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A special exhibition 'The Noble Dane: Images of Tycho Brahe' has recently opened in the Museum with, as its centrepiece, the newly restored painting in the Museum's collection of a scene from the life of the sixteenth-century astronomer. The cost of the restoration was met in part by a grant from the South Eastern Museums Service.

Unfortunately there is no record of how the painting came to Oxford, though it may have belonged to the remnant of the Gabb Collection presented to the Museum by George H. Gabb after most of his instruments had been purchased by Sir James Caird for the National Maritime Museum. It bears the signature '1855 Eduard Ender', and a painting of that date is recorded by the Viennese artist Eduard or Edouard Ender in Constant von Wurzbach's *Biographisches Lexikon des Kaiserthums Oesterreich* with the title 'Rudolph und Tycho Brahe am Hradschin in Prag'. (The Hradschin was the site of the Emperor's residence, an extensive complex of buildings in a walled enclosure in the City of Prague.)

There is little information on Ender in the standard reference works, but he was the son of the better-known painter Johann Nepomuk Ender, under whom he studied at the Academy of Fine Art in Vienna. Even his date of birth is unclear, 1822 and 1830 being cited by different sources; he died in London in 1883. His work was mainly historical genre painting and recorded subjects include François I in the workshop of Benvenuto Cellini, the young Mozart playing for the Empress Maria Theresa in Vienna, and Shakespeare reading Macbeth at the court of Elizabeth I. He also painted Hagar in the desert, from the Old Testament, and from the Apocrypha, Judith with the head of Holofernes.



The history of science provided Ender with at least two other subjects. One was Copernicus in his study, which has not been traced, but a painting of Alexander von Humboldt and Aimé Bonpland on expedition in South America survives in the Berlin-Brandenburgischen Akademie der Wissenschaften. It has been reproduced several times in recent years. The title given in Wurzbach for the work is 'Alexander von Humboldt und Bonpland im Orinoko-Gebiete' and the similarity in style between the Oxford and Berlin paintings is immediately obvious.

Ender was criticised in his day for stiff, artificial composition, for overburdening his pictures with still-life groupings of equipment and for loud and affected colouring. The point about still-life can be understood from both surviving paintings. That of Humboldt has an astronomical repeating circle, a theodolite, a sextant, a compass and a microscope - all rendered carefully and accurately from contemporary instruments. In the case of the Tycho painting, individual instruments, not just instrument types, can also be identified.

Tycho stands before the Emperor with his hand on a clockwork celestial globe, where the coloured constellations are cut out in fretwork. Rudolph is seated and holds a paintbrush and palette, while to the right is a canvas stretched on a frame and resting on an easel. Clearly Ender is demonstrating some point of astronomy or, more likely, astrology, while the Emperor listens, or at least half-listens. Astrology is strongly signalled by the manuscript sheet left deliberately hanging over the edge of the desk so as to reveal itself as a diagram of planetary aspects. By contrast, the diagram of planetary motion, probably representing the Tychohonic system of the world, lies on the floor at Rudolph's feet.

Five other men are included in the composition. Behind Tycho are two monks, one seated with an open book but looking at Tycho, the other standing while reading a folio printed volume. To the right of Rudolph is a figure with a hand on an astronomical sextant. Two final figures are seen reading or studying on an upper level reached by a flight of stairs.

Both the sextant and the more prominent quadrant on the right of the picture are known instruments that survive today in the National Technical Museum in Prague. The sextant is confidently attributed to Jost Bürgi, who in 1604 became 'Kammermacher' or 'clockmaker' to Rudolph. In Ender's time it was thought that Tycho had brought this instrument with him to Prague. The quadrant is unusual in having rackwork on an inner arc engaging cog-wheels that move the indexes of the dial just visible on the right of the instrument. This is an eighteenth-century quadrant and, of course, has no associations with Tycho.

Since both these instruments are modelled on extant pieces, and it is clear that the instruments in the Berlin painting are taken from real pieces, it seems almost certain that the clockwork celestial globe also records a real instrument, but this has not been traced.

