a little patch of crown land on the opposite side of Parkshot from Clarence Street straight to the south porch of the Observatory is shown on the O.S. 25<sup>th</sup> map surveyed in 1866 (Figure 17).

In 1875 the Kew Committee of the Royal Society applied to the Office of Woods and Forests for the making of a 'gravelled footway' across the Old Deer Park. This was done in 1876, but a request in 1879 to Woods and Forests for repairs as the path 'was impassable after long wet weather' was not met, and the Kew Committee carried out emergency repairs themselves.

At some date around this time the path may have been slightly re-aligned as the O.S. map of 1897 (revised in 1893-4) (Figure 19) shows the track starting from the same point but now running, equally straight, to the north-east corner of the Observatory building. (There was some consideration given in 1891 to making a new entrance from Parkshot to avoid problems with cattle, but no sign that this was done). The present access road is on the same alignment but its southern end was of course completely altered by the construction of the 'Great Chertsey Road' in 1933.

### Roads within the compound after enlargement

Chree's plan of 1896 (Figure 21) shows a similar track, but apparently somewhat wider, up to the gate to the new enclosure, then continuing – a bit narrower – past the NE corner of the Observatory building to the foot of the eastern flight of the north entrance steps. Running west-south-west from the entrance gate a so-called 'carriage road' leads to a widened turning place some 25 yards south of the Observatory building, just outside the old garden hedge. The O.S. map of 1913 (Figure 23) shows the same features but with a new building (C/8) on the south side of the turning place.

By 1929 (aerial photo – Figure 24) and 1933 (O.S. map and aerial photo – Figures 25 and 26) the road layout within the compound had been changed. A short straight stretch running due west from the entrance gate then divided into a narrow path to the north-east corner of the Observatory building and round to the steps and a wider road to the south-west, circling round by the north-east corner of the workshop building (C/8) to run due north to the Observatory south porch. The same pattern is seen in the O.S. map of 1960 (Figure 29) and aerial photos of 1965 and 1980 (Figures 31 and 36), but immediately on the north side of the straight stretch of road inside the gate an area of hard standing for hydrogen cylinder trailers was laid in April 1964.

When the Lesser Group took over, a car park for 20 vehicles was made on the north side of the entrance gate. A new path to the entrance steps was made from this car park.

Another park for 5 cars was situated on the east side of the Museum building (C/8), and one for 15 cars to the north of the new office building (5). (See site plan).

### The 'mounds'

There are now long low mounds of earth, one to the north-west of the Observatory building beyond the remnants of the shrubbery and one just outside the western side of the old garden, beside the swimming pool and curling round to shield most of the south side of the pool.

The north-west corner of the compound appears in the OS 1933 map (Figure 25) to be a small enclosed area. The 1929 aerial photo (Figure 24) shows what appears to be a kitchen garden in this area (possibly being planted with plants for use in electrical experiments. They didn't thrive in the Observatory compound and the experimental plots were later transferred to Richmond Park). The 1933 aerial photo (Figure 26) shows the area still fenced off, but apparently quite flat and empty of any features. The aerial photo of 1965 (Figure 31) shows the separating fencing removed, but the area still flat and featureless. There is no sign at all in these photos (or in the architect's plans of 1981) of the mounds. They were probably spoil earth from the developments of the early 1980s.

### The 'King's Walk'

A depression in the land north of the Observatory compound – apparently aligned on the north entrance steps – has been called 'The King's Walk' in the belief that King George III might have approached the Observatory on foot, having landed from the river at a point north of the Observatory. This is not only inherently unlikely - it would have been much simpler to walk or ride there straight from Richmond Lodge or the 'White House' at Kew – but it would have been actually impossible. There was a quite deep (and almost certainly water-filled) ha-ha between the river bank and the Observatory, separating the Triangle Close from the riverside meadow. This feature with a long terrace beside it had been created by Bridgeman about 1726 and still existed when shown on the 1771 plan of Richmond Gardens (Figure 4). Even after it had been removed (by the mid-1780s) there remained a large water-filled ditch on the inside of the riverside tow-path. In any case, if the King had for some reason wanted to come by river from Kew (or perhaps directly from London), he would surely have landed at the Surrey stage of the Isleworth Ferry (to the north-west of the Observatory) from which there was a path to Richmond Lodge. Needless to say, there is no trace at this place of any path or avenue of trees, or significant depression in any maps of any period. The 1800 British Library painting (Figure 8) shows a few clumps of trees but not a defined avenue – and the ground on the north side of the Observatory is shown absolutely flat. This latter point argues against the 'obvious' explanation that earth might have been taken from here to build up the mound round the Observatory. Another possibility lies in the record that in 1881, after the Observatory basement had been flooded for the third time in five years, 'a new ditch was built to the river to remove the water'. (Royal Society Kew Committee Report 1881). A plan dated July 1881 shows a proposal to drain the 'area' around the Observatory (presumably the inner vault) into the ha-ha (WORK 32/511), but does not identify on which side of the Observatory this would be carried out.

For identification of the instruments set up in the grounds of the Observatory and of the various outbuildings, see the Scrase plan (Figure 27) and the plan of 1965 (Figure 32).

## 5. THE WORK OF THE OBSERVATORY WHILE STILL IN ROYAL HANDS – AND THE ROYAL COLLECTIONS

King George III appointed as his ‘Superintendent Astronomer’ Dr Stephen Demainbray, a well-known man of science who had been his tutor in astronomy and mathematics when he was Prince of Wales and had aroused his interest in the subject. Together, with other members of the royal family and a few other local notables, they witnessed the transit of Venus on 3 June 1769 and a solar eclipse on the very next day.

