

Navigating Matters: Reflections on an Oxford-Made Ivory Nocturnal in Munich

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This paper focuses on an Oxford-made, purportedly eighteenth-century, ivory nocturnal from the Deutsches Museum. While nocturnals are kept in various other museum collections, those instances are invariably made of metal or wood. The use of ivory is especially noteworthy due to the nocturnal's provenance: Oxford was neither a center for ivory products nor for scientific-instrument-making. As such, the nocturnal appears to be a material and geographical outlier and raises questions about its maker, material, and use. In the absence of written records detailing its biography, this paper turns to the nocturnal itself as a primary source to help answer these questions and uncover its history. Put differently, I will take a material culture approach—gleaning clues and gathering evidence from a close study of the object (and others like it) and the elements and materials of which it is composed—and combine it with the more traditional reading of textual and visual sources. I tentatively argue that the nocturnal probably served as an educational tool for a wealthy, mathematically-inclined member of eighteenth-century English consumer culture. In addition to shedding light on the object's history, and paving the way for further research, this paper aims to serve as a case study in navigating matter.

Keywords: Nocturnal, Ivory, Oxford, Deutsches Museum, Material Culture

Introduction

There is nothing particularly eye-catching, perplexing, or thought-provoking about the box containing the object with inventory number 29041 at the Deutsches Museum in Munich (Fig. 1.). So much so, perhaps, that it is hard to imagine the opposite can be said about its content, and unless one would peek through the handle holes on the box's opposing short end sides, little else about this container could betray the extraordinary and complex nature of the artifact that lies within (Fig. 2). Indeed, from the rough wood and cracked ivory, richly engraved with letters, numbers, and symbols in red and black ink, to its multi-shaped components, decorated to boot on all sides, the object starkly contrasts with the smooth, minimalist, monochromatic, and run-off-the-mill-looking container in which it currently resides (Fig. 3 & 4). Although the box was obviously chosen for its function as a repository rather than for its resemblance to the object, the contrast in appearance is nevertheless striking, and the two don't quite seem to fit. But the peculiarities surrounding this object do not end with its container.



Fig. 1 The container holding the object with inventory number 29041 at the Deutsches Museum in Munich. Source: Deutsches Museum, Munich. Photograph by author.



Fig. 2 The opened container from Fig. 1, showing the object that lies within. Source: Deutsches Museum Munich. Photograph by author.



Fig. 3 The front of the object. Source: Deutsches Museum, Munich. Photograph by author.



Fig. 4 The reverse of the object. Source: Deutsches Museum, Munich. Photograph by author.

To not further bury the lede, the object is a nocturnal—an instrument to determine the time at night by using the stars—and belongs to the collection of navigation and time-keeping instruments of the Deutsches Museum for Science and Technology in Munich.¹ It is fashioned of ivory and coupled with components of wood. We do not know its maker and the object is not dated either, but the museum has estimated it was produced between 1740–1750, probably around 1745. The inscription “Oxon,” from the Latin *Oxonia*, on one part of the nocturnal, furthermore informs us that it originates in Oxford (Fig. 5).²



Fig. 5 Detail of the handle of the nocturnal, inscribed with the word ‘Oxon’, from the Latin *Oxonia* for Oxford. Source: Deutsches Museum, Munich. Photograph by author.

On their own, and considered in a vacuum, none of these biographical features are peculiar or problematic. Yet collectively, when grounded in historical context, and brought in conversation with other, similar objects, they evoke questions. First of all, historians assert that nocturnals were predominantly produced between the fifteenth and eighteenth centuries (Bennett 1987: 77; Higton 2002: 387; Oestmann 2001: 5; Devoy 2023). It is not clear on what factors—material, historical, or otherwise—the museum’s dating of the object is based, but if accurate, then, following historians’ claim about their general period of production, the nocturnal in Munich would be a fairly late example.³ This becomes interesting compared to other preserved eighteenth-century nocturnals, none of which are made of ivory, and whose designs, while similar in parts, are nevertheless distinct from the one in Munich. Indeed, such material sources corroborate historians’ other claim that nocturnals

¹ Nocturnal mit ewigem Kalender, anonymous, Oxford, c. 1745, ivory and wood. Deutsches Museum, Munich, Inv.-Nr. 29041. Permalink: <https://digital.deutsches-museum.de/item/29041>.

² This fact was established during the group analysis portion of the workshop.