It is known that Rudolph had a particularly fabulous mechanical globe by Bürgi, now lost, which displayed the motions of the planets as well as the celestial sphere. Most mechanical spheres of the period indicate the time by the rotation of a complete globe with the clockwork movement inside. If the motions of the planets were to be represented as well, an appropriate and impressive solution would be to accommodate them inside the celestial sphere, to arrange for them to be visible, and to mount the movement outside.

The globe in the painting seems to have been formed by applying a series of cut-out and coloured constellations to a set of brass meridian ribs, and has a complex movement beneath. While individual elements depicted in the globe are known from other examples, Ender's painting may be a valuable record of a lost mechanism of an original design; it is difficult to imagine him inventing the piece himself.

Other instruments in the painting are probably too small and commonplace for individual identification, with the possible exception of the equatorial or zodiacal armillary on a stand in the bottom left corner. This is a small version of an observing instrument Tycho had on Hven. Also on the floor are a brass quadrant and a pair of compasses; on the desk with the globe are another pair of compasses, a model of Ptolemy's rulers, a level and a sand-glass; there is a clock among the miscellaneous objects on the shelves behind, while to the right of these is a square, a semicircular protractor and a vertical circle hang on the wall.



Among all this attention to detail, one omission is surprising. Surely the best-known feature of Tycho's appearance was his metal nose, worn to disguise the disfigurement he suffered in a fencing duel. It is now thought that he had one in precious metal - a finch-coloured blend of gold and silver - for special occasions and another less valuable and less heavy for everyday use.

The Tycho in this picture, however, has a perfect nose and also lacks the scar on his forehead included in other portraits. It is surprising for a painter in this genre to miss so exotic and distinguishing a feature, especially one that evokes other characteristics of the noble astronomer.

The exact occasion Ender may have had in mind in planning his composition remains a mystery. Some allusions in the picture can be guessed at, but that is all. It is known, for example, that Tycho demonstrated a 'mechanism' that Rudolph had noticed among Tycho's effects and that Rudolph remarked that, although he had one or two similar devices, they were smaller and constructed differently. This seems to have been an astronomical mechanism as Rudolph declined Tycho's offer to present it to him, saying that he would save the astronomer's make something similar.

Tycho had some dealings with monks while he was in Prague, complaining that he was disturbed by their nocturnal devotions, while the monks in their turn did not appreciate the close proximity of a heretic enjoying the patronage of the Holy Roman Emperor. One of the sources available to Ender that deals with Tycho's disagreements with the monks was J. H. Mädler's *Populäre Astronomie* published in Berlin in 1852.

In 1600, when Tycho was asked to live nearby on the Hradschin and was received in audience by the Emperor, Rudolph was disturbed by many anxieties, not least the astrological significance of the dawning of a new century. Some reports implicate Tycho in alarming prognostications around this time, but no specific event has been traced to explain the scene and to identify the other characters in the picture.

The title of the exhibition, 'The Noble Dane', is chosen from among several respectful epithets applied to Tycho by the first Astronomer Royal, John Flamsteed. Pieter Gassendi, in his first biography of Tycho published in 1654, had already referred to him as 'sollis Danus'. Nobility was the quality most commonly attributed to Tycho. He was indeed a member of a Danish noble family, but it was not mere lineage that gave Tycho his lasting image. He practised astronomy in a princely manner and on a grand scale.

Although Tycho benefited from the generous patronage of Frederick II, notably through the use and revenues of the island of Hven, he did not serve the King in the traditional manner of the court astronomer. Rather, Tycho ruled his planet as a fiefdom, as is reflected in Victor Thoren's recent biography of Tycho, *The Lord of Uraniborg*.

'Uraniborg' or 'Heavenly Castle' was the name Tycho gave to one of the buildings he constructed on Hven. There and in a second observatory building, 'Stjerneborg' or 'Starry Castle', he erected a remarkable range of instruments for astronomical measurement, from armillary spheres after the manner of Ptolemy to large quadrants of bolid and original designs.

Tycho's instruments were built in his own workshops and his books were printed on his own presses. With the help of an extensive staff of assistants he carried out an ambitious programme of work, effectively re-establishing the observational basis of astronomy. Gassendi observed that if Hipparchus could be regarded as Atlas, Tycho was another Hercules.