The King, and Queen Charlotte, were keen collectors of scientific and natural history objects. They housed their collections, to which Dr Demainbray added his own, in the Observatory in the glass-fronted, fretted cabinets lining the walls of the central ground floor rooms and the then Superintendent’s room on the upper floor – which were the work of the joiner James Arrow. Dr John Evans in his Richmond and its Vicinity (1824) describes the collections as ‘some excellent mathematical instruments, a collection of subjects in natural history, well preserved, an excellent apparatus for philosophical experiments, and a collection of ores from His Majesty’s mines in the forests in Germany’. An article by R. S Whipple on ‘An old Catalogue and the Scientific Instruments and Curios of George III’ published in The Proceedings of the Optical Convention 1926 describes the collections in detail, and a splendid book by Alan Morton and Jane Wess, entitled Public and Private Science: The King George III Collection was published by the Oxford University Press, jointly with the Science Museum, in 1993 illustrating the items of the scientific collection. The Science Museum also published at the same time an illustrated booklet by Alan Morton ‘Science in the 18<sup>th</sup> Century’.

The King also had an interest in time-keeping and a collection of clocks and watches. Among them was a very accurate clock made by Benjamin Vulliamy, ‘Clockmaker to the Crown’, which was used to provide a standard time to important government buildings in London. This task was later transferred to Greenwich Observatory, but not before three obelisks had been erected in the Old Deer Park, close to the river bank, in June 1778 to assist in the exact alignment of instruments in the King’s Observatory. The northern one and the western one of the southern pair are on the true north-south meridian line passing through the west room of the Observatory which housed a tracking telescope. The other southern one is due south from the east room with its great mural quadrant. [See Figure 13]. Dr Demainbray’s great-grandson wrote, ‘His Majesty frequently attended at the Observatory and procured the best clocks and watches that could be made and placed them under the Doctor’s care, so that by daily observation of the sun when passing the meridian the time was taken from the King’s Observatory for the regulation of the clocks in both Houses of Parliament, at the Horse Guards, St James’s and elsewhere in London’. In 1772 the King and Dr Demainbray personally tested Harrison’s chronometer [BJ5/306].

Apart from astronomical and time-keeping work, Dr Demainbray started meteorological observations in 1773 which were continued after his death in 1782 by his son and successor, the Revd. Stephen Demainbray, until 1840. A rain gauge was erected on the roof; and the observation of sun spots was initiated in 1819. Latterly the younger Demainbray was assisted by his nephew Stephen Peter Rigaud, Savilian Professor of Astronomy at Oxford – who took over at Richmond during the Oxford vacations. It was around this time that the misnomer ‘Kew Observatory’ came into common use.

Though King William IV had shown an interest in the Observatory, Queen Victoria seems to have had none. It was probably the association with Kew, where the only remaining royal residence in the area now stood, and where Kew Gardens (including Richmond Gardens) and the Old Deer Park were handed over to the Commissioners of Woods and Works in 1840, that led to the decision in 1840 to dismantle the Observatory. The collections were dispersed – to the British Museum, to King's College London, to the Royal College of Surgeons, and to various members of the Royal Family. Some of the astronomical instruments were sent to the Royal Observatory of Ireland at Armagh, including the 'large reflecting telescope made by James Short in 1745' which was the instrument, housed in the cupola, used by the King and Dr Demainbray to observe the transit in 1769. The Queen agreed that the building should be demolished. The Rev. Stephen Demainbray retired on a pension.

## 6. THE WORK OF THE OBSERVATORY FOR SCIENTIFIC PURPOSES 1842-1980

### a. The British Association for the Advancement of Science

Members of the Royal Society were dismayed at the breaking-up of the Observatory and made an initial bid to save at least the building and some of its instruments. But when the Commissioners of Woods and Forests agreed that they might have it, the Physics Committee of the Society took months debating the purpose to which it might be put and in the end, in May 1842, the Council of the Society decided to reject the proposal.

Some leading Fellows of the Society were also involved in the newly formed British Association for the Advancement of Science, and they now submitted a proposal in the Association's name to establish 'Kew' as 'a physical observatory' concerned with meteorology, earth magnetism, atmospheric electricity, etc., and the establishment of standards for the instruments concerned. This application was approved, and the Queen made a grant to the Association on 14 June 1842 on 'grace and favour' terms.

Both the Commissioners of Works and the Commissioners of Woods and Forests were concerned in this transaction – as from 1831 to 1851 they were parts of a joint operation. It was Lord Duncannon, Chief Commissioner of Works, who had reported to the Queen that the building was in a dilapidated state and who then received Her Majesty's commands to have it pulled down. It was also Duncannon who handed it over to the Royal Society in 1841. But it was a Mr A. Milne, a Commissioner of Woods and Forests, to whom Demainbray reported in March 1841 on the instruments and other items in the Observatory collection; and it was the Earl of Lincoln (later Duke of Newcastle), as First Commissioner of Woods and Forests, who handled the grant to the British Association in May-June 1842. (WORK 6/414).

Much of the early work depended on the particular enthusiasms of the scientists involved. Initially Francis Ronalds (who had invented an electric telegraph in 1816 – for which he was belatedly knighted in 1871) acted as Honorary Superintendent; his primary interest was in atmospheric electricity, but an array of instruments for meteorological and other observations was erected on and around the roof of the Observatory, as can be seen in Ronalds's sketch accompanying his report to the Association in 1844 (Figure 15). He was particularly pleased that 'the neighbourhood of the river and the rather marshy state of the land near the building cause sometimes dense and interesting fogs...which present remarkable electric phenomena'. He started atmospheric electricity observations in 1843, and developed an electrograph.

