
**Figure 18.1:** *The Royal Observatory Greenwich in about 1900, showing the original building, Flamsteed House, on the right, and the Meridian Building in the centre. (Scan from a postcard in a private collection)*

# 18. The Royal Observatory, Greenwich, London: Presenting a Small Observatory Site to the Public

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When a working observatory is turned into a museum many potentially conflicting issues have to be addressed. The aim of this paper is to examine the problems which arose at the Royal Observatory, Greenwich, in London, and the various efforts made to resolve them. A brief historical introduction will set the scene, followed by an examination of the initial process of turning the Observatory into a museum, including the aims and criteria which guided the decisions made about what should be preserved and what was dispensable. The final section will deal with the challenges presented by growing visitor numbers and changing views about the purpose of scientific museums.

## 18.1 Historical Introduction

The Royal Observatory, Greenwich, was created in 1675 on the order of the king at that time, Charles II. Greenwich was chosen partly because it was royal land, and it remains a royal park to this day. The initial purpose of the Observatory was to provide more accurate methods of navigation and specifically to devise a practical way of finding longitude at sea from astronomical observations. Buildings and telescopes were added over the years and sometimes destroyed to make way for better ones. The original Observatory building was designed by one of the leading architects of the time, Sir Christopher Wren, who was also responsible for St Paul's Cathedral and many other churches in London, as well as the general oversight of the rebuilding of the City after the Great Fire of 1666. This first building later became known as Flamsteed House, after the first Astronomer Royal, John Flamsteed, who moved in when it was completed in 1676. However, his main observing instruments were in a separate small outhouse in the garden. This was added to by subsequent Astronomers Royal, until there was an extensive range of structures housing the telescopes, usually referred to now as the Meridian Building (see Fig. 18.1).[1]

The Observatory's original objective was achieved in 1766 when the fifth Astronomer Royal, Nevil Maskelyne, produced the first Nautical Almanac, with tables for 1767.[2] This provided all the information needed to find longitude by the so-called lunar distance method, which involved using a sextant to measure the angle between the Moon and a bright star or the Sun, and then undertaking a lengthy series of calculations to convert these measurements into longitude. Just a few years earlier, in 1764, another method of finding longitude had been successfully tested. It used a very accurate watch invented by the Englishman, John Harrison. This second method relied on the fact that longitude and time are interchangeable, since one hour's difference in local time is equivalent to 15 degrees of longitude. Harrison's marine timekeeper was intended to keep the time of the home port or other reference meridian, such as that at Greenwich, and this could then be compared with local time from the Sun to find the current longitude of a ship at sea. Eventually, after further development by other makers, these very accurate timekeepers for navigational use came to be called chronometers. However, both these methods of finding longitude at sea created a continuing need for the Observatory, to produce the tables published in the Nautical Almanac. It also took on new responsibilities such as the testing of chronometers for the Admiralty and checking their time-keeping against astronomical observations. In turn, this led the Observatory to become involved in the production of accurate time signals, represented most visibly by the time ball on the roof of the Observatory, installed in 1833. Also during the nineteenth century the seventh Astronomer Royal, George Biddell Airy, began to conduct regular magnetic and meteorological measurements, and further buildings were constructed to house the necessary instruments. His aim was to improve the accuracy of astronomical measurements by making appropriate allowances for the effects of variations in the earth's magnetic field and in atmospheric conditions.

Later in the nineteenth century the Royal Observatory at Greenwich acquired an international as well as a national significance. At a conference in Washington, USA, in 1884 the Greenwich Meridian was adopted as the prime meridian of the world, which has given the Observatory an iconic status as the place where east meets west, and the starting point for the World's system of time zones.[3] By this date the astronomers were becoming increasingly involved in research astronomy to discover the size and structure of the universe, alongside

the more practical work of providing accurate time and compiling the nautical almanacs required for astronavigation. This kind of investigation soon became known as astrophysics, to distinguish it from the traditional positional astronomy, which had been the main work of most national observatories until the later nineteenth century. The possibilities for such scientific research had been greatly extended by the application to astronomy of two new techniques: photography and spectroscopy. But the new work required larger telescopes and led to the building of a number of new domes at Greenwich, including the Great Equatorial building at the eastern end of the meridian building, which housed a large equatorial telescope, based on designs by the then Astronomer Royal, George Airy (see Fig. 18.2).