Tycho was held in enormous respect by generations of astronomers. While there is no doubt that his achievements gave him a special place in the history of astronomy, he fashioned his own image in a striking and individual manner.



Tycho did more to construct an image of himself in the view of others than any other astronomer of his time, perhaps of any time. His whole programme was so comprehensive, audacious and individual that it seems inseparable from his author. He published a detailed account of his observatory and instruments in a book, the *Astronomice instrumentarum mechanica*, that became a model for others and that abounds with personal references and assertions. The most abiding image of Tycho and one of the most famous in the history of astronomy comes from the fresco he had had painted on the wall that carried the instrument he named after himself, the Tychoian Quadrant.

Tycho's grand and emphatic self-presentation may sit unusually with the image of him offered in the picture by Ender, where he performs a more traditional courtly service before a patron whose attention is less than complete. By the time of this scene, Tycho had lost favour in Denmark and had been obliged to seek patronage elsewhere. Although Rudolph was keen to accommodate this prominent addition to his entourage, Tycho's situation was much more constrained than it had been on Hven.

Tycho, however, was careful to raise his work above such worldly concerns. Linking nobility with astronomy itself, he wrote in the *Mechanica* that 'the person who cultivates divine Astronomy ought not to be influenced by ignorant judgements, but rather look upon them from his elevated position, considering the cultivation of his studies the most precious of all things, and remaining indifferent to the censures of others. And when statements or others bother him too much, then he should leave with his possessions.' If Tycho was careful to build his own image during his lifetime, his reputation was frequently recruited to other causes after his death. As is illustrated in the exhibition, his image was used in a large variety of ways by later generations of astronomers.

One of the first such uses was by Willem Janzoon Blaeu, who worked under Tycho at Uraniborg. Many of his star positions were derived from Tycho's observations and Blaeu included a portrait of the astronomer on a celestial globe of his dated 1603.



Not long after, in about 1616, Tycho's image appeared in Oxford, included as one of 200 painted heads of famous men - along with Regiomontanus, Apianus, Copernicus, Mercator and Ortelius - depicted in the frieze of what is now the Upper Reading Room of the Bodleian Library.

Such was Tycho's reputation in the early years of the London instrument-maker George Adams adopted Tycho's portrait as his shop sign, so that the address of his premises in Fleet Street became 'at Tycho Brahe's Head'.

These are only a few examples of the appropriation of Tycho's image. The illustrated title-page of Kepler's *Rudolphine Tables* and frontispieces of several of Johannes Hevelius's books are other instances from the seventeenth century. The relationship of Hevelius, however, with Tycho's legacy, is more personal. He is one of two astronomers - the other being John Flamsteed - who could be said to have cast themselves in the image of Tycho. Hevelius's rooftop observatory in the city of Danzig was named 'Stjerneborg' after Tycho's 'Stjerneborg'.



The instruments at Stjerneborg were designed in the manner of those on Hven and were constructed under the close super vision of the astronomer, as Tycho's had been the sights, for instance, exactly followed the pattern devised by Tycho at Uraniborg. Like Tycho, Hevelius had his own printing press, and his instruments were fully described in his *Mechanica* codex of 1673 - an account of his observatory published after the model of Tycho's *Mechanica*.

Hevelius's identity with Tychohonic practice in astronomy offered positive associations when building an observatory but, almost a century after the observations made at Uraniborg, it raised questions about the status of his results. This is clear from the reaction of some of his contemporaries, particularly in regard to his reluctance to adopt the newly introduced telescopic sights.

Robert Hooke, for example, while being careful to preserve the reputation of 'the Noble Tycho', charged Hevelius with ignoring subsequent progress in practical astronomy. John Flamsteed, likewise, doubted whether Hevelius, for all his work, was actually improving on the accuracy of Tycho's observations at all: 'it will be difficult', he wrote, 'to judge whether we ought to make use of Tycho's Catalogues or his when they come forth.'