³ Unfortunately, the person who originally suggested the object’s date is no longer available for comments or questions

were generally made of metal, most often brass, or boxwood (Fig. 6) (Bennett 1987: 77; Highton 2002: 387; Devoy 2023), but not of ivory, and to date I have not found any other instances of nocturnals made from this material.⁴ The National Maritime Museum, Greenwich has a silver nocturnal from the seventeenth or eighteenth century in their collection, which, like ivory, was an equally uncommon material to use for such instruments.⁵ Nevertheless, it still falls within the category of metal nocturnals, and in terms of its design resembles those made of wood.

It is important to note here that while nocturnals were often developed as stand-alone objects, they were sometimes also part of a Gunter quadrant (Jardine 2008a; Bennett 1987: 78–80), incorporated into astronomical compendia (Fig. 7 & 8)—instruments comprising multiple time-telling and astronomical devices, from sundials and compasses to lunar volvelles, and nocturnals (Jardine 2008b; Devoy 2023)—and coupled with diptych sundials.⁶

Yet these compendia and Gunter quadrants too were commonly constructed of brass and boxwood (Jardine 2008a-b; Bennett 1987: 78–80), and although the diptych sundials are often characterized by their use of ivory, the components on them that belong to a nocturnal (that is, the disk with scales and the pointer or index arm) are made of metal as well (Syndram 1989: 85; Cowham 2018: 42–43). Moreover, both the compendia and the diptych sundials tend to be from earlier periods, sometimes predating the Oxford nocturnal by two centuries. As such, the nocturnal from the Deutsches Museum appears to be a material and temporal outlier.

Finally, it is worth remarking that the use of ivory is equally surprising due to its provenance, since English nocturnals were commonly made of boxwood (Bennett 1987: 77; Highton 2002: 387), and Oxford, unlike other European cities such as Nuremberg and Dieppe, was not known as a center for ivory products, or for the making of scientific instruments, for that matter.⁷ This is of course not to say that no such objects were or could have been produced in Oxford, but rather that its provenance there is unexpected, and therefore thought-provoking.

⁴ For an example of a boxwood nocturnal, see, for instance, the copy with inventory number AST0128 at the National Maritime Museum, Greenwich, London: <https://images.rmg.co.uk/asset/16264/>; In addition to the collections of the Deutsches Museum in Munich, I have also consulted those of, among others: The Adler Planetarium, Chicago; The History of Science Museum, University of Oxford; Science Museum, London; Whipple Museum, Cambridge; National Maritime Museum, Greenwich, London; National Museum of Scotland; Germanisches Nationalmuseum, Nuremberg; Mathematisch-Physikalischer Salon, Dresden.

⁵ For the silver nocturnal see, National Maritime Museum Greenwich, London, inventory number AST0135:

https://www.rmg.co.uk/collections/objects/rmgc-object-10297?_gl=1*1qjwth5*_up%20*MQ%E2%80%A6*_ga*MTAyOTAy-MzU5NS4xNzYwNT%7CwMjlx*_ga_4MH5VEZTEK*czE3NjA1%20MjAyMjAk-bzEkZzAkdDE3NjA1MjAyMjAkajYwJGwwJGgw*_ga_7JJ3J5DBF6*czE3NjA1MjAyMjAk-bzEkZzAkdDE3NjA1MjAyMjAkajYwJGwwJGgw

⁶ See, for instance, the ivory diptych sundial with nocturnal at the Collection of Historical Scientific Instruments at Harvard University, inventory number 7527: <http://waywiser.fas.harvard.edu/objects/3880/astronomical-compendium?ctx=87b77a07-f544-4317-9302-eb91feb3cc59&idx=0>, also discussed in Lloyd 1992, Category nr. 79; the ivory diptych sundial in Syndram 1989, Category nr. 17, p. 85; and the one discussed in Cowham 2018: 42–43.

⁷ For Nuremberg and Dieppe as centers for the manufacture of ivory products, see especially: Gouk, Penelope 1988. *The Ivory Sundials of Nuremberg 1500–1700*. Cambridge: Whipple Museum of the History of Science.



Fig. 6 Nocturnal mit ewigem Kalender, C. C. Schindler, 1705, Brass. Source: Deutsches Museum, Munich, Inv.-Nr. 44070. © Konrad Rainer (CC BY-SA 4.0).



Fig. 7 Astronomical Compendium with equatorial sundial. Caspar II Buschmann, Augsburg, ca. 1560–1613. Source: Deutsches Museum, Munich, Inv.-Nr. 43553 © Konrad Rainer (CC BY-SA 4.0).



