Brass astrolabe, the front of the plate engraved for a universal astrolabe with De Rojas projection, graduated regula and cursor, below the throne a table of 24 stars and a perpetual calendar for Leap Years and Epact, dated 1678; the reverse of the plate with scales for a circular slide rule with scales for tangents, sines and numbers, two rotating index arms.

THE “PANCHRONOLOGIA”

[Brass Astrolabe and Slide Rule]

Author
[?MARKE, John]

Publication date
[1678]

Publisher

Publication place

Physical description
Brass astrolabe, the front of the plate engraved for a universal astrolabe with De Rojas projection, graduated regula and cursor, below the throne a table of 24 stars and a perpetual calendar for Leap Years and Epact, dated 1678; the reverse of the plate with scales for a circular slide rule with scales for tangents, sines and numbers, two rotating index arms.

Dimensions
713 by 659mm (28 by 26 inches).

Notes
One of the largest and grandest computational devices made in the seventeenth century.

The so styled “Panchronologia” combines one of the most ancient of scientific instruments, the astrolabe, with one of its most modern (for the time) the slide rule. At 26 inches (66 cm) in diameter and weighing 23 lbs (10.4kg) it is not only one of the largest astrolabes ever produced but arguably the largest computational device to have survived from the seventeenth century, and thus a hugely important work in the history of computing.

The Astrolabe

The astrolabe some times called the slide rule of the heavens, can trace its history back to Hellenistic times. The smart phone of it’s day it could perform numerous functions including calculating the time day or night, determine your position, show the movement and identify heavenly bodies, cast horoscopes, help you navigate the oceans, and survey your land.

The astrolabe is on a De Rojas or orthographic projection. The De Rojas is a form of universal projection, i.e. one that can be used at any northern latitude, unlike their traditional cousins which were bound to a particular latitude. Such universal astrolabes had been pioneered by Islamic instrument makers in the Twelfth century, but were made popular in the Europe in the Sixteenth century when De Rojas published his ‘Commentariorum in astrolabium’, in Paris, in 1551.

To the upper part below the throne is a list of 24 stars marked a-z:

a – Aliot;
b -Cin: Andr
c – Spica [Virgo]
d – Cap [Aries]
e – Arctu
f – Os: Ceti
g – Corona
h – Cor [Scorpio]
i – Ocul. [Taurus]
k – Hircus
l – Pes: Ori S.
m – Cin Orio.
n – Auriga
o – Lyra
p – Can. ma:
q – Can: mi: Aquila
r – Aquila
s – Corn: VS.
t – Cignus
u – Cor: hy:
w – Cor: [Leo]
x – Fomaha
y – Caud [Leo]
z – Ala peg.

Below this a perpetual calendar for Leap Years, and Epact (age of the moon at the beginning of the year), dated 1678.

The instrument is bisected by a graduated regula and cursor.

The Slide Rule

A Brief History

The slide rule was central to the practice of mathematics, from its invention at the beginning of the seventeenth century, to its hasty demise at the hands of the pocket calculator some 340 years later. It's invention by William Oughtred (1574-1660), in 1632, would revolutionises the area of computing, allowing the user to perform quickly complex computations; its use was not only mathematical but practical, with rules designed for engineers, brewers, printers, customs officers, shipwrights, and astronomers among many others. They were even used during the cold war to calculate radiation exposure over time, and Buzz Aldrin is said to have used one for last minute calculations before landing on the moon. Though suggestions, that his failed attempts to put it back in his pocket was the reason he was second out of the lander have not been verified.

In its purest form, two logarithmic scales are placed next to each other on two rules, enabling calculations to be made when sliding the rules past each other, hence slide rule. The earliest extant example of such an instrument (though not the instrument itself – which is now lost) is housed the in Macclesfield collection at the University of Cambridge Library, where a counter proof print of Elias Allen's (1588-1653) instrument is attached to a letter from Oughtred to Allen, dated 1638. Oughtred laments to Allen that he is yet to have one made.

However, the very first slide rules were circular, as here. The earliest extant example of such an instrument was produced by Elias Allen – him again – and although not dated, is believed to have been produced in around 1634. It currently resides in the History of Science Museum, Oxford (HSM 40847). The earliest dated circular slide rule, marked 1635 (though lacking the rule) and signed by the Oxford instrument maker Johannes Hulett, is in the British Museum (BM 2002,0708.1).