In his 1844 report Ronalds noted that 'the eastern wing is a room which was built for the great mural quadrant, and has shutters in the roof, etc. and in the meridian of the two obelisks near the river\*....The other wing consists of the (former) transit-instrument room, with its sliding shutters, a small apartment for an azimuth instrument, and part of a circular staircase....The central rooms are entirely lined with glass cases, which formerly contained philosophical instruments, objects of natural history, etc. (many of the cases now subject to dry rot, but still may prove very convenient), and all the rooms are provided with stoves.

'The flat leaden roof...is entered upon by convenient stairs and a door, and serves admirably for viewing the sky, and for the reception of some instruments, etc.... The small

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\* It was however the west wing through which the meridian marked by the northern obelisk and the westernmost of the two southern obelisks passed.

equatorial apartment is composed chiefly of wood covered externally by sheet copper....The dome was moveable round its axis by means of beautiful, but by now scarcely efficient, internal rack work, etc. It had above, the usual opening with sliding shutters, and below, a kind of door, corresponding with them and opening upon the plinths; this room is now our principal Electric Observatory, which has been thus adapted and furnished.'

The two rooms in the upper floor of the central block had been converted into a bedroom and a library/laboratory. In addition to the electrical apparatus installed in the cupola and elsewhere, many new conducting rods had been fitted to the roof. A variety of meteorological instruments were also installed on the roof: a rain and vapour gauge, a wind vane, anemometers, etc. A caretaker and his family were housed in the basement.

In 1849 the British Association set up a special 'Kew Committee', and from 1852 salaried Superintendents were appointed. In 1852 the new Superintendent John Welsh made some balloon ascents with instruments to make meteorological observations above the ground. These ascents, though made from Vauxhall Gardens, were an essential part of his work at Kew. Work on the standardisation of instruments was started in 1851.

Some magnetic instruments were provided in 1850 by Colonel (later General Sir Edward) Sabine, and soon after the 2 acres of garden were acquired in 1854 Sabine himself paid for the erection of a 'Magnetic Hut' (no.13 on site plan, on Scrase plan). Sabine, a regular artillery officer, was particularly interested in magnetism. He served as General Secretary of the British Association from 1839, moved to be President of the Royal Society from 1861 to 1871 and as Chairman of the Society's Kew Committee from 1871 to his death in 1883.

Observations of temperature began in 1854. Welsh was particularly interested in thermometry, but he also improved Ronalds's magnetograph (his revised instrument was still working in 1914) and constructed the standard large barometer. And in 1856 the Kew Photoheliograph was installed in the dome to take daily photographs of the sun spots.

In 1859 Welsh was succeeded as Superintendent by Balfour Stewart whose forte was the field of electro-terrestrial magnetism, but whose principal contribution to the instruments of the Observatory was the self-recording rain gauge on which he had worked with Robert Beckley, the Observatory's machinist who participated in much of the work of instrument design. Built by 1866 on the new 2 acre ground acquired in 1854 was an 'Experimental Hut' [6 on site plan, D on Scrase plan] for testing self-recording instruments.

In 1866 new arrangements were agreed for cooperation with the meteorological department of the Board of Trade, and in the following year the 'Meteorological Office' was placed under the direction of the Kew Committee. It was agreed that Kew should be regarded as the central observatory for the British meteorological service. The photo thermograph was installed in the so-called 'north wall screen', outside the north-facing window of the ground floor room of the west wing, in 1867. In 1869 the Meteorological Office agreed to grant to Kew £250 a year as a self-recording observatory and £400 a year for checking and correlating the records of all the Met Office observatories.

However, the British Association was finding the increasing costs of all these new developments too much of a burden, and in January 1871 the Association's Council appealed to the Royal Society for help, saying that they could not continue beyond the end of the year, but hoped that the buildings would be at the Society's disposal – if the Society so desired.

## **b. The Royal Society**

Within 2 months of the British Association's appeal for help the Royal Society was presented with an offer they could hardly refuse. A Mr J. P. Gassiot, a rich wine merchant who was a keen amateur astronomer and a Fellow of the Society, offered £10,000 to support 'a Central Magnetic and Physical Observatory at Kew' on condition that the Royal Society itself should take direct charge of the management. This was agreed (General Sabine was since 1861 President of the Royal Society); the deed of trust was sealed on 29 June 1871; and on 8 July the Society took possession. A new Kew Committee was formed, with Sabine as Chairman and R. H. Scott (the first historian of the Observatory) as Hon. Secretary. The Meteorological Office agreed to maintain its grants to Kew, to which were now added a grant of £450 p.a. from the Gassiot Trust Fund.

One of Sabine's first moves (in November 1871) was to get two Sergeants from the Artillery headquarters at Woolwich to help with magnetic observations (the Transit Room was partitioned to provide accommodation for them). They stayed until 1877 when their room and the adjacent one were used for the verification of thermometers.

The observation of solar radiation was started in 1875 and 'black bulb' thermometers were set up in the garden.

In 1876 the requirement for Kew to check the records of all the other observatories was dropped, and the Meteorological Office's annual grant to Kew was reduced to £400 p.a. in consequence.

The standardisation and verification work increased considerably in the 1870s and in 1877 the famous 'KO' mark was agreed (to be introduced the following year) to brand instruments which had been tested and approved at the Kew Observatory.

New instruments for Kew's own meteorological, magnetic and electrical work were constantly being installed. In an article written in 1889 R. H. Scott commented 'The chamber in which most of these instruments [magnetographs] are situated is a somewhat eery [sic] place. It is underground, in order to be kept constantly at the same temperature, and as care must be taken to shield the sensitive photographic paper from all light other than the line or spots it is intended to record, the chamber is all but totally dark. If you are standing in it you see nothing, but you hear the measured beat of the clocks driving the several drums. The barograph is in the same chamber as the magnetographs. The thermograph and electrograph are upstairs, as they must be kept in close proximity to the outer air'. (Article 'The Kew Observatory' by R. H. Scott in Good Words 1889).