Fig. 8 Frontside of the compendium in Fig. 7, showing a nocturnal with its index arm protruding out. Source: Deutsches Museum, Munich. © Konrad Rainer (CC BY-SA 4.0).

In short, the Oxford nocturnal in Munich appears to be unusual and unique for a number of reasons, and therefore merits historical attention. Specifically, it prompts us to ask:

What is this nocturnal? What was it used for and by whom? Who made it and why? How can we explain the use of ivory as a material for construction, rather than the more commonly employed brass or boxwood? How do we make sense of its elaborate design, especially compared to the more simplified wooden versions typically produced in England? What can we say about the nocturnal's unexpected origin in Oxford, and what can we infer from this provenance about the instrument's maker? In this essay, I will explore these questions and navigate the complex set of issues that underpin and arise from them. I will do so by taking a material culture approach—gleaning clues and gathering evidence from a close study of the object itself (and others like it) and the elements and materials of which it is composed—combined with a more traditional reading of textual and visual sources. The aim of this essay is not to present hard arguments based on conclusive evidence, but rather to suggest possible answers to the questions raised by the nocturnal and share preliminary findings in order to open up further avenues of research. I tentatively argue that the nocturnal probably served as an educational tool for a wealthy and mathematically-inclined member of eighteenth-century English consumer-culture.

The Nocturnal: Main Components, Inscriptions, and Decoration

Main Components

With such a complex, richly inscribed and decorated object, it may be difficult to determine where to begin and what to direct our gaze to first, but perhaps a convenient starting point is to identify and discuss the main elements of which the object is composed (Fig. 9).⁸

Looking at the frontside of the object, shown in Fig. 9, we can see that it consists of three concentric disks of different sizes, stacked on top of each other, with the largest one at the bottom and the smallest on top (Fig. 10).

These disks are joined at their center with a rivet, which has been punctured in the middle, so as to create a hole.⁹ The smallest disk on top extends into a long, narrow rectangle with a beveled end shaped like a fish. An ivory hand, holding a handle has been screwed onto the bottom disk, while on its opposite side we find a triangle featuring what appears to be the face of an animal, possibly a sea creature. Two left hands with their index fingers protruding out are furthermore attached to the second, middle disk.

Turning the object over to view the reverse (Fig. 11), we find one main disk with the same hole at its center, the opposite side of the hand holding a handle—yet now showing its palm and four fingernails—and, the backside of the triangle, equally inscribed with animal-like features.