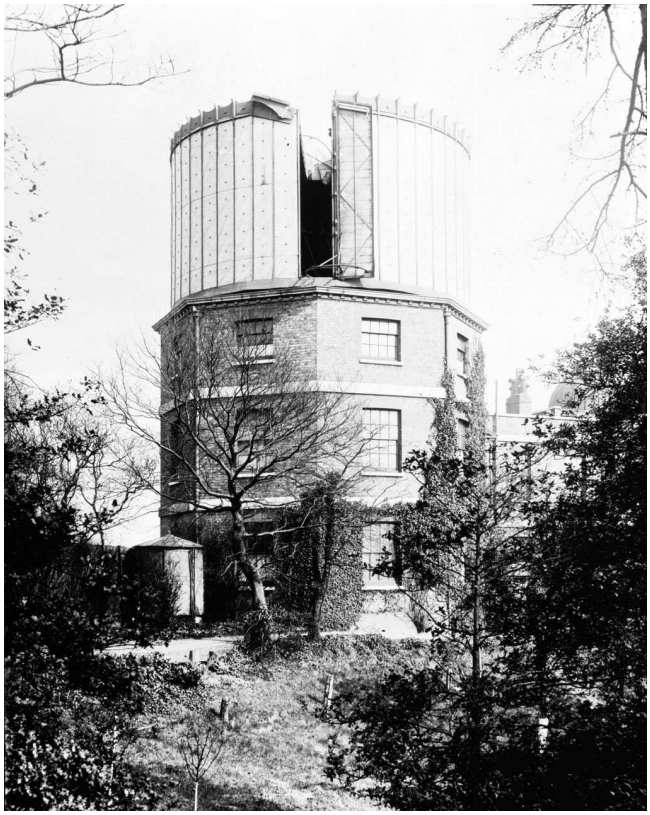

**Figure 18.2:** *The Great Equatorial Building, completed in 1857, showing the original drum-shaped dome (© National Maritime Museum, negative A9217)*

Astrophysics was enthusiastically taken up by Airy's successor, William Christie (1845–1922), who took up office in 1881.[4] He installed a larger refractor in the Great Equatorial Building to facilitate the Observatory's research work. The new instrument was designed by Howard Grubb of Dublin, with an objective lens 28 inches in diameter, or about 71 cm, much larger than that of the old telescope, made by Merz of Munich, which had an objective of 12.8 inches, or about 32.5 cm. The installation of the larger instrument meant replacing the old wooden drum-shaped dome by an onion shaped one, made of papier mâché by Thomas Cooke & Sons of York, to provide more space (the new dome can be seen on the left-hand side of Fig. 18.1). An additional dome was also added to the western end of the Meridian Building in 1890 to house a 13-inch (about 33 cm) astrographic telescope. The research work carried out in these new buildings had an international dimension, with the astronomers at Greenwich taking part in the 'Carte du Ciel' project, to provide a photographic map of the night sky.[5]

Christie then secured permission from the Admiralty to build a completely new Physical Observatory at the southern extremity of the site, consisting mainly of offices for the human computers who did the astronomical calculations, with a telescope dome on the top (Fig. 18.4). The new building incorporated a number of novel features; it was cruciform in shape with an iron framework and was designed by the architect, William Crisp, to be built in stages, so that the expense could be spread over several years. Work began in 1891 and was completed in 1899, the whole building being faced with decorative terracotta, incorporating the names of astronomers and telescope makers associated with Greenwich and a bust of Flamsteed above the main entrance. A small building in matching style was added a little to the north in 1899, to house a new altazimuth instrument, intended for the observation of the Moon, to support the Observatory's fundamental positional work.