In November 1881 G. M. Whipple, the Superintendent of Kew Observatory and Acting Secretary of the Kew Committee, wrote to the Office of Works and Public Buildings pointing out that the access to the upper floors (by spiral staircase) was very inconvenient and asking if a more suitable staircase could be provided. The Office of Works rapidly agreed the need, and estimated the cost at £65 which would go into the 1882-83 estimates; then they applied to the Treasury to sanction this expenditure. The Treasury came back, enquiring by whom and for what purpose was the building occupied, by what authority and on what conditions – and what was the Kew Committee anyway?

The draft reply prepared by the Office of Works set out the history of the 1842 grant and then said that 'about 1871 the building was transferred by the British Association to the Royal Society' but no authority for this could be found. There was however a report which Whipple had made to the British Association Council in 1871 in which he stated that as the Royal Society were ready to take possession immediately (on the terms set out in the grant to the British Association), had already appointed a committee to manage the observatory

and had placed £600 from the Gassiot Trust Fund at the disposal of that committee for costs in the current year, the Association could hand over the premises right away. The Council had recommended that the Government be informed accordingly. (This step was apparently forgotten in the haste to hand over!)

Having confirmed that the building was in a fair state of repair, the Office of Works replied to the Treasury on 11 January 1882 on the above lines. However the solicitor to the Royal Society recommended that the Queen's approval be sought for the continued occupation by the Society – and this was duly requested by the First Commissioner of Works. Sir Henry Ponsonby, the Queen's Private Secretary, informed the Commissioner on 24 April 1882 that the Queen's sanction had been given. The Treasury now agreed that a licence should be given to the Society to occupy the premises on a 'grace and favour basis' (and that £65 could be spent on the staircase – the installation of which was noted in the Kew Committee's report for 1883). In preparing the licence, the Office of Works suggested that an 'acknowledgement rent' of 5 shillings a year should be charged. The Royal Society having accepted the terms (with some minor amendments) the licence was issued on 30 November 1882 and enrolled on 22 December. Then someone noticed that its wording implied that the Observatory was within Kew Gardens – and a revised licence had to be issued. It was duly enrolled on 6 April 1883. [TNA – WORK 6/414].

Simpson's Guide to Richmond and Kew Gardens, published in 1890, devoted several pages to the Observatory. It stated that 'something like 10,000' instruments were being tested each year. Describing some of the instruments installed in the Observatory, it noted that the photo-heliograph installed in the dome roof [in 1856] to photograph sun spots was 'fitted with the first instantaneous photographic shutter that was ever made'. In the basement was 'the famous Kew standard barometer and the old disused mural quadrant, so large that it cannot be got out of the building'....'The new department for watch rating carries out a system which is in force in Switzerland and the United States, requiring from sixteen to forty-five days according to the class of the watch' (which system was then described in some detail). The rating of clocks and watches had started in 1884.

The most useful account of the set-up in the Observatory at this time is by Charles Chree (Superintendent from 1893 to 1925) in a Description of the Kew Observatory published in the Royal Society records in 1896. The detailed account of the interior is tabulated at section 7 below on 'The Internal Arrangement of the Observatory Building' and is accompanied by useful floor plans (Figure 20). Chree also noted that in the 'garden', as well as the original magnetic hut and the 'Experimental House', there were now the Workshop and Clinical House (both brick buildings under one roof, with a further extension at the north end), two rain gauges, the black bulb maximum thermometer on a stand, and various minimum thermometers in the grass nearby. At the time Chree wrote no new buildings had yet been erected in the new 5 acres of land around the Observatory. (Figure 21) (For the grant of this extra land see Section 4, The Observatory Compound, above).

In 1897, following a lot of lobbying by various scientists (who noted that some other countries had set up central laboratories for the coordination of observations and the standardisation of instruments), a committee was established to consider the establishment of a 'national standards laboratory'. In 1898 the committee's report recommended that such an institution should be set up, based on the Kew Observatory, but extending it with additional buildings 'at a distance'. The Royal Society agreed that the Observatory should become part of the National Physical Laboratory, the establishment of which (under the auspices of the Society) had been approved by Parliament, and proposed to hand over the Observatory to the N.P.L. on 1 January 1900. The Kew Committee was formally wound up on that date.

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\* If it could be moved into the basement, it could surely have been got out of the building!

**c. The National Physical Laboratory (N.P.L.)**

The Executive Committee of the N.P.L. took over the management of Kew Observatory from the Kew Committee of the Royal Society on 1 January 1900, and Kew became the 'Observatory Department' of the N.P.L. The Royal Society however remained financially responsible, with the help of the Meteorological Office's £400 p.a. grant.

The proposal to extend the premises with 'new buildings at a distance' resulted in the Royal Society's selection of a site in the north-east corner of the Old Deer Park. This was a long rectangle of ground, very close to the boundary with Kew Gardens, with its west end in line with the Queen's Cottage and its east end close to the 'Cricket Ground' and the Royal Laundry. It was intended to put up two buildings, one at each end of the site, at a cost of £12,000. The idea aroused much public opposition, not least from the Director of Kew Gardens and from the Richmond Borough Council. The matter was raised in Parliament. So other possible sites were investigated, including Bushy House and its adjacent grounds in Teddington. (WORK 17/63).

Bushy House belonged to the Queen, who was quite keen to exchange it with the Commissioners of Woods and Forests for two houses in Pall Mall. In November 1900 'the Queen appropriated Bushy House etc. to the Commission of Works for the purpose of the laboratory by her grace and favour.... The Royal Society will be located there on much the same terms as they are located at Burlington House'.\*

In the meantime however a new 'workshop and packing house' (No.8 on site plan, C on Scrase plan) was built in 1900-01 in the Observatory compound. The former workshop in the 'Clinical House' and its adjacent extension (enlarged in 1897) was to become a laboratory for the Director.