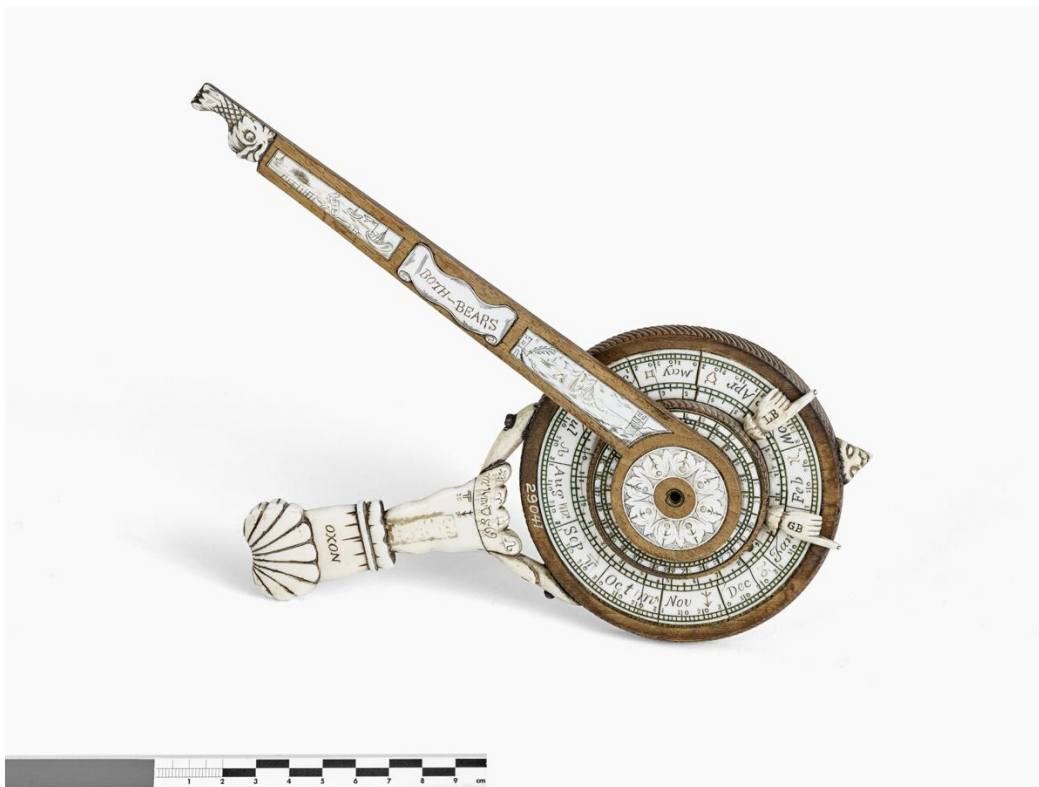


Fig. 9 Front view of the nocturnal. 1740–1750, probably 1745. Oxford. Ivory and wood. Source: Deutsches Museum, Munich, Inv.-Nr. 29041. © Konrad Rainer (CC BY-SA 4.0).

⁸ This description of the object's individual components is based on the group analysis of the object that took place during the workshop. I have slightly altered the language we used in our original description for the purposes of this essay and to match my own writing style.

⁹ The fact that it is a rivet was confirmed by Thomas Rebényi, head of metal conservation at the Deutsches Museum.



Fig. 10 Side view of the nocturnal, showing how the three discs are stacked on top of each other. Source: Deutsches Museum, Munich. Photograph by author.



Fig. 11 Reverse of the nocturnal shown in Fig. 9. Source: Deutsches Museum, Munich. Photograph by author.

The Inscriptions and Decoration

Before reflecting on what each of these components are and what their function (if any) was, it will be worthwhile to discuss the inscriptions and decoration of the object.¹⁰



Fig. 12 Close up of the front of the nocturnal, displaying the three concentric disks. Source: Deutsches Museum, Munich. Photograph by author.

Frontside

Beginning with the frontside (Fig. 3, 9 & 12), working our way up, and starting with the biggest disk at the bottom, we can identify two concentric rings. The outer ring is divided into twelve equal sections, each containing the first three letters of the months, followed by a zodiac sign. The second, inner ring of the bottom plate is divided into twenty-four sections, containing two consecutive sequences of 1 to 12. Moving one level up, the second circular plate also contains two concentric rings with a sequence of numbers. The ones in the outer ring range from 1 to 30; the ones in the inner ring from 1 to 12. The third, smallest, and uppermost disk does not contain numbers or symbols, but is decorated with what look like eight petals.

¹⁰ This description is based on the group analysis of the object that took place during the workshop. I have slightly altered the language we used in our original description for the purposes of this essay and to match my own writing style.



Fig. 13 Close up of the rectangle extending from the top disk. Source: Deutsches Museum, Munich. Photograph by author.

As previously noted, this top disk extends into a long, narrow rectangle with a beveled end shaped like a fish (Fig. 13). Three ‘plates’ of ivory are either inlaid or glued onto this rectangle. The outer two of which depict maritime scenes: In the one on the left, we see a figure carrying boxes towards a ship with a hoisted flag, while two more ships can be spotted in the background. The scene on the right depicts two ships with their flags equally hoisted, flanked on each side by a tower, while another ship can be seen sailing in the far distance. One of the ships in the front carries a load, presumably the boxes from the scene on the left. Two sailors, one depicted on each ship, are paddling in the water. Separating these two scenes, and placed in the middle of the rectangle, is another small ivory plate with a scroll carrying the words “Both Bears.”

Working our way down again, directing our attention to the ivory attachments (Fig 3 & 9): Two left hands are inserted into the second wooden disk, with their index fingers pointing outwards, ever so slightly extending beyond the edge of the bottom disk. Going clockwise, beginning with the one on the left, the hands are inscribed with the letters ‘LB’ and ‘GB’ respectively.

The bottom disk has two ivory pieces attached to it. A triangle, which, as already mentioned, has an animal-like face carved into it. Opposite this triangle, on the other end of the disk, a big left hand (with part of the arm, a sleeve and a ruffled cuff mimicking a shell), is holding a handle, which has been screwed into the bottom plate (Fig. 14 & 15).