One drawback of the construction of buildings with an iron framework was that the main Observatory grounds were no longer suitable for making magnetic observations, so Christie negotiated a new site within Greenwich Park, about 320 metres to the east, for a replacement magnetic pavilion. This became known as the Christie enclosure, but in 1923 it too became unsuitable for magnetic observations because of the electrification of the nearby Southern Railway. The magnetic work was then transferred to Abinger in Surrey, to the south-west of London, and the existing buildings in the Christie enclosure were demolished. In their place two new telescope domes were constructed to house a 36-inch Cassegrain reflector (91.4 cm) by Grubb & Parsons, installed in 1932, and a reversible transit circle by Cooke, Troughton and Simms, completed the following year.

However, during the first half of the twentieth century the observing conditions at Greenwich deteriorated markedly, with the expansion of London and its dust and smoke, the spread of electric street lighting and the construction of railway lines nearby. The decision was made in 1946 that the Royal Observatory should move from Greenwich to Herstmonceux Castle in rural Sussex, to the south of London, for clearer and darker skies away from the city. The astronomers left Greenwich in stages during the late 1940s and 1950s. In 1951 it was agreed that the old Observatory buildings would be transferred from the control of the Admiralty to the nearby National Maritime Museum, to become a historic site open to the public 'as an astronomical and navigational annexe'.[6] The Ministry of Works, a department of central government, took initial responsibility for the buildings, so that essential repairs could be made before they were handed over to the Maritime Museum, and decisions were made then about how to present the Observatory site as a

**Figure 18.3:** *Left: Flamsteed House in 1947. Right: Flamsteed House about 1957. (© National Maritime Museum, negative)*

**Figure 18.4:** *The new Physical Observatory at Greenwich, later known as the South Building (© National Maritime Museum, negative P39986)*

museum which would probably be more controversial today.

## 18.2 The Process of Turning the Observatory into a Museum

The first part of the Observatory opened to the public in 1953. This was the Octagon Room, the largest room in the Wren building of 1675–76, which still has the original decorative plasterwork on the ceiling. The rest of Flamsteed House followed in 1960, with a grand opening by the Queen, then the Meridian Building after the completion of repairs in 1967.

The philosophy which guided the refurbishment of the buildings for presentation to the public was that, as far as possible, they should be returned to the state they were in when used by the astronomers, and that the historical instruments should be restored to their original positions. None of Flamsteed's instruments could be traced; since he had provided them himself or been given them by patrons, they were considered to be his property, and they were sold by the family after his death. It was decided that a few of the most important examples would be represented by replicas, made using surviving drawings.[7] In addition, because the site was an awkward shape and had become cluttered with extra buildings and storerooms, some in a poor state of repair, it was decided to demolish many of the more recent and less important structures. The diagram in Fig. 18.5 shows these changes. The Ministry of Works was also keen to demolish the Physical Observatory, by then known as the South Building. The telescope formerly in the dome, the 30-inch equatorial, had been transferred to Herstmonceux in 1949 and the office accommodation was of no great historical interest. A senior Ministry official in 1957 described it as 'the ugliest of modern buildings' and added that demolishing it would be 'to the obvious benefit of the Park'.[8] However the National Maritime Museum started to use the building as a store and this ultimately preserved it as it was felt to be too useful to lose, as the museum was always short of storage space for reserve collections. A few years later the then Director of the National Maritime Museum, Frank Carr, inspired by a visit to the United States of America, decided to create a small planetarium, seating a maximum of 48 people, in the former telescope dome on the top of the South Building, and began offering shows to visitors in