The Meteorological Office report for 1 Jan 1900 - 31 March 1901 summarises the observations which the Kew Observatory would be providing to the Meteorological Office:-

- |                           |  |
|---------------------------|--|
| - Atmospheric pressure    | - Barograph readings 5 times daily                               |
| - Air temperature         | - Thermograph readings 5 times daily (+ min/max reading at 10pm) |
| - Evaporation temperature | - Thermograph readings 5 times daily                             |
| - Wind direction          | - Anemometer continuous  |
| - Wind velocity           | - Anemometer continuous  |
| - Rainfall                | - Beckley gauge and check gauge daily                            |
| - Weather                 | - 5 observations daily   |
| - Cloud                   | - 5 observations daily   |
| - Sunshine                | - Continuous – 1 weekly tabulation                               |
| - Electrograph            | - Continuous   |

The development of electric tramways in the neighbourhood affected the magnetic work at Kew and in 1908 the Government opened a new observatory at Eskdalemuir in Scotland, to work in association with Kew under the N.P.L. Magnetic work at Kew continued on a reduced scale until 1925.

At the same time as work proceeded at Bushy to prepare for the N.P.L., the Government was building a new headquarters for the Meteorological Office in South Kensington. This led the Office to reconsider its relationship with Kew. With the N.P.L. moving out, with the decline in magnetic work, and noting that much of the meteorological

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\* Financial responsibility for the N.P.L. was finally transferred from the Royal Society to the Department of Scientific and Industrial Research in 1918.

records work was now being done by the Office's own central staff, the Meteorological Committee gave notice in May 1909 that they were not prepared to continue their grant to Kew beyond 31 December 1910.

This led to a reorganisation. The management of the three observatories (Kew, Eskdalemuir and Valencia (in Ireland, established 1867) should come under a Royal Society Committee, through the Director of the Meteorological Office (who would be a member of the Committee). Each observatory would have its own Superintendent. For the time being, until extra new buildings at Bushy were ready, the testing of instruments (which would continue to be a N.P.L. responsibility) would continue to be carried out at Kew, but on the N.P.L.'s behalf. When the Treasury had accepted the new scheme, it was agreed that the Meteorological Committee would take over the staff of the observatories from 1 July 1910 (BJ8/32). Bushy House was by then ready and the N.P.L. moved there, handing over control of Kew to the Meteorological Committee and Meteorological Office.

The transfer of the verification work from Kew to Bushy was finally completed by the end of May 1913.

#### **d. The Meteorological Office**

The work of Kew was now to concentrate on meteorology, terrestrial magnetism, atmospheric electricity and seismology. After the final removal of the verification work, considerable reorganisation of the layout within the main building became possible (see at 'The Internal Arrangement of the Observatory', Section 7 below), and planting was done in the grounds (see at 'Observatory Compound' above).

In May 1912 a proposal to erect a steel tower to support an anemometer with its head 40 feet above ground – outside the observatory enclosure if possible, to be well away from the 'magnet house' – led to an enquiry into what rights the observatory had outside the compound. The interesting outcome of a lot of minuting and correspondence was as follows (in October 1915):-

- i. the use of the Observatory is assigned by licence of the Crown to the Royal Society
- ii. the two enclosures round the Observatory and the right of access to the obelisks are held by the Royal Society on an annual tenancy from the Office of Works
- iii. an iron tower, erected by consent of the Office of Works given on 3 June 1912, stands on a small plot on the right hand of the access road between the golf club house and the gate, originally used as a theodolite stand for cloud observations
- iv. a small plot, allegedly 40' x 40', but apparently the 25' x 25' 'cowl shed' marked on the 1913 OS map, was probably an 'anemometer hut' removed about 1905 – the site being now (1915) occupied as a shelter by the golf club
- v. the tenancies were granted to the Kew Committee of the Royal Society under two memoranda, dated 24 March 1893 (in which 'a wooden structure' mentioned was probably the anemometer hut) and 27 April 1894. The second of these was presumably the lease of the 5 acres from the office of Woods and Forests.

(It is interesting that there is no direct reference in this file to the Office of Woods and Forests – other than that the original request to erect the steel tower was to be referred to them in 1912). The Office of Works enquired whether the Meteorological Office wished to retain properties iii and iv, and, if so, for what purpose. The file (WORK 6/418) ends there; but the iron tower possibly appears in a new location in the observatory compound in the photograph published in 1947 but probably dating from the late 1930s (Figure 28).

In 1919 an underground 'magnetic house' with 2 rooms was erected in the observatory basement – but all magnetic observations ceased in 1925, and in 1926 the old magnetographs in the main building were replaced by seismographs.

In 1920 the Meteorological Office was placed under the control of the Air Ministry, and thereafter the annual reports were submitted to the Air Council. The Royal Society's involvement was finally at an end. In the 1920s, partly as a result of the change of emphasis implied by this change of authority, much work on the development of radio-sondes (instruments to record observations in the air above ground, and to transmit the results directly to the ground, without human participation) was carried out at Kew. In September 1924 'upper air work' was transferred to Kew from R.A.F. Benson, and the workshop was extended and supplied with electric light and power, and new machine tools. An office and laboratory were set up in 'another existing building' (the south end of the Clinical House) and apparatus for the calibration of balloon meteorographs installed. Balloon ascents (some from Kew, some from Sealand aerodrome, but all master-minded from Kew) began in 1924 – with steadily improving results.