The thumb of the hand is resting on the handle, while the remaining four fingers are wrapped around it (and folded into the palm of the hand) with the knuckles protruding outward as a result. Twelve zodiac signs and twelve numbers are carved onto, in between, and below the knuckles. Beginning at the top left knuckle, reading from left to right, and from top to bottom, they are:

♈, ♈, ♈, ♈, 31, 31, 31, 31, ♎, ♎, ♎, ♎, ♎, 31, 28, 31, 30, 31, 30, ♏, ♏, 30, 30

Finally, right below these symbols, the word ‘OXON’ (already referenced in the introduction) has been carved into the lower part of the sleeve (Fig. 15).



Fig. 14 Close up of the hand attached to the bottom disk of the nocturnal. Source: Deutsches Museum, Munich. Photography by author.



Fig. 15 Close up of the sleeve bearing the inscription 'OXON'. Source: Deutsches Museum, Munich. Photography by author.

Backside

The reverse side of the nocturnal only consists of one big disk, which is divided into four concentric circles (Fig. 16). In the most inner one, we find a depiction of a sun (in red-brown ink), pierced at its center by the riveted hole of the instrument. This inner ring is encircled by an eight-pointed star, in between whose points, four different moon phases are depicted, which are alternated by a three-pointed, four-pointed, five-pointed and six-pointed star respectively.

The third ring from the center is divided in thirty-two equal sections, each of which contains three numbers: the first of which ranges from 0 to 2, while the second and the third one are coupled and run from 01 to 58. Five of these sections are also inscribed with letters in red-brown ink: 'Und' and 'Abo' (four in total) or 'LB' (one in total).

The fourth and outer ring is similarly divided in thirty-two equal sections, which align with the sections of the previous third ring, and which also contain three numbers: the first number in each section runs from 0 to 2, while the second and the third are once again paired and run from 04 to 55. Here too, three of these sections contain the letters 'Und' or 'Abo', while another is inscribed with 'GB' (aligning with the section marked with 'LB' in the third circle).



Fig. 16 Close up of the reverse of the nocturnal. Source: Deutsches Museum, Munich. Photograph by author.

Finally, the reverse does not contain any new ivory attachments; we simply find here the same hand as described on the front (except now showing its palm and fingernails), and the reverse of the triangle, equally featuring an animal-like face.

Identification and Function of the Main Elements

Now that we have described the nocturnal's main elements, its inscriptions and decoration, the next logical step would be to figure out what they are and what they are meant for. Fortunately, this is not too complicated, for although the nocturnal is unusual in some respects, in others it is common. Indeed, the object's main components and its inscriptions overlap with those of other nocturnals—especially the previously mentioned boxwood versions produced in England—which historians of science and scientific instruments have already discussed. We can therefore helpfully draw on their work to explain what the components of the Oxford nocturnal are and what they are meant for.

Beginning with the front of the nocturnal: Nocturnals typically consist of two or three concentric disks, joined together at the center with a pierced rivet, as is also the case with the Oxford nocturnal. The hole created by the punctured rivet is used to locate the Pole Star (Polaris). Moving on to the three circular plates: The largest disk of this nocturnal is divided into two rings: the outer ring, consisting of twelve equal sections. This is a date or calendar

scale, providing the months of the year (and their corresponding Zodiac sign), and the days per month. The inner ring is a time scale, with each of its twenty-four parts indicating one hour (twelve for the day, twelve for the night)—many nocturnals also have jagged “teeth” or raised knobs or bosses running along this time scale (see, for instance Fig. 6 & 8), with one tooth at each hour mark and (occasionally also) a longer tooth at the midnight mark, enabling the user to tell the time at night by touch (Bennett 1987: 78; Oestmann 2001: 5; Higton 2002: 387; Gunther 1967: 274). The Oxford nocturnal does not have such teeth. The hand attached to the main plate is a handle, allowing the user to hold the instrument, and the triangle on its opposing side can be used as a guide to discern that the nocturnal is kept upright when wielding it (Seller 1711: 135).¹¹

As for the second disk: the inner ring represents a time scale, indicating the hours in a day (again twelve for the day, twelve for the night), whereas the outer one (with a range of one to thirty) is a lunar scale, to determine the time of high tide based on the Moon's age (Bennett 1987: 78; Higton 2002: 387). The two hands or manicules inscribed with ‘GB’ and ‘LB’ that are attached to this disk are pointers, referring to the type of constellation with which the nocturnal can be used: the Great Bear and the Little Bear. As the historian of science Hestor Higton helpfully explains: “Nocturnals [as instruments to determine the time at night with help of the stars] can be used with all the circumpolar constellations but most of these instruments focus on the apparent rotation of the Great Bear about the pole star. Sometimes they can also feature the Little Bear” (Higton 2002: 387). Indeed, as the late Jim Bennet has pointed out: “when the inner plate [of a nocturnal] carries two pointers, indicated by ‘GB’ and ‘LB’, [...] such an instrument might be marked ‘Both Bears’”—as is the case with the Oxford nocturnal (Bennett 1987: 78). The rectangle attached to the third and upper disk is an index arm.