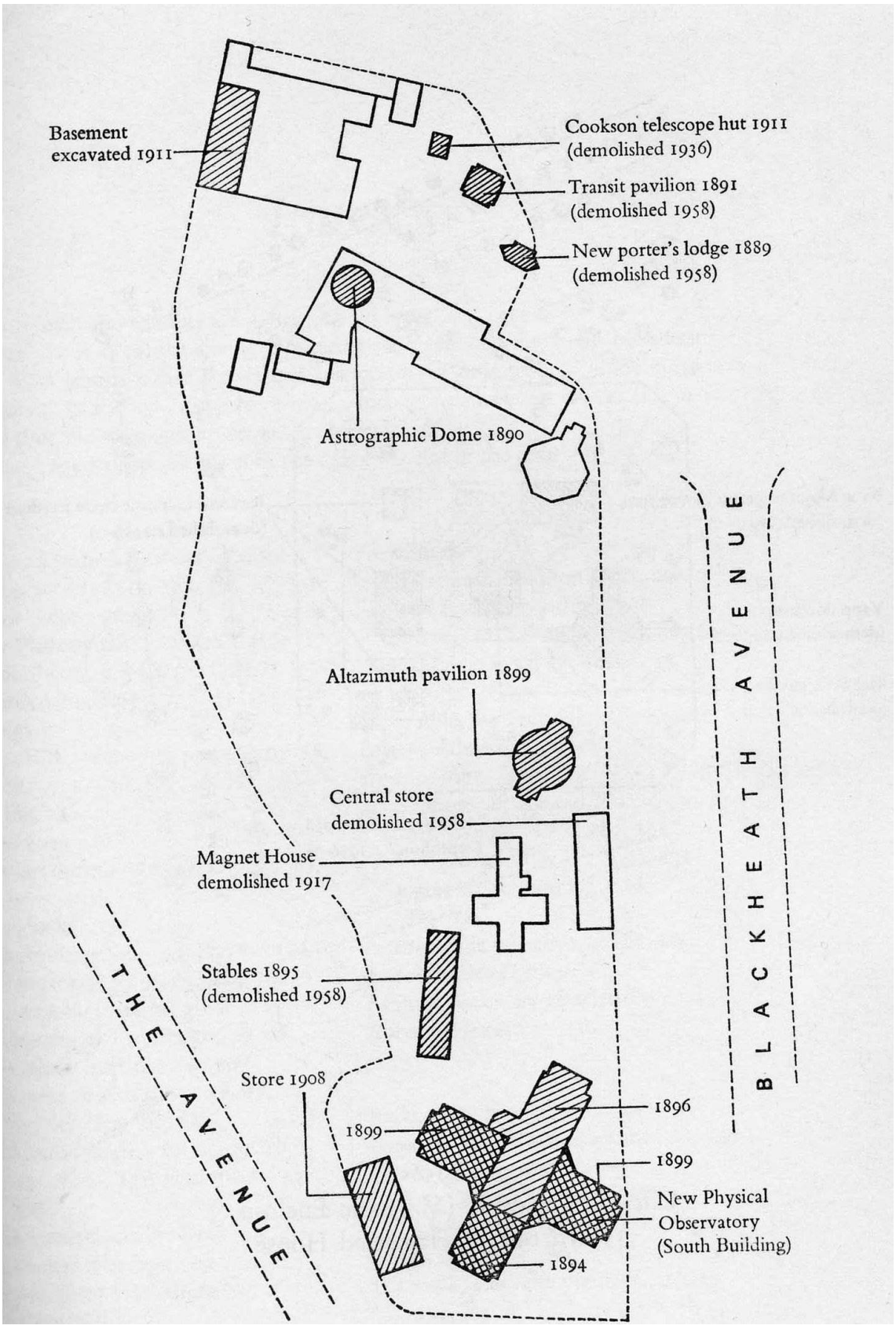


**Figure 18.5:** *Diagram showing the buildings demolished when the Royal Observatory, Greenwich, was turned into a museum (Source: Howse 1975, p. 165)*

1965.[9] In addition several of the rooms on the ground floor and in the basement were converted into picture restoration workshops.