A number of other important changes in the instrument installation were made at this time. The photo heliograph, installed in the Dome in 1856, was sent to the Science Museum in 1926/7; and the Robinson-Beckley anemometer (with revolving cups) above the dome was

relocated in the SW corner of the grounds and was replaced by a Dines pressure tube anemograph with its vane 75 feet above ground level on 1 January 1931. The older Dines anemometer, erected on staging at the corner of the roof in 1913, was taken down in 1931/2 and the staging removed in 1934. In 1927 a 'nephoscope hut' (not identified) was erected, and in 1930 the underground laboratory at the south east was constructed. (Scrase) This was described as 'underground atmospheric electricity lab' in 1967 and as 'shelter' in the architect's plan of 1981. (Building 12 on site plan, H on Scrase plan).

A bad flood in 1910 had caused the Office of Works to make new sanitary arrangements in the basement, but in December 1924 the 'worst flood for 30 years' flooded the vaults for over a week, and on 7 January 1928 'the highest flood on record' not only completely submerged the 'observation lawn' but came up in the basement almost to the level of the new floors. In 1935 the floors of the upper storey of the Observatory were pronounced unsafe and were replaced by new floors supported on steel girders. The 18<sup>th</sup> century ceiling mouldings in the entrance hall and in the Superintendent's room had to be sacrificed.

In 1937 it was decided that the instrumental work on radiosondes should be based at Kew, and a small 'factory' was developed, with a new calibration house (3 on site plan) erected in early 1942. In May 1939 the 'investigation of the upper atmosphere' was laid down as Kew's main priority, with atmospheric electricity second. During World War II work on the radiosondes predominated. (The first British radiosonde ascent in 1938 was unsuccessful, but the Kew Mark I developed in 1939-41 proved satisfactory). The radiosonde work was moved to Harrow in 1946.

With a start to the resumption of normal operations in 1946-7 a mercury-and-steel thermograph was installed, with its records 'in the nearby chronograph hut'. If the thermograph is the 'radiation recorder (bimetallic)' shown in the Observatories Yearbook 1965 photo dated February 1967 (Figure 32) the otherwise unidentified 'chronograph hut' might be the one standing by the figure 23 in that photograph – but the hut is not shown in the 1965 plan, nor in the 1965 air photo. In January 1969 the photo thermograph and the 'north wall screen were replaced by an electric resistance aspirated psychrometer in the centre of the main lawn.

The development of the airport at Heathrow led to increased study of opacity, fogs and ground fog in the 1950s. A wind tunnel was built in the Clinical House in the 1960s.

In 1950 the Ministry of Works spotted that the Air Ministry had not paid up the 5s annual rent since Christmas 1943. A decision was taken in 1953 to make no further claim for rent.

From 1959 Kew began work on rocket and satellite equipment, designing instruments to be sent up in American satellites, including a spectrometer designed and made at Kew in the former 'calibration hut', and in 1961 the 'Skylark' rocket. The balloon winch hut was built in 1963.

In the late 1970s the work at Kew was gradually being phased out. In 1974 many of the instruments were sent away to the Science Museum and the National Maritime Museum. In 1980 the Observatory was finally closed down.

## 7. THE INTERNAL ARRANGEMENT OF THE OBSERVATORY BUILDING

There are 3 main descriptions of the layout of the rooms in the Observatory building itself, which give us a snapshot of the arrangement in 1844, 1896 and 1968. It may be convenient to set them out side by side.

Source	1844 British Association Report by Francis Ronalds	1896 description of Kew Obs. by Charles Chree (Royal Society)	(TNA BJ5/298) 1968 letter to D. G. Met Office from S. G. Crawford (Supt., Kew O.)
Basement N room	No information except 'accommodation for caretaker and his family'	Magnetograph room	Laboratory (optical eqpt)
Basement S hall		Incl. a walled off pendulum room	Pendulum room removed. Modle Room
Basement NW		Photographic room	Dark room
Basement SW		Kitchen	Switch room
Basement NE		Caretaker's apartments	Office
Basement SE		Sextant room	Clock Room (synchrometer)
Main floor N hall	Display cases	North Hall entrance	Entrance Hall & gallery Instrument displays
Main floor S hall		Computing room	Superintendent's room and Library
Main floor NW	Transit instrument room	Stairs and?(carpenter's room)	Electrograph & thermograph
Main floor SW		Thermometer room	Office and barometers
Main Floor E	Great mural quadrant	Barometer room (+ standard clock)	Admin office
Upper floor N	Library/laboratory	Library	Seismic room
Upper floor S	Bedroom	Superintendent's room	Angstrom room and record storage
Upper floor NE	[not yet built]	Optical room	Caretaker's flat
Upper floor SE		First Assistant's room	
Upper floor W		(Not yet allotted)	
Roof	Dome. Electrical observatory	Dome with photoheliograph and anemometer Lens room with anemometer records and lens testing	Dome housing anemograph  [Removed]

Other known alterations in the interior prior to the 1980s reconstruction were:-

- i. the partitioning of the transit room to provide a room for the 'Magnetic Sergeants', subsequently used for verification of thermometers (1872 and 1877)
- ii. the provision of a new staircase 'from the ground floor to the first floor' in 1883 (actually basement to main floor) in west wing
- iii. the dome was lifted and refitted in 1886
- iv. Major alterations in 1913 after the last of the verification work had been transferred to the N.P.L. in Teddington included:-
  - the construction of the gallery in the north hall octagon room to give better access to the upper tiers of cases

- the rebuilding of the 'seismograph hut' in the south hall of the basement
  - new rooms with raised floors in the basement – dark room and photographic laboratory on the west side, physical laboratory and 'time room' (with standard clock, etc.) on east side
  - the south octagonal room on the ground floor converted to Superintendent's office and Committee room, and the side room on the east into a library. The side rooms on the west (with an awkward protruding staircase) made into one computing room
  - the upper floor made into rooms for resident observer and caretaker (and one room reserved for Director)
  - new lavatories and offices partly in the main building (and partly in the outbuildings erected as a workshop by the N.P.L. – the rest of which refitted as workshop)
- v. Repair work in 1934-35 included the replacement of the upper storey floors by new ones supported by steel girders (which entailed the sacrifice of the ceiling mouldings in the main hall and the Superintendent's room). The electrical supply in the building was converted to A/C.

