Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Canolfan Sophia
The Sophia Centre

CULTURE AND COSMOS

A Journal of the History of Astrology and Cultural Astronomy

Vol. 8 no 1 and 2
Spring/Summer and Autumn/Winter 2004

Papers from the fourth conference on the Inspiration of Astronomical Phenomena (INSAP IV), Magdalen College, Oxford, 3-9 August 2003.

Published by Culture and Cosmos
and the Sophia Centre Press,
in partnership with the University of Wales Trinity Saint David,
in association with the Sophia Centre for the Study of Cosmology in Culture, University of Wales Trinity Saint David,
Institute of Education and Humanities
Lampeter, Ceredigion, Wales, SA48 7ED, UK
www.cultureandcosmos.org

Cite this paper as: Ricci, Patricia, 'Lux ex Tenebris: Etienne-Louis Boullée's Cenotaph for Sir Isaac Newton', *Culture and Cosmos* 8, nos. 1 and 2, Spring/Summer and Autumn/Winter 2004, pp. 355–70.

British Library Cataloguing in Publication Data
A catalogue card for this book is available from the British Library

ISSN 1368-6534

Printed in Great Britain by Lightning Source

26

Lux ex Tenebris: Etienne-Louis Boullée's Cenotaph for Sir Isaac Newton

Patricia Ricci
Elizabethtown College

Abstract. In 1784 the visionary French architect Etienne-Louis Boullée (1728–1799) designed a colossal monument to Isaac Newton (1642–1727) that was both a cenotaph and a planetarium. A tribute to Newton's contributions to astronomy, the building was conceived as a microcosm in which the night sky would be visible by day and the daytime sky by night. Entering the 'center of gravity' of a vast hollow globe set in cylindrical tiers, the viewer would experience the virtual reality of the starry heavens created by natural light sparkling through shafts in the exterior of the masonry sphere. At night, the interior would be transformed into day by a luminous artificial sun suspended from the vault in an armillary sphere. Belonging to the brotherhood of freemasons whose motto was '*lux ex tenebri*' or 'light out of darkness', Boullée believed in the mystical origins of knowledge. His monument was a vindication of Newton whose law of universal gravitation had been attacked as 'occult' by Leibniz and others.

Boullée's design can be traced to Archimedes, who was the son of an astronomer and the inventor of the first planetarium c. 250 BCE. Archimedes' tomb in Syracuse was surmounted with a sphere inside a cylinder representing his discovery of the formulas for finding their volumes and surface areas. The Newton cenotaph was also a development of the Gottorp Globe (1654-1664), a revolving planetarium made of a pierced hollow sphere that held twelve people. Although the enormity of Boullée's plan was impossible to construct in the eighteenth century, architects treasured his evocative drawings. More than 200 years later, the architect James Stewart Polshek acknowledged the Newton cenotaph as the inspiration for his design for the planetarium of the Rose Center for Earth and Space in New York.

Patricia Ricci, '*Lux ex Tenebris*: Etienne-Louis Boullée's Cenotaph for Sir Isaac Newton', *The Inspiration of Astronomical Phenomena:* Proceedings of the fourth conference on the Inspiration of Astronomical Phenomena, Magdalen College, Oxford, England, 3-9 August 2003, special issue of *Culture and Cosmos* 8, nos. 1 and 2, Spring/Summer-Autumn/Winter 2004, pp. 355–70.
www.CultureAndCosmos.com

'The homage that it pleases us to pay great men', observed the eighteenth-century French architect Etienne-Louis Boullée (1728–1799), 'has its source in the sensations inspired in us by the high plane on which we place them'.[1] No one inspired Boullée more than Sir Isaac Newton whose law of universal gravitation revolutionized astronomy. During the Enlightenment, the astronomer was seen as a hero who fought the evils of oppression and superstition with the light of reason. To honor his achievements, Boullée 'wanted to give Newton that immortal resting place, the Heavens'.[2] Anticipating the modern planetarium by nearly 150 years,[3] the Newton Cenotaph is a memorial in the form of a microcosm. It is also a monument to the era that recognized the importance of public education in astronomy. As Voltaire wrote in his primer to Newton's philosophy, 'the Knowledge of Nature is a Good, to which all Men have an equal Right'.[4]