Meanwhile work was proceeding slowly under the Ministry of Works to refurbish the old Observatory buildings and improve the site. Major repairs were needed because of damage during World War 2 caused by bombs falling nearby, although luckily there was no direct hit. However, general maintenance was also neglected during the war, when only a few staff remained and most Observatory functions had been transferred out of London for strategic reasons. The worst affected part was the Great Equatorial building, which had housed the 28-inch refractor. Fragments from a V2 rocket, which landed in Greenwich Park, set fire to the dome, which was especially vulnerable because of the papier-mâché from which it was made. Fortunately the telescope lens had been removed for safe keeping and eventually the whole instrument was moved to Herstmonceux and used there. The damaged dome was removed and a flat roof put in its place. Other essential repairs were carried out, especially to deal with dry rot, which had taken hold in the Meridian Building. There was also some disagreement between Carr, as museum director, and the Ministry of Public Building and Works (as it was then called), which was financing and directing the repairs. Carr wanted the Observatory to be a museum of astronomy, albeit with some emphasis on the links between astronomy and navigation, including retaining the historic telescopes which were no longer required by the astronomers and had been left in place during the move to Herstmonceux.[10] The Ministry took some effort to convince but it eventually agreed that the western part of the meridian building should be restored to its appearance in 1779, complete with the historic telescopes, and that the Airy transit circle, which defined the prime meridian, should be retained in its original position. Since the range of buildings housing the telescopes had developed piecemeal, it could not all be restored to the same date, so it was decided to return each part as closely as possible to its appearance at its principal period of use.[11]

A considerable amount of tidying also took place, removing many of the additions which had been made in the later nineteenth and twentieth centuries to Flamsteed House and the Meridian Building. Flamsteed House was largely restored to its late seventeenth century appearance, except that the eighteenth and early nineteenth century residential extensions were retained for use as galleries.[12] The external staircase, which had been added in 1849 to provide easier access to the meteorological instruments on the roof, was removed, as was the porch and covered way linking Flamsteed House and the Meridian Building (see Fig. 18.3.)[13]

However, in trying to turn back the clock in this way questions arose as to how far to go, and inevitably the final result was a site that appeared more architecturally coherent, but which did not actually look as it had done at any precise moment in its past. The focus on the earlier history of the Observatory meant that the physical evidence of some of the more recent work was completely removed. This obliteration of the recent past was further compounded by the fact that when the astronomers moved to Herstmonceux they took with them some of the late nineteenth and early twentieth century instruments. As well as the 28-inch refractor and 30-inch equatorial, both the 36-inch reflector and the reversible transit circle from the Christie enclosure were removed for use at the new observatory in Sussex, which was named the Royal Greenwich Observatory, with a change of word order to distinguish it from the original Royal Observatory, Greenwich. The historic buildings at Greenwich were renamed the Old Royal Observatory.[14] But all the structures in the Christie enclosure were completely demolished and the land once more became part of the park, leaving no physical trace of the aspects of the observatory's work once carried on there.

This more recent history was partly restored in the 1970s. By then the 28-inch telescope at Herstmonceux had been superseded by more up-to-date instruments and it was decided that it should be returned to its original home in the Old Royal Observatory at Greenwich. The telescope was placed back in its old position in the Great Equatorial Building in 1971 and a new dome was constructed over it, following the same design as the old one, but made of fibreglass rather than papier-mâché. The refurbished dome was opened to the public in 1975.

## 18.3 The Challenges Presented by Growing Visitor Numbers and Changing Views about the Purpose of Scientific Museums

It was found that growing numbers of visitors made many of the rooms very crowded at busy times and circulation around the site was increasingly difficult. In addition the old exhibits, with lots of historic instruments packed into showcases, were felt to lack appeal to a modern audiences, used to high standards of display in art galleries and even shops. Given that so many changes had been made to the Observatory, there were no strong objections when it was decided to undertake further alterations to the buildings in the early 1990s to improve access and to create spaces more suited to modern displays. The architects Stanton Williams were commissioned both to plan changes to the buildings to create a one-way flow around the site and to redesign the exhibition. They designed a new entrance area at the eastern end of the meridian building and a new shop on the ground floor of the Great Equatorial Building, which also formed the exit.