Slide Rules on Astrolabes

It would seem from our research that it took a while before slide rules were added to astrolabes (though further study is required). The earliest example we were able to trace is housed in the National Maritime Museum (NMM AST0567). The astrolabe was originally made for Edward VI around 1552 by the instrument maker Thomas Gemini. Over one hundred years later, Henry Sutton (c1635-65), the pre-eminent instrument maker of his day (and John Marke's master) engraved inside the mater – which was originally blank – a circular slide rule, signed and dated 1655. A rather stylish Seventeenth century retrofit.

The circular slide rule on the present instrument is clearly the largest ever produced in the seventeenth century, and certainly the largest ever on an astrolabe. The two rotating index arms are marked for tangents, sines, and numbers i.e. in order to perform complex trigonometrical calculations. One assumes this was in order to calculate the accurate positioning of celestial bodies where triangulation was essential. Its sheer size allowed for an unprecedented number of gradations, making the most accurate slide rule of the time, and allowing the user of the instrument unmatched precision.

Attribution, Association, and Date

One of the most curious aspects of the instrument is that it's neither signed nor dated. However, documents in the Archer-Houlbon Archive at Welford Park, do shed some light on to both aspects.

They reveal that the object was sent on a four year loan to Professor Karl Pearson F.R.S. (1857-1936) at University College London, alongside a now lost manuscript which bore the title 'Panchronologia' and was dated 1672/3. The letters confirm that the 'Panchronologia' was first cleaned in December 1900 and that Pearson appears to have been more interested in the face with

the slide rule than the astrolabe: when he exhibits it at the Royal Society it was described as the former.

Furthermore, he writes that he compared the handwriting of the manuscript to that of Sir Isaac Newton (1642-1726) but that there was no match to indicate his involvement – his investigation stems from the familial tradition that asserted the manuscript and astrolabe were passed down the generations from Newton himself, to whom they were related.

A similar, but smaller, 17 inch (43 cm) universal astrolabe at the History of Science Museum in Oxford (HSM 51786) is signed and dated 1659 by Henry Sutton (c1635-65). Indeed, it is tempting to speculate that Sir John Houblon (1632-1712) may have even known Sutton since he lived on Threadneedle Street, where Sutton had his workshop, although no known documentation exists to confirm the acquaintance. What is more concrete however is that the current astrolabe is clearly related to that in Oxford. Although dated thirteen years after Sutton's death, the table of stars on the 1678 astrolabe includes and expands upon those on the earlier instrument. Further a copying error on the perpetual calendar attest to this relationship: a '78' on the Oxford astrolabe is punched incorrectly with the '8' on its side resembling '00'; this is copied onto the larger astrolabe's perpetual calendar as '700'. The maker of the instrument in 1678 either had access to the Sutton astrolabe or the counter proof, also preserved in Oxford (HSM 56420).

The most likely candidate to have had that access to the master maker's instruments are amongst one of Sutton's five recorded apprentices: specifically John Marke (fl 1664-79) who caught the attention of John Collins (1625-83) when he wrote that "We hope he may prove as good a Workeman as his deceased Master". From his surviving instruments, the visible similarity in the style of engraving mixed with the use of smaller punched numbers is striking. He is also known in 1673 to have engraved a new plate for the then century old "Great Astrolabe" (University of St. Andrews ID PH201) by Humphrey Cole (d 1591), which is the only other extant English astrolabe on this scale, having a diameter of 24 inches (61 cm).

Conclusion

Although astrolabes had a variety of functions the sheer size of the present instrument, its grand title 'Panchronolgia' (All Time Calculator), the perpetual calendar, together with its use of the universal projection would suggest its primary function was the precise calculation of the position of the heavenly bodies over the previous and coming years i.e. as the most accurate calendar of its day. A function greatly reinforced by the addition of the huge circular slide rule on the reverse.

This would be the last great flowering of the astrolabe in the western world, with the instrument superseded by the scientific advances of the coming century. The slide rule on the other hand would last for a another 300 years, until 1972 when Hewlett-Packard produced the first pocket calculator.

Bibliography

Provenance
Provenance:

Sir John Houblon (1632-1712), thence by descent.

Exhibited: London: Royal Society Soirée, 14 May 1902.

Price: £500000

Inventory reference: 22198