Finally, the numbers in the two concentric rings on the reverse of the nocturnal are the values for the declination, or the corrections to the altitude, of the Pole Star above or below the North Celestial Pole—indicated with either ‘VND’ (under) or ‘ABO’ (above) on the Oxford nocturnal. What does that mean? The North Celestial Pole equals the position or latitude of an observer. However, due to its brightness and visibility, Polaris is a more useful reference point for determining the time and one's position. Yet since Polaris does not have the same altitude above the horizon as the North Celestial Pole, but rather rotates around it each day, and is therefore either slightly above or under it, an observer would have to take this small difference in altitude into account in order to determine their own position.¹² These corrections of altitude were sometimes included on the reverse of nocturnals, as is the case with the one from Oxford at the Deutsches Museum.

How Does a Nocturnal Work?

To summarize, thus far we have been able to identify the nocturnal's individual components (along with their inscriptions and decoration); we also know what they are; and what they are meant for. But how do they work exactly, and how do they function together? Or, in other words, how does a nocturnal work?

¹¹ Thank you to Stephen Johnston for recommending this source.

¹² I am grateful to Stephen Johnston and David Alberto for their helpful clarifications in this regard. Any mistakes in the explanation and understanding of this part of the nocturnal, or the conclusions drawn from them, are mine.

Measuring the Altitude and Time at Night

We know that a nocturnal is an instrument used to measure the time at night. To explain how that is done, we may use a depiction of the nocturnal's use provided by the mathematician and astronomer Peter Apian in his *Cosmographia* (1533) (Fig. 17), along with the illustration in Fig. 18, as a visual guide.