In 1997 World Heritage Site status was awarded to 'Maritime Greenwich' by UNESCO, including not only the Observatory and Maritime Museum, but also a large section of Greenwich town centre, including the Old

**Figure 18.6:** *Above: Aerial view of the Royal Observatory, Greenwich, in 2000. Below: Aerial view of the Royal Observatory, Greenwich, in 2007, showing the new planetarium building. (© National Maritime Museum, negative D9533–15-3, © National Maritime Museum, negative F7703-010)*

Royal Naval College, and Greenwich Park, which is still owned by the Crown. Since then the numbers of visitors to the Observatory have more than doubled, from about half a million to just over a million in 2007. This created new challenges in terms both of public expectation and of managing increased numbers of people on a small site.

The refurbishment of the early 1990s had originally been intended to include the South Building, and it had been suggested that it should become a space centre, featuring the exploration of space in the second half of the twentieth century. However the costs proved too great and that part of the project was abandoned for a while. It was revived in the late 1990s for a number of reasons. One was the growing demand from school groups for visits focusing on modern astronomy and space science. Another was the deteriorating state of the building itself, with a leaking roof, inefficient heating, and electrical and plumbing systems which needed renewal. A third reason for looking again at refurbishment of the building was recent legislation on disabled access. Both the Education room on the first floor and the planetarium in the dome at the top of the building could be reached only by a steep staircase.[15] Before undertaking any work on the South Building it was also decided to conduct some market research to discover what a range of visitors to the Observatory would most like to see. As well as simple questionnaires the research also made use of focus groups, including families, teachers and young adults.

This showed that there was a great interest in recent discoveries in astronomy and space missions, which strengthened the determination of the Museum's executive to combine repair of the South Building with the creation of a modern astronomy centre with interactive exhibits. The decision is principle was taken in 2001, subject to a satisfactory feasibility study.[16]

The government Department for Culture, Media and Sport provided a million pounds for the repair of the fabric of the building and a bid was made to the Heritage Lottery Fund for funding towards an astronomy centre with a new planetarium at ground level. This bid succeeded, backed up by the evidence from the market research, with the fund agreeing to provide £7.2 million. However, in discussions leading up to the submission, the managers of the Heritage Lottery Fund made it clear that they expected the whole site to present a coherent story, and so the bid included a plan to redisplay the galleries in the other buildings too. The Heritage Lottery Fund did not provide all the money and the museum also had to mount a general fund raising campaign to find the total sum of a little over £15.3 million.[17] Substantial amounts were granted by the Millennium Commission, Lloyd's Register Educational Trust, the Wolfson Foundation, and the Particle Physics and Astronomy Research Council. The planetarium equipment was financed by a private businessman, Peter Harrison, through his foundation, and the astronomy galleries were supported by the Weller Settlement Fund, along with many private individuals.[18]

Options for a new planetarium within the South Building were limited by the space available. Secondary schools often wanted to bring a whole year group, which would mean a planetarium which could seat at least a hundred people. In the end, after discussions with the architects appointed to oversee the project, Allies and Morrison, the decision was made to construct a completely new building in the garden. This had to be approved by English Heritage, which oversees alterations to buildings and sites which have been listed as being of historic importance. Given the many buildings which had come and gone over the years, a new structure could be seen as continuing this tradition, and English heritage was prepared to agree. The architects felt the new planetarium should be obviously modern, but in keeping with the older buildings. They were concerned that it should not overwhelm the historic site, so a substantial part of the new structure was out of sight below ground level; however it was felt that a shortened dome would look strange in the comparison with its neighbours, so the architects searched for an alternative but equally appropriate shape. It was eventually decided to give the structure a shape which has astronomical meaning, inspired by the ideas of the then Senior Astronomer at Greenwich, Dr Robin Catchpole. The building is basically an inclined cone shape, with the northern side cut off at an angle parallel to the celestial equator and covered by a mirror to reflect the northern half of the sky (Fig. 18.8). The angle of inclination is 51.5 degrees, the latitude of Greenwich. The overall effect is shown in the aerial views of the site before and after the construction of the planetarium building, Fig. 18.6.