## 8. THE OUTBUILDINGS

Most of these have been mentioned in the foregoing sections. This is a ready-reference tabulation.

<u>No. on site</u> <u>Man</u>	<u>No. on Scrase man</u>	<u>No. on 1985 plan</u>	<u>Date built</u>	<u>Date demolished</u>	<u>Purpose – and comments</u>
1	A	A	1768-9	Extant	Observatory (enlarged 1888+1892)
1a			1914	Extant	Terrace
1b			?World War II	c.1980	Fire escape
1c		0	?World War II	1980s	Water tank
2	D	B	1866-75	Extant	Brick building, now merged with 5. 'Clinical House'. S end a workshop in 1896. Laboratory in 1901. Office and lab for 'upper air work' 1924. N end for testing clinical thermometers 1896. Occupied by International Seismological Summary in 1947-8. Wind tunnel in 1960s.
2a			1895	Extant	Small brick extension on N side of 2 for testing platinum resistance thermometers (1896)
2b			By 1894	1980s	Small lean-to at SW end of 2. (Appears larger in Scrase plan, but not in 1933 map nor 1965 plan).
2c			?mid 1930s	1980s	Lean-to extensions at NW and W of 2 (not on 1933 map, but (possibly joined together) on Scrase plan. Both extant in 1960, but only 2d remaining by 1965.
2d			?mid 1930s	By 1967	
3		K	Early 1942	1980s	Wooden. Probably 'new calibration house' built early 1942 (Harrison). Not on 1933 map but shown in 1960. Occupied by International Seismological Summary Unit in 1965.
4		N	? 1942	1980s	Corrugated iron hot water storage tanks. Not shown 1937, but in 1960. Probably date from World War II; at same time, or before, 3.
5			1981-3	Extant	New office building for Lesser group.
6	D	D	1854-66	1980s	Wooden 'experimental hut' for testing self-recording instruments. Built in garden granted 1854. Shown on map surveyed 1866. Illustrated in <u>Strand</u> 1891.
6a			?1950s	1980s	Greenhouse (apparently on site on some sort of pylon seen only in photo published 1947 but probably from 1930s). In 1960 map.

<u>No. on site Man</u>	<u>No. on Scrase man</u>	<u>No. on 1985 plan</u>	<u>Date built</u>	<u>Date demolished</u>	<u>Purpose – and comments</u>
7			1981-3	Extant	New caretaker's cottage for Lesser Group
8	C	C	1901	Extant	Brick building (now Museum) 'new workshop and packing house' built 1901. Not in Chree plan 1896, but (without 8a) in 1913 map. Partly used for lavatories 1913.
8a			1924	Extant	Penthouse extension at S end of 8. Not in 1913 map but seen in 1929 air photo.
8b			c.1930-32	....1960	Small lean-to shed on SE side of 8. Not seen in 1929 air photo, but in 1933 map and Scrase plan.
8c			c.1939-60	1980s	Large lean-to building on SW side of 8. Not in 1933 map, nor in photo (published 1947 but probably late 1930s). In 1960 map.
8d			?by 1947 by 1966	?1950s 1980s	?Possible site of chronograph hut (1947) Small detached wooden shed (not in 1965 plan nor 1965 air photo, but shown in 1967 photo.
8e			.....1967	1980s	Small hut not noted until architect's plans of 1981
9		G	1933-60	1980s	Wooden building – carpenters shop (1967). Not in 1933 map, but in 1960 map and 1965 air photo.
10		J	1964	Extant	Pump house erected 1964.
11		L	1933-60	Overgrown by brambles	'Underground Seismological House' (1967), 'shelter' in 1981 plans. Not in 1933 map but shown in 1960.
11a		P	1963	By 1980	Balloon winch hut built September 1963.
11b			1982-86	Extant	Swimming pool
12	H	H	1930	Extant but ruinous	Underground laboratory built 1929-30, seen in 1933 air photo and Scrase plan. 'Underground atmospheric electricity lab' (1965). 'Shelter' in 1981 plans.
13	F	E	Shortly after 1854	Extant	Original 'Magnetic Hut' built soon after 2ac. garden acquired, at expense of Gen. Sabine. 'Store' (condemned) in 1967.
14	E	F	1896-1913	Extant	New 'Magnetic Hut' built on ground granted 1894. Probably after 1911 (no sign of path past 13 in 1911 photo). Shown in 1913 map. 'Store' in 1967.

## 9. ADAPTATION TO USE AS A COMMERCIAL OFFICE

Back in the hands of the Crown Estate Commissioners, the Observatory now reverted to its more correct name as 'The King's Observatory, Richmond'.

It was offered for sale in April 1981 by Cluttons estate agents, acting for the Crown Estate Commission. As there were no immediate takers the offer was extended to include a long lease in June 1981. A lease was taken on 21 December 1982 by J. E. Lesser and Sons (Holdings) Ltd for a term of 99½ years dating from 5 July 1982. The term was extended by an agreement of 30 May 1985 to run for a further 25½ years, expiring in 2107.