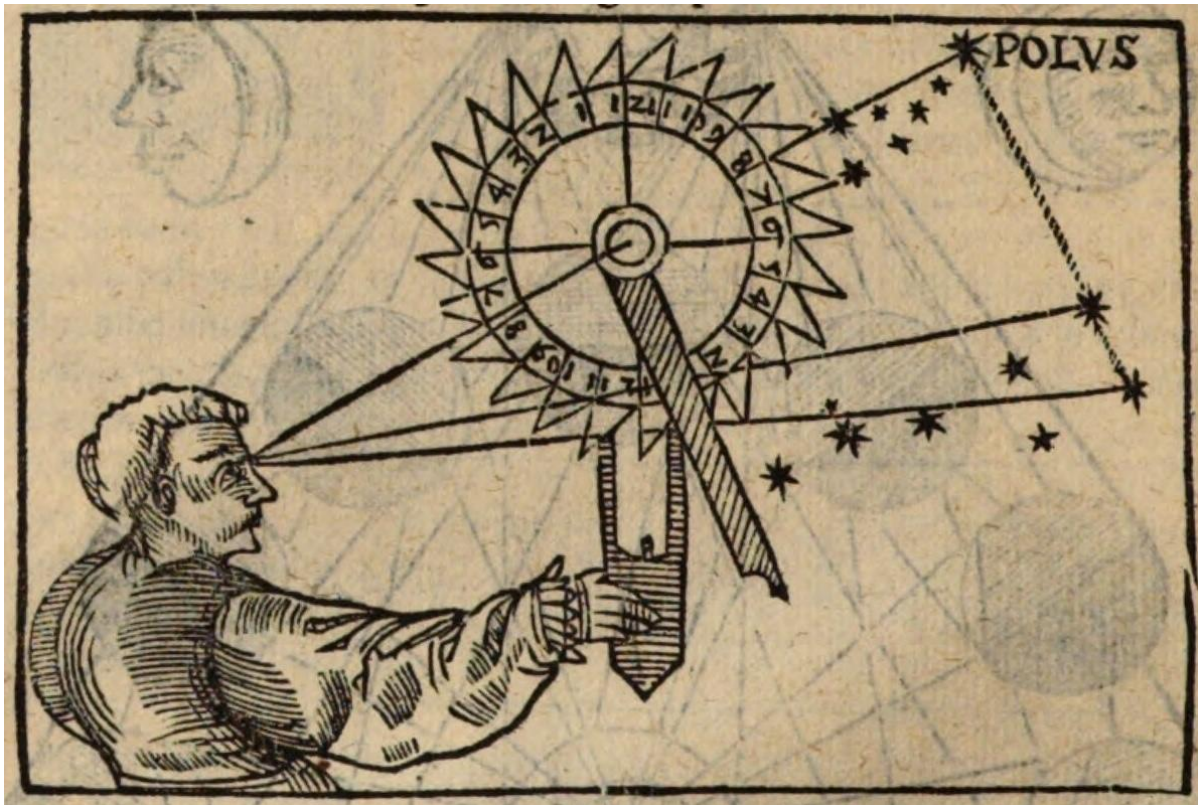


Fig. 17 Depiction of an individual using a nocturnal and sighting the pole star (*polus* in the image) through it, from Peter Apian and Gemma Frisius' *Cosmographia* (1533), f. 50v. Source: Bayerische Staatsbibliothek, Munich (CC0 1.0 Universal). URN: urn:nbn:de:bvb:12-bsb10806466-1.

To measure the time at night with a nocturnal, an observer could either use the Great Bear (GB) (Ursa Major) or the Little Bear (LB) (Ursa Minor) constellation. If a nocturnal was designed for use with Both Bears, the observer would turn the dial of the second disk so that either the pointer marked 'GB' or 'LB' was set to that day's date. Then, as Apian shows us in his *Cosmographia*, the observer would hold the nocturnal by its handle, with a stretched arm, and point it towards the sky in such a way that the polar star could be sighted through the pierced hole at the instrument's center (Fig. 17). Next, he would align the long or straight end of the index arm with the two stars of the Great Bear, "which are in line with the Pole Star [Dubhe or Merak,] or [with] the bright star Kochab in the Little Bear" (Bennett 1987: 78; Higton 2002: 387; Devoy 2023) (Fig. 18). The time could then be read by looking at which hour on the main disk's outer scale was marked by the index arm, or in case it was too dark and if available, by counting the number of teeth from the midnight mark (Fig. 7 and 9) (Bennett 1987: 78; Devoy 2023).