At the same time there was a major internal rearrangement of the former South Building to create a new Astronomy Centre. The concrete pillar which had run up through the centre of the building to support the telescope in the dome at the top was removed, and replaced by a spiral staircase. The old stairwell was used to provide space for a lift. A café, shop and lavatories were built in the basement, and along with a lobby leading to the planetarium. On the first floor three new galleries were created to explain the most recent discoveries in astronomy. However, the curators were also keen to remind visitors that recent achievements have long roots, so examples of historical instruments and books, such as Isaac Newton's *Principia*, are displayed alongside the modern exhibits. The old telescope dome was turned into a library and seminar room.

## 18.4 Conclusions

Presenting a coherent story for a wide range of visitors in an institution which existed for nearly 300 years means choices have to be made about which parts of the story to tell. Much of the physical evidence for the twentieth century history of the Royal Observatory Greenwich was destroyed when the astronomers left, so this element of the story receives much less attention than

**Figure 18.7:** *The 28-inch telescope in use for a viewing session (© National Maritime Museum, image from Corporate Review 2004, p. 11)*

the important work carried out from the seventeenth to the nineteenth centuries. Providing a full chronological history may be easier in observatories where modern astronomical research continues on the same site, so that there is not the same physical separation between the historical telescopes and working astronomers.

Expectations of modern audiences and those providing funds inevitably shape the way the story is presented, and museums have to be ready to adapt as these demands change, if they are to interest large numbers of potential visitors and to secure funds to refurbish displays at regular intervals. In recent times the emphasis in the United Kingdom has been on encouraging young people to study science at university, so it has been easier to secure funds for displays and activities likely to interest them, rather than for purely historical exhibits. However, the new displays at Greenwich try to combine both, so that the dependence of today's scientists on the achievements of the past is made clear. Historical Observatories are well placed to provide this kind of balanced approach. Even though they are old, viewing the night sky though large telescopes is still an exciting experience (Fig. 18.7), which can capture the imagination of people of all ages.

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1. The account which follows is based largely on: Maunder 1900; Forbes, Meadows and Howse 1975; Howse 1997; Littlewood and Butler 1998, and Ronan 1975.
2. For Nevil Maskelyne see Howse 1989.
3. Smith 1976 p. 225–226.
4. William Christie became the eighth Astronomer Royal in 1881 and retired in 1910. See the Oxford Dictionary of National Biography 2004.
5. Forbes, Meadows and Howse 1975, Vol. 3, p. 11, 94–95.
6. Waters, Howse and Munday 1976, p. 253.
7. Howse 1966, p. 3–4.
8. Littlewood and Butler 1998, p. 177.
9. Littlewood and Butler 1998, p. 179–181.
10. Littlewood and Butler 1998, p. 155, 179–180. Carr 1957.
11. Waters, Howse and Munday 1976, p. 254.
12. Waters, Howse and Munday 1976, p. 253.
13. Howse 1975, p. 150–160, has a summary of the various changes made to buildings and instruments at Greenwich.
14. This name change was reversed after the abolition of the Royal Greenwich Observatory (RGO) in 1998, and the original site once again became known as the Royal Observatory Greenwich. In 1990 the RGO had moved from Herstmonceux to Cambridge. By then its main telescopes were in the Canary Islands, where observing conditions were so much better than in any part of the British Isles, and it was felt that its research work would benefit from closer collaboration with that being carried on in the universities. The ultimate logic of this was the integration of the researchers into the universities, which took place in 1998. The telescope domes at Herstmonceux have been taken over by a trust and are run as a science centre, and the remaining historic collections of books and artefacts were transferred to the National Maritime Museum. However the original archives remain in the University Library at Cambridge, partly because of they are part of a much broader scientific archive in that institution.
15. National Maritime Museum, documents submitted to the Heritage Lottery Fund, in folder GEN/21722.
16. National Maritime Museum Review 2001, p. 7.
17. National Maritime Museum file, NMM07/1448.
18. National Maritime Museum Review 2005 p. 11, 2006 p. 6, 32.

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**Figure 18.8:** *Detail of the new planetarium building by Allies and Morrison, 2007, and its position in relation to the South Building, housing the new Astronomy Centre (© National Maritime Museum, negative F6947–040)*