Boullée was born in Paris in 1728, a year after Newton's death, when the Englishman's star was beginning to rise over the continent. His fame eclipsed that any philosopher, ancient or modern. Throughout the Enlightenment, an international community of poets, painters, sculptors and architects tended Newton's shrine.[5] A century earlier, Galileo's discoveries had aroused a similar excitement before they were censored by the Inquisition. While Galileo was persecuted, imprisoned, and denied a funeral by papal decree, Newton was revered in life and honored in death. Voltaire, who witnessed the elaborate state funeral during his exile in England, remarked that Newton was fortunate 'not only to be born in a country of liberty, but in an age when all scholastic impertinences had been banished from the world'.[6] In the social context of the eighteenth century, tributes to Newton were also tributes to the nation that cultivated

---

[1] Etienne-Louis Boullée, *Architecture: Essai sur l'Art* , trans. Sheila de Vallée, in Helen Rosenau, *Boullée and Visionary Architecture* (London: 1976) [hereafter Rosenau, *Boullée*], p.106.

[2] Rosenau, *Boullée*, p. 107.

[3] Rosenau, *Boullée,* n.70, p. 146.

[4] Voltaire, *The Elements of Sir Isaac Newton's Philosophy*, trans. John Hanna (London: 1738; repr. London: 1967), p. 3.

[5] For Newton's image in the fine arts and literature, see M. H. Nicholson, *Newton Demands the Muse: Newton's Opticks and the Eighteenth Century Poets* (Princeton NJ: 1946); Francis Haskell, 'The Apotheosis of Newton in Art', *Texas Quarterly* (Autumn, 1967): pp. 218–37.

[6] Voltaire, *Letters Concerning the English Nation,* ed. Charles W. Eliot (New York: 1910), letter xiv, p. 113.

his genius; they were forms of political rhetoric that promoted anti-clericalism and liberal ideals. Thus artists who paid homage to Newton invariably eschewed Christian iconography in preference for classical motifs that alluded to the ancient origins of modern science.

The first of these monuments was Newton's tomb at Westminster Abbey, completed in 1731. Its original classical style is now obscured by a Gothic arch that was added in 1834. Designed in marble by the English architect William Kent and the Flemish sculptor Michael Rysbrack, the tomb consists of a Roman sarcophagus in front of an Egyptian pyramid ornamented with the sun. Immortality transformed Newton from a modern to an ancient: Rysbrack portrays him in a toga, reclining against his books as if attending an eternal symposium. He is accompanied by two genii, the Roman guardians of the soul, who hold a scroll inscribed with his mathematical notations. Newton's contributions to the sciences and the Royal Mint are represented in relief on the sarcophagus by boys playing with a telescope, a prism, models of the planets, and coins. Astronomy, however, is his muse: she floats above him on a celestial globe inscribed with the constellations and the path of the comet of 1680. Newton's law of universal gravitation which revealed the invisible scaffolding of the solar system was widely recognized as his crowning achievement. Lest he be remembered as a heretic, a Latin inscription asserts that 'he vindicated by his philosophy the majesty of God…'[7] Kent and Rysbrack also produced a bust of Newton for the Temple of British Worthies at Stowe, a monument to Whig heroes commissioned by Lord Cobham about 1730.[8]

The cult of Newton was brought to Italy by Joseph Smith, a British collector and publisher who later served as Consul to the Venetian Republic. Smith's Pasquali Press published several Italian volumes of Newtonian philosophy for a general audience including Count Algarotti's bestseller, *Il Newtonianismo per le Dame.*[9] While the Westminster Abbey tomb was underway, Smith commissioned the Venetian painters Sebastiano and Marco Ricci to envision monuments to Newton. A drawing by Sebastiano (Royal Collection, Windsor Castle) depicts Newton's bust placed on a sarcophagus. Seated to the left of the

[7] G. L. Smyth, trans., *The Monuments and Genii of St. Paul's Cathedral and Westminster Abbey* (1826), ii, 703–4.
[8] Haskell, 'The Apotheosis of Newton', p. 222.
[9] F. Vivian, *The Consul Smith Collection: Masterpieces of Italian Drawing from the Royal Library, Windsor Castle* (Munich, 1989), pp. 72–74.