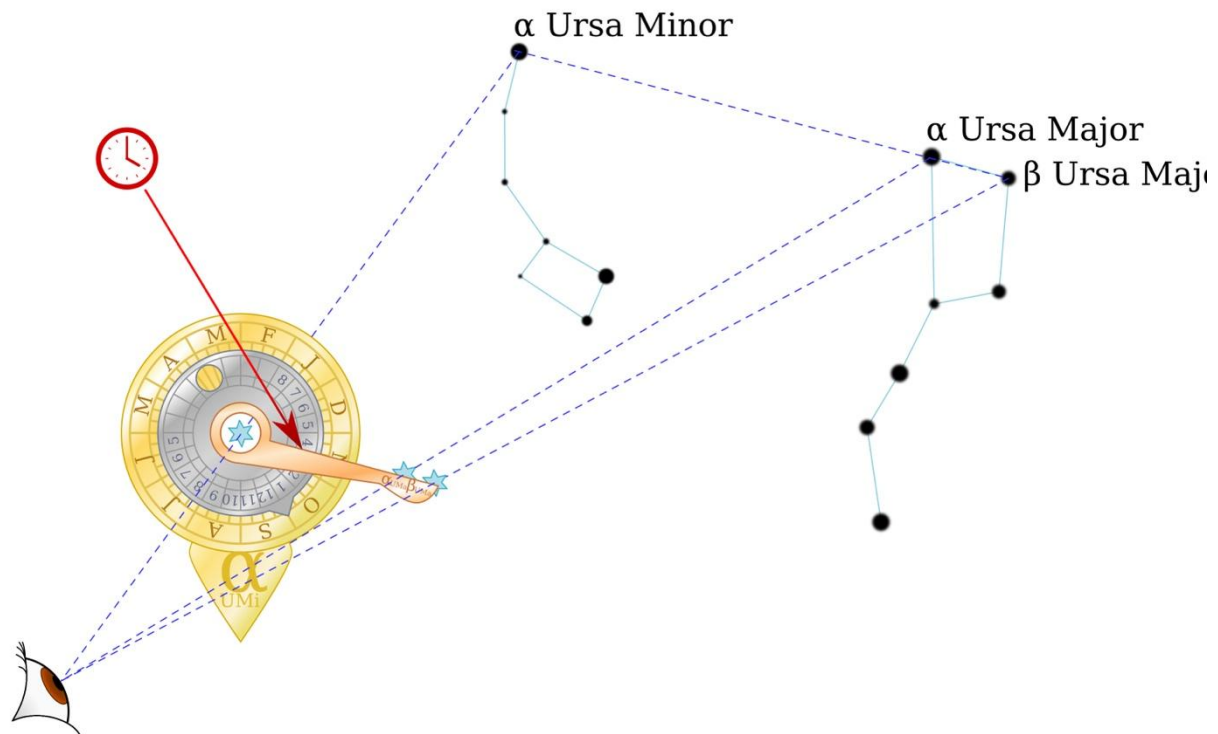


Fig. 18 Illustration showing how to use a nocturnal. Illustration © Johann "nojhan" Dréo — CC-BY-SA, via [Wikimedia Commons](#).

The reverse of the nocturnal could then be used to determine the latitude (Fig. 16). By turning over the nocturnal, leaving the index arm in the same position, an observer could read off the correction to the latitude, by looking which value in the outer ring (if the Great Bear was used) or the inner ring (if the Little Bear was used) was aligned with the index arm. That value would then have to be subtracted from or added to the altitude of the Pole Star (Bennett 1987: 78; Highton 2002: 387).

Measuring the Time of High Tide

If a nocturnal also contained a disk with a lunar and time scale (as the Oxford nocturnal does), one could calculate the time of high tide based on the Moon's age. The process of how to do so has been explained by Jim Bennett:

These [the lunar and time scales] are used to find the time of high tide, given the Moon's age and the 'establishment' of the port in question. 'Establishment'—a constant for each port—is the time interval between the meridian transit of the full Moon or the new Moon (midnight and midday respectively) and the next high tide. The zero of the lunar scale is set to the establishment of the port on the time scale of the larger plate.

The index arm is then set to the Moon's age on the lunar scale, and the time of high tide read off the time scale on the inner scale [of the second disk] (Bennett 1987: 78).

The Problem of Use

Now that we have established that a nocturnal was an instrument to find the time at night, determine one's altitude, and calculate the time of high tide, the next question to consider is: who would use such an instrument? In light of this, Jim Bennett has noted that: "Of the two general types [Bennett is referring here to the smaller nocturnals made of brass, and the larger, (often English) ones from wood], the wooden ones are more like shipboard instruments, and this is confirmed by the fact that they almost always carry additional scales related to latitude finding and tide prediction," furthermore adding that nocturnals are "regarded by many as [instruments] for the navigator" (Bennett 1987: 77). Such a perception may well find part of its origin in the writings of early modern actors, such as those by the mathematician Edmund Gunter (1581–1626), who, in his *De Sectore et Radio* (On the Description and Use of the Sector and the Cross-Staff) (1623), refers to the nocturnal as "for the use of sea-men" (Gunter 1623: 60). We may recall here that the Oxford nocturnal bears resemblance to the wooden versions described by Bennett, in the sense that it too contains a lunar scale for predicting tides and tables to determine latitude. Considering this, coupled with the maritime theme of the decoration—the fish at the beveled edge of the long pointer, the shell-shaped sleeve on the handle, the sea-creature-like face on the tip of the nocturnal—and the fact the scenes on the index arm seem to allude to the act of loading one's cargo before the end of high tide, we might infer from this that the Oxford nocturnal, just like their wooden counterparts, was used by sailors or navigators to find the time at night, determine their altitude, and predict the tides while aboard a ship. One mystery surrounding the object solved, right? Not quite.

Theory versus Practice

Historians of science, particularly those specialized in scientific instruments, may want to raise an objecting (index)finger at this point. In his seminal article "Knowing and Doing in the Sixteenth Century: What Were Instruments For?" Jim Bennett has cogently argued that while many sixteenth-century instruments were practical in theory, a study of extant instances of them reveals that "in a good many cases they appear not to be very practical at all" (Bennett 2003: 133). Although Bennett's focus lies with sixteenth-century mathematical instruments, his point is nevertheless instructive for our analysis of the Oxford nocturnal. Specifically, it pushes us to consider whether the nocturnal could have