Nevertheless, as his career progressed, Flamsteed increasingly identified himself with 'the noble Tycho' or 'the noble Dane'. Like his distant mentor, Flamsteed was devoted to astronomical measurement, was responsible for equipping an observatory from scratch, received patronage from the king while also meeting many of his own costs and was, he believed, beset by enemies and detractors. Officially called 'Astronomical Observer', Flamsteed preferred to style himself 'Mathematicus Regius' - Tycho had been imperial mathematician in Prague.

The well-known engravings of the Royal Observatory and its instruments, commissioned by Flamsteed's patron Jonas Moore from Francis Place, were probably part of a scheme to publish an account of the observatory in the manner of Tycho's *Mechanica*. As its first incumbent, Flamsteed had to fashion the image of the occupant of the Royal Observatory, Tycho, 'the greatest prince among astronomers', was a valuable resource. He even took the trouble to acquire from Denmark a portrait of Tycho, now in the Bodleian Library.

In his efforts to assert authority over his own observations, Flamsteed could deploy the association between astronomy and nobility represented by Tycho. In an age more attracted to the construction of theories in astronomy, of which Newton's *Principia* was the outstanding example, Flamsteed attributed a higher morality to laying down a secure store of measurements than to following the uncertain and transient goal of theory. It was a judgement he believed he shared with his noble predecessor.

Eventually Flamsteed would also identify with Tycho in his tribulations. Not only did he see himself as Tycho, but he even began to call Edmond Halley, whom he saw as a dangerous enemy, by the name 'Planyer' - after Tycho's own detractor Nikolai Remers Ursus. Forced by the 'Visitors' to the Observatory to account for his performance and surrender his observations, Flamsteed complained bitterly he had even been treated 'worse than ever the noble Tycho was used in Denmark'.

The power of Tycho's image is not limited to Europe. In about 1670 the Finnish Jesuit missionary in China, Ferdinand Verbiest, was given charge of the Imperial Observatory in Beijing and set about re-equipping it with a new set of instruments. He chose Tycho as his model and the *Mechanica* as his text, building an observatory on the Tychohonic model.

The Museum has a rare original set of the illustrations, not included in the exhibition, detailing the form and construction of the instruments for the Beijing observatory, printed in China around 1674 on a total of one hundred and five separate sheets of paper approximately 300 x 460mm in size.

Here are instruments from Uraniborg - such as the altazimuth quadrant, the bipartite arc and the great celestial globe - refashioned in China, modelled directly on the Tychohonic precedent but with eastern decoration. The sights are of Tycho's design and the arcs are divided by transverse lines as he had done.

Most surprising of all is that Verbiest has built two armillary spheres, instruments tried but condemned by Tycho and not attempted by Hevelius. There is even a zodiacal armillary - the most complex and impractical of instruments for measurement, originally described in Ptolemy's *Almagest*.

The Jesuits were using European astronomy to persuade the Chinese of the superiority of the Christian tradition that had produced it, so why choose to present them with an astronomical technology a century old and obsolete in the West? One proposed explanation is that it was the best that could be handled with the available labour and materials.

Another explanation could be that the Jesuits were more comfortable in a Tychohonic astronomical tradition, since it adhered to a stationary earth and eschewed the heretical hypothesis of Copernicus. But part of the answer may lie in the continuing rhetorical power of Tycho's instruments, evoked most tellingly by the majestic geometry of a large armillary sphere. As was the case when Tycho dedicated his *Mechanica* to Rudolph, the noble Dane's Heavenly Castle still offered the most appropriate model for the Emperor's observatory.

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Further reading: R. J. W. Evans, *Rudolph II and His World* (Oxford, the University Press, 1973); V. Thoren, *The Lord of Uraniborg: A Biography of Tycho Brahe* (Cambridge: the University Press, 1990); Frances Willmoth, 'Models for the Practice of Astronomy: Flamsteed, Horrocks and Tycho', forthcoming in Frances Willmoth (ed.), *Flamsteed's Stars: New Perspectives on the Life and Work of the First Astronomer Royal* (Woodbridge: Boydell Press, 1997); A. Chapman, 'Tycho Brahe in China: The Jesuit Mission to Peking and the Iconography of European Instrument-making Processes', *Annals of Science*, 41 (1984), pp. 407-48.