sarcophagus is Clio, the muse of history, and to the right, Urania, the muse of Astronomy. Between them a weary, winged Father Time rests with his sickle and hourglass.[10] Replacing the bust with a recumbent Newton leaning on a globe, Marco incorporated his uncle's design into his *Allegory with a monument to Newton* (Royal Collection, Windsor Castle) painted in 1728. In a picturesque landscape, he envisioned eighteenth-century tourists discovering Newton's tomb among the ancient ruins.[11] In the distance, a pyramid resembling the tomb of Cestius suggests a location near the Aurelian wall in Rome where the Protestant Cemetery would be established in 1738.

The Irish playwright, Owen McSwinny, commissioned the Venetians G. B. Pittoni and Domenico and Giuseppe Valeriani to paint an *Allegorical Monument to Sir Isaac Newton* (Fitzwilliam Museum, Cambridge) for a series commemorating modern British heroes.[12] Their program derived from Raphael's allegory of Philosophy, *The School of Athens,* which was inspired in part by Plato's dialogue with the astronomer Timaeus. In addition to showing philosophers at work with globes, they represented the experiment in which Newton demonstrated, in Keats's words, how to 'unweave a rainbow'.[13] Beneath a pyramid above Newton's urn, a beam of sunlight streams through a round window, passes through a prism, and splits into the colors of the visible spectrum. The revelation of Newton's *Opticks*, published in 1704, prompted Alexander Pope to write: 'Nature and nature's laws lay hid in night/ God said, let Newton be! And all was light!'[14]

Early in the eighteenth century, light came to symbolize the mind of man rather than the grace of God. Frances Yates traced the metaphor of enlightenment to the Rosicrucian text, *Lux in tenebris,* a prophesy of a new social order published by Comenius in 1657.[15] British speculative freemasons appropriated the hermetic tradition of the Rosicrucians, adopting the motto 'lux ex tenebris' for the initiate's ritual passage from ignorance to knowledge. They worshipped the Great Architect of the Universe whose wisdom was passed down to them from the builders of the Temple of Solomon and the pyramids of Egypt. Newton's study of

[10] Vivian, *The Consul Smith Collection,* p. 73.
[11] Vivian, *The Consul Smith Collection,* p. 72.
[12] See Haskell, 'The Apotheosis of Newton', pp. 222–32.
[13] John Keats, *Lamia,* II. 237; quoted in Nicholson, *Muse,* p. 2.
[14] Alexander Pope, 'Epitaph Intended for Sir Isaac Newton', Ibid, p. 37.
[15] Frances A. Yates, *The Rosicrucian Enlightenment* (London: 1972), p. 158.

the Temple of Solomon[16] endeared him to the freemasons who promoted the new science by illustrating their literature with astronomical symbols, globes, armillary spheres, and compasses.[17] In orthodox circles, however, the secrecy and rituals of the Masonic lodges smacked of the dark arts, and Newton's association with freemasonry lent credence to Leibniz's accusation that his theory of attraction was 'occult'.[18] After the founding of the Grand Lodge of London in 1717, freemasonry rapidly became an international movement of deists and free-thinkers advocating social reform. To curtail its influence, Clement XII issued a papal bull condemning freemasonry in 1738. The Papacy was particularly opposed to the practice of electing officials in the English lodges in imitation of 'the government of the Republics'.[19]

Newtonianism was introduced in France by Voltaire after his return from exile in 1728. His *Lettres Philosophiques*, which created the popular image of Newton with anecdotes about his fateful encounter with a falling apple, his monkish celibacy and his royal funeral, were burned in Paris in 1734. Undaunted, he composed *The Elements of Sir Isaac Newton's Philosophy,* a laymen's guide to Newtonian physics that was published in French and English in 1738.[20] Growing more radical with age, he published *Republican Ideas* in 1765 and in 1778, at the age of eighty-four, he was initiated into the Masonic Lodge of the Nine Sisters in Paris.[21]