Although the Lesser Group were themselves contractors, they had employed a local firm of architects, Clifford Culpin and Partners (then of Hogarth House, Paradise Road, Richmond), to draw up plans for the redevelopment of the building and the compound. These were prepared by November 1981 – and were of course a basis for the negotiation with the Crown Estate Commission. (Figure 37)

The new site plan shows that, in general terms, all the buildings would be demolished except the Observatory itself, the former 'Clinical House' (2 on site plan), the workshop (8), the pump house (11) and the two 'Magnetic Huts' (13 and 14). The underground laboratories were apparently dismissed as 'air raid shelters'. A new 'office and amenities block (single-storey)(5) would be joined onto the west side of the Clinical House; the workshop would become a Museum. (A condition of the lease was that the lessee shall 'cause to be constructed and installed in the cupola a working telescope and to install in the Museum displays recording the history of the Observatory'. The public were to have access, by appointment, to the cupola, the galleried reception room, and the Museum between 10 a.m. and 4.30 p.m. on at least one day a week). Close to the Museum a new bungalow would be built for the caretaker. New car parks would be made and the road pattern altered as necessary. (See site plan).

Within the Observatory building the biggest change would be the construction of a new staircase at the north end of the east wing, running right up from the basement, through the ground floor and 'mezzanine' to the upper floor. The 'mezzanine', in the east wing only, was also new, at the level of the gallery round the entrance hall, and provided a location for new toilets. In the basement a new kitchen was to be beside the new staircase. A false ceiling was inserted in the west wing of the ground floor. The top floor was partly re-partitioned and new fire doors and fire screens inserted. The dome was restored to working order and a telescope (of 1880s vintage) installed.

The anemograph from the dome was removed to the courtyard between the Museum and the caretaker's cottage, as was a length of concrete block wall taken out of the basement. A large storeroom and garage were later built round the back of the pumphouse.

The Museum still displayed some instruments in addition to documents (and copies of documents) and pictures, until the instruments were apparently removed by the Royal Observatory in 2000.

A new swimming pool was made on the west side of the enclosure – a little to the SW of the caretaker's bungalow.

The S.W. underground laboratory remained unopened – and is now almost completely covered by brambles. The S.E. underground laboratory, grassed over in the early 1980s, is

marked by a low square mound – but its roof recently collapsed – and there is now a hole in the top of the mound.

## 10. ARCHAEOLOGICAL REMAINS

The aerial photograph of September 1929 (Figure 24) shows clearly that the north wall of the Charterhouse enclosure (and the road on the north side of the wall) crossed the Observatory compound a little to the south of half-way. The main north-south wall in the Charterhouse enclosure, dividing the monastic buildings in the west from the monastery gardens on the east is also clearly seen in the photo in the south side of the Observatory compound, on a line that would have put it just inside that of the western hedge of the old 2 acre garden.

In 1893 (allegedly 'during some work at the Observatory') some traces of old walls, including this main north-south one were found just outside the Observatory compound in what was later the 'paddock' of the Royal Mid-Surrey Golf Club course (until recently a practice ground). These finds were very badly recorded by the builders on a plan which is now itself missing. But a diagram allegedly based on that plan was drawn up by a Richmond and Twickenham Times artist in 1956 to illustrate an article on the Charterhouse by Margaret C. Aldred (Figure A1). The account tells of 'cells with pointed brick doors' and 'rounded arches', of an 'underground passage 5' 6" high and 9' 9" wide, a tiled floor and a stone room 10 foot by 12 foot. It is not known what happened to these remains, whether they were removed or covered up again. But from the diagram it would seem that projections of the three recorded parallel walls would have extended into the Observatory compound. However the fact that the 5 acre extension of the Observatory land was not granted until 1894 suggests that the RT and T plan should be treated with some caution.

Still the fact remains that the SW corner of the 5 acres granted in 1894 does overlap with what was almost certainly the NE corner of the great cloister of the Charterhouse (see Figure A2). In 1927 a Dr. W. M. Tapp, a Fellow of the Society of Antiquaries and an active member of the Royal Mid-Surrey Golf Club sought permission 'to discover whether any remains of Sheen Priory were to be found in the Kew Observatory ground'. He proposed to start a trench in the SW corner and proceed northward until the old boundary wall is discovered. This trench would be 'close to the fence all the way and would be filled in afterwards'. (Letter from FJW Whipple, Superintendent of Kew Observatory to Director of Meteorological Office 14 July 1927).

The work was started on 18 October 1927. 'The foundations of a considerable building were revealed as well as an underground chamber. More foundations were found in ground leased by the Golf Club, just outside the paddock. After inspection by Mr Bushe Fox the excavation has been filled in. The broken crockery has been preserved.' (Letter from Whipple to DMO 8 February 1928) (There is no information on this held by the Society of Antiquaries).

Also in 1927 an investigation of the Observatory vaults was carried out by Nathaniel Lloyd, author of A History of English Brickwork. (See at section on the Observatory building above).

In the 1970s John Cloake compiled from documentary evidence, his first plan of the Charterhouse, published with his article 'The Charterhouse of Sheen' in Surrey Archaeological Collections Vol. LXX1, 1977, pp145-198. This was later revised and republished in 1990 by the Richmond Local History Society as Richmond's Great Monastery: the Charterhouse of Jesus of Bethlehem of Shene. A small further revision of the plan appeared in Palaces and Parks of Richmond and Kew, Vol.1 (p40) in 1995 (see Figure 2).

The Cloake plan showed clearly his contention that a row of monks' houses, each with its separate little garden enclosure would have lain inside the corner of the ground of the Observatory compound.

In 1983 magnetometer and resistivity surveys were carried out in the SW corner of the Observatory compound. (Ancient Monuments Laboratory Report, Geophysics G22/83 by A David). Though generally inconclusive these did indicate some possible straight line features and vaguely rectangular features approximately where the 1893 account indicated and which fitted the Cloake plan. (Figures A3 and A4).

A geophysical survey of much of the Charterhouse site – outside the Observatory compound – in 1997 did not produce any result relevant to the Observatory area. (RCHME Survey Report 97/92).