In the two decades prior to the Revolution, French neoclassical artists and architects were increasingly attracted to freemasonry. Boullée was one of a group of Parisian architects who designed in the Masonic idiom.[22] He has been described as an 'enthusiastic occultist freemason',[23] who by his teachings was 'the leader of a whole generation of

[16] Newton's *Description of the Temple of Solomon* was published posthumously in his *Chronology of Ancient Kingdoms Amended* in 1728.
[17] James Stevens Curl, *The Art and Architecture of Freemasonry* (New York: 2002), p. 90.
[18] For Leibniz's attacks on Newton's theory of attraction, see Alexandre Koyré, *From the Closed World to the Infinite Universe* (Baltimore MD: 1957), Ch. XI, pp. 235–72.
[19] Jacob, *Enlightenment,* p. 23.
[20] Voltaire, *The Elements of Sir Isaac Newton's Philosophy,* trans. John Hanna (London: 1738).
[21] Curl, *Freemasonry*, p. 132.
[22] Curl, *Freemasonry,* p. 120.
[23] Craske, *Art*, p. 208.

architects'.[24] He hung portraits of Newton and Copernicus in his studio and collected the works of the modern philosophers. He owned Jean-Sylvain Bailly's encyclopedic *Histoire de l'astronomie ancienne et moderne,* published from 1775-1782.[25] Bailly considered Newton not only the greatest modern astronomer, but perhaps the rarest genius of all nations and centuries.[26] He likened Newton's theory of attraction to a magnificent painting outlined in broad strokes which his successors would fill in.[27] His elaborate funeral was justified, Bailly wrote, because by such rituals the spirit of great men could rise again from their ashes.[28] These interpretations might explain why Boullée wanted to make Newton a tomb, albeit an empty one, in France, and why he identified Newton exclusively with astronomy while other artists emphasized the diversity of his genius.

The Newton Cenotaph is known only by six ink drawings and a written description included in Boullée's *Essai sur l'art*, a treatise on architecture.[29] Its controversial theme, enormous size, and innovative design doomed the project from the start. Boullée's grandiose unexecuted plans for public buildings evoked the platonic solids and cosmic scale of the Grand Architect of the Universe. 'In Newton's Cenotaph, I attempted to create the greatest of all effects, that of immensity', he explained, 'for that is what gives us lofty thoughts as we contemplate the Creator'.[30] The exterior view of the Newton Cenotaph (Fig. 1) shows a colossal sphere set in two tiers of cylinders planted with the cypresses used to landscape ancient tombs. Based on the scale of the figures represented, the building would be approximately 480 feet high, the size of the Great Pyramid of Gizeh.[31] But instead of the pyramids that were typically incorporated into Newton monuments, he chose the sphere for its symbolic associations. '"O Newton!" With the range of your intelligence and the sublime nature of your Genius, you have defined the shape of the earth', wrote Boullée.[32] The remark suggests an astronomical debate earlier in the century. While

[24] Curl, *Freemasonry*, p.125.
[25] For Boullée's library, see Pérouse de Montclos, *Boullée*, p. 40.
[26] Jean Sylvain Bailly, *Histoire de l'Astronomie moderne,* Vol. II, Bk. XII, p. 577.
[27] Bailly, *Histoire de l'Astronomie moderne,* Vol. III, p. 331.
[28] Bailly, *Histoire de l'Astronomie moderne*, Vol. II, p. 578.
[29] Rosenau, *Boullée*, 'A Newton', p. 107.
[30] Rosenau, *Boullée,* p. 111.
[31] A. M. Vogt, *Art of the 19th Century* (New York: 1973), p. 23.
[32] Vogt, *Art of the 19th Century.* p. 107.

the Cartesians had asserted that the earth was egg-shaped, Newton's discovery of the law of universal gravitation made him think it was probably a sphere flattened at the poles. In 1733, the French Royal Academy of Sciences organized an expedition to measure the Earth that ultimately proved Newton correct. 'I conceived the idea of enveloping you with your discovery', Boullée continues, 'to make your sepulcher in the shape of the earth'.[33]

After climbing a staircase, the visitor entered the sphere through 'the center of gravity', an archway at the base.[34] The only object inside was a Roman sarcophagus resting on a high plinth. From this vantage point, one contemplated the simulated sky in the curved space of the vault. Using natural and artificial light, Boullée planned to represent the diurnal cycle. By day, sunlight shining through apertures in the sphere's masonry shell would reproduce the effects of the moon, stars and planets (Fig. 2); by night, an enormous Copernican armillary sphere with a lamp in the place of the sun would recreate daylight.[35] In designing this celestial chandelier, Boullée may have had in mind the illuminated orreries developed by his English contemporaries. The London instrument maker John Rowley invented an orrery in which the sun-ball was an oil lamp fitted with a convex lens that provided a parallel beam of light. In 1766, Joseph Wright of Derby, a freemason and associate of the Lunar Society,[36] exhibited a painting of one of these planetary machines entitled *Philosopher lecturing on the Orrery, in which a lamp is put in the place of the Sun* (Derby Art Gallery).[37]

The uniqueness of the Newton cenotaph results from its unprecedented spherical shape which seemed to spring, as it were, from the head of the architect. Boullée, however, was an avowed empiricist who argued that 'pure invention' in architecture was impossible because, as 'a modern philosopher tells us, all our ideas, all our perceptions, come to us from external objects'.[38] Pérouse de Montclos thought that the Newton

[33] Vogt, *Art of the 19th Century*.
[34] Vogt, *Art of the 19th Century*.
[35] Boullée manuscripts, Biblioteque Nationale, B.N., Est., Ha 57, No. 9. Reproduced in Lemagny, no. 10, 'Cross-section of Newton's Cenotaph, interior day effect', p. 29.
[36] Craske, p. 211.
[37] David Fraser, 'Joseph Wright of Derby and the Lunar Society', in *Wright of Derby,* exhibition catalogue (London: 1990), p. 16.
[38] Fraser, 'Joseph Wright of Derby', p. 86; n.10, 145.

Cenotaph derived from the theories of the archaeologist Viel de Saint-Maux, whose cosmological interpretations of ancient buildings – such as the Temple of Bel at Palmyra and the Domus Aurea and Pantheon in Rome – were published in 1779-80.[39]

The tomb of a famous ancient astronomer provided Boullée with another classical source. According to Plutarch, Archimedes requested that a sphere circumscribed in a cylinder be represented on his tomb with his formula for determining the ratio between their volumes and surface areas. [40] After his death during the Roman siege of Syracuse, two celestial spheres made by Archimedes, a globe inscribed with the constellations and a geared planetary machine, were brought to Rome with the spoils of war. Cicero, an admirer of Archimedes, reported in *Tusculan Disputations* that the legend of the sphere and cylinder motif enabled him to find and restore the tomb when he was *quaestor* in Syracuse.[41] This act of restitution became a popular subject of painting during the last quarter of the eighteenth century that appealed to grand tourists and antiquarians traveling to Sicily to see the ancient ruins.[42] Hubert Robert, the designer of Rousseau's sarcophagus, illustrated *Cicero Rediscovering the Tomb of Archimedes* in Abbé Richard de Saint-Non's *Picturesque Voyage or Description of the Kingdoms of Naples and Sicily,* published in Paris between 1781 and 1786.[43]

Boullée incorporated a constellation globe in his plan for a public library,[44] commissioned the same year he conceived of the Newton Cenotaph. On the library's rectangular façade, the entrance is flanked by twin Atlases holding up an enormous celestial sphere. They are modeled on the ancient *Atlas* (after CE 150) in the collection of Cardinal Alessandro Farnese that was discovered in Rome in 1575.[45] The life-size marble figure holds a celestial globe, 25 inches in diameter, that is the

[39] J. L. Viel de Saint Maux, *Lettres sur l'architecture* (1779-80), in Pérouse, *Boullée*, p. 35.
[40] Plutarch, *Lives,* 'Marcellus', xvii, 7, quoted in D. L. Simms, 'The Trail for Archimedes's Tomb', *Journal of the Warburg and Courtauld Institutes*53 (1990): pp. 281–86.
[41] Cicero, *Tusculan Disputations,* v., 23, 64–66.
[42] J. B. Trapp, 'Archimedes's Tomb and the Artists', *Journal of the Warburg and Courtauld Institutes* 53 (1990): pp. 286–88.
[43] Trapp, 'Archimedes's Tomb', Fig. c, p. 37.
[44] Rosenau, *Boullée*, p. 18
[45] E. Dahl and J.F. Gauvin, eds, *Sphaerae Mundi: Early Globes at the Stewart Museum* (Montreal: 2000), Fig. 3, p. 16.

largest surviving representation of the classical constellations. A rationale for Boullée's choice of this motif for the library has never been determined. However, he provides us with a clue in his notes on the library in which he refers to 'the place where the magnificent globes are housed'.[46]

Just two years earlier, the Salon des Globes in the Biblioteque du Roi was opened to the public for the first time. The masterpieces of the royal collection were the largest globes in the world, the terrestrial and celestial spheres made for Louis XIV by the Venetian cartographer, Vincenzo Coronelli in 1683. [47] Constructed of wood covered with linen, the globes were 12 feet in diameter and weighed more than 3000 lbs. On their painted surfaces, the discoveries and explorations of the seventeenth century were meticulously recorded. The blue celestial sphere was painted with the positions of the constellations and planets on the 5th of September 1638, the date of Louis XIV's birth. From 1704-15, the Coronelli globes were installed in two pavilions at Chateau de Marly near Versailles. They were stored in Paris until a room was prepared for them in the royal library in 1731.[48] That the people were given *entrée* to the Salon des Globes in 1782 is a measure of the popular interest in astronomy. A sizeable increase in the production of globes during the second half of the eighteenth century indicates that astronomy was expanding into the cultural mainstream.[49]

The idea of a globe large enough to hold an audience was not Boullée's invention. At least three room-sized globes had been previously constructed. The prototype was the Great Sphere produced under the direction of the court astronomer, Adam Olearius for Duke Frederick III of Gottorp in 1654. [50] The hollow, copper globe with a diameter of 11 feet ingeniously combined the functions of terrestrial and celestial spheres. A map of the world was painted on the exterior and a map of the constellations on the interior. As many as twelve spectators could enter the globe through a door in the southern hemisphere. Inside, they sat at a circular bench and watched as the lamp-lit gilded constellations revolved

---

[46] Rosenau, *Boullée*.
[47] Helen Wallis and Monique Pelletier, 'The Resurrection of Coronelli's Great Globes', *The Map Collector* 13 (1980): pp. 22–26.
[48] The Coronelli's Great Globes are scheduled to be reinstalled at Marly in 2005.
[49] E. L. Stevenson, *Terrestrial and Celestial Globes* (New Haven CT: 1921), Vol. II, p. 176.
[50] Henry King, *Geared to the Stars* (Toronto: 1978), pp. 103–04.

around them, driven by a water wheel. In 1713, the Gottorp globe was given to Czar Peter the Great of Russia where it was destroyed by a fire in 1748. A full-scale reproduction made in 1752 survives in the Lomonosov Museum in St. Petersburg.[51]

The fame of the Gottorp globe prompted Erhard Weigel, a mathematics professor and astronomer at the University of Jena, to build a larger sphere in 1661.[52] His rotating celestial globe made of sheet metal had a circumference of 17 feet. Weigel appears to have invented the process of simulating stars on the inside of the globe by drilling holes into it.

Nearly a century later, the Cambridge astronomer Roger Long constructed a globe with a diameter of 18 feet to demonstrate celestial motion to his students.[53] Made of iron ribs covered with sheets of tin, Dr. Long's sphere (Fig. 3) was manually rotated on its axis by turning a winch, as shown in William Stukeley's drawing (Bodleian Library) of 1762. The interior combined the painted constellations of the Gottorp globe with the pierced stars of the Weigel globe. The Pembroke sphere survived for 113 years until it was sold as scrap metal in 1871.

During the nineteenth century, two large terrestrial globes were erected for public entertainment. In 1824, Colonel Langlois designed a spherical diorama on the Champs Elysée in Paris.[54] Enclosed in a cubic building like a globe in a case, the *Georama* was entered from the south pole. Spectators climbed a spiral staircase to a circular platform where they could peruse a transparent map of the world. For the Great Exhibition of 1851, James Wyld, honorary geographer to Queen Victoria, constructed a globe with a diameter of 60 feet on Leicester Square in London.[55] His design was unusual in that the terrestrial map was on the inside. Four staircases with galleries on each landing enabled visitors to study the detailed relief map at different levels. Wyld's globe remained in use for a decade before it was dismantled in 1861.

In 1912, William Atwood, director of the Chicago Academy of Sciences, designed a didactic celestial sphere that became a popular local attraction.[56] Fabricated of galvanized sheet iron, the Atwood Globe (now

[51] King, *Stars,* Fig. 6.14, p. 105.
[52] King, *Stars,* p. 104.
[53] King, *Stars,* p. 176. Described by Long in R. T. Gunther, *Early Science in Cambridge* (London: 1969), p. 167; Fig. 199, p. 164.
[54] King, *Stars,* p. 318; Fig. 19.8, p. 319.
[55] King, *Stars,* pp. 320–21, fig. 19.10.
[56] King, *Stars*, p. 342.

in the Adler Planetarium) had a diameter of 15 feet and was rotated by an electric motor. The stars and planets on the interior were created by 692 holes of various sizes drilled through the metal surface.

At the dawn of the twenty-first century, the architects James Stewart Polshek and Todd H. Schliemann publicly acknowledged the Newton Cenotaph as the inspiration for their design of the Rose Center for Earth and Space at the American Museum of Natural History in New York.[57] Their homage to Boullée is evident in the colossal sphere that houses the 400-seat planetarium.[58] Viewed from the outside of the building, the aluminum Hayden sphere, 87 feet in diameter, floats like the moon within the ether of the glass cube that encases it. After climbing a spiral ramp, visitors enter the sphere through an arched portal as in the Newton monument. This vault is also pierced with tiny holes, but they manipulate sound rather than light; today the heavens are computer-generated.

Although the firmament inside the Newton Cenotaph was only a painted image, Boullée had shown that the awesome spectacle of the night sky surpassed the charm of the classical constellations. If others had designed planetariums before him, he was still convinced that his version was unique. 'Before Newton, someone had seen an apple fall', he remarked, 'but what was the result?'[59]

[57] The Rose Center's official website states that the Polshek Partnership Architects created a 'design of pure geometries whose inspirations include the eighteenth-century architectural theorist Etienne-Louis Boullée's memorial Cenotaph for Sir Isaac Newton'.; www.amnh.org. See Soren Larson, 'A Design Crossing Time and Space', *Architectural Record* 187, no. 5 (May, 1999), p. 105.
[58] For an illustrated description of the building, see *The Rose Center for Earth and Space: A Museum for the Twenty-first Century,* (New York: 2001).
[59] Rosenau, *Boullée* , p.107

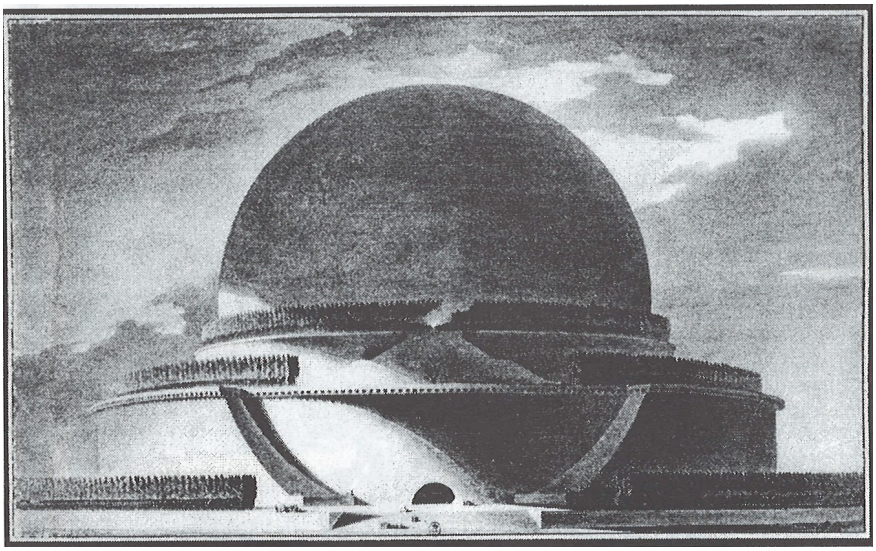

Figure 1. Design for Newton's cenotaph, 1764 (pencil on paper) (b/w photo) by Etienne Louis Boullée (1728–99) Bibliotheque Nationale, Paris, France Archives Charmet.

Figure 2. PD.52-1973 An Allegorical Monument to Sir Isaac Newton, c.1725 by G. B. Pittoni (1687–1767) and Valeriani D. and G. Fitzwilliam Museum, University of Cambridge, UK.

Figure3. The Orrery, exh. 1766 (oil on canvas) by Joseph Wright of Derby (1734–1797). Derby Museum and Art Gallery, UK.

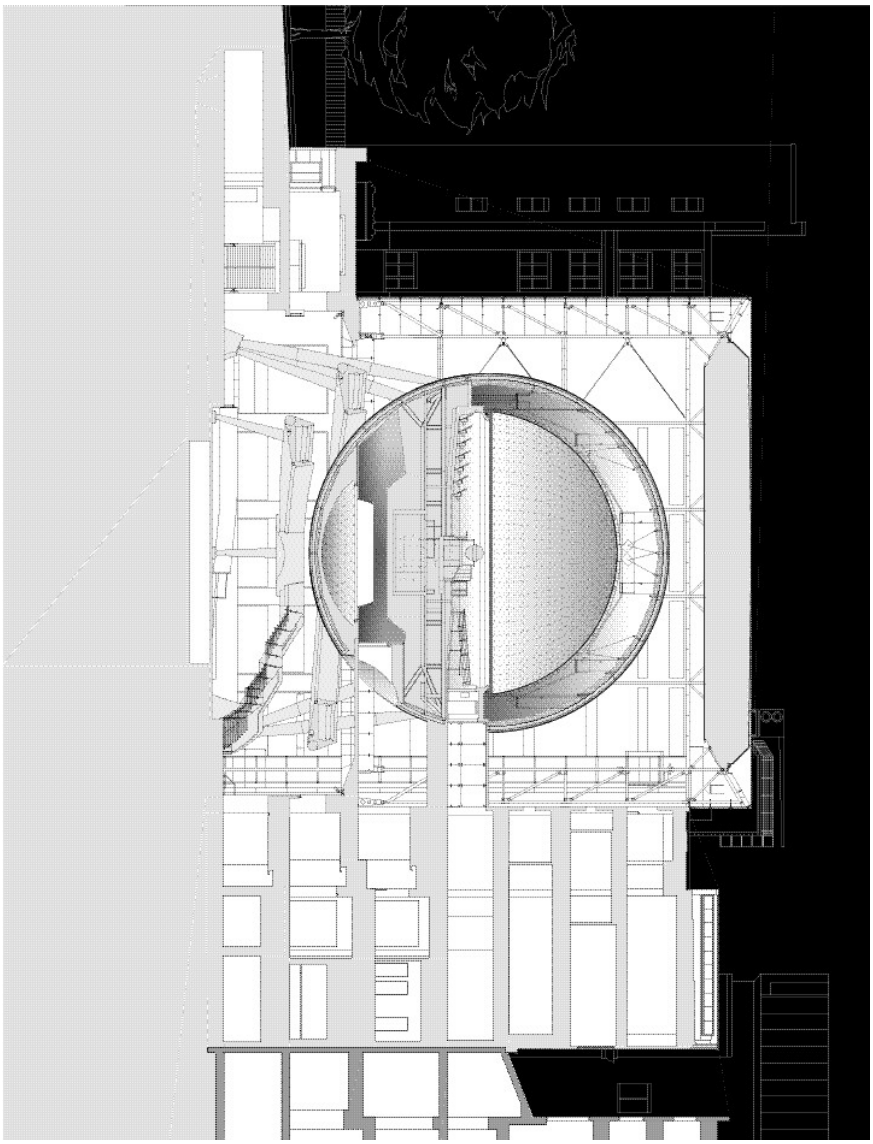

Figure 4. Rose Centre Architectural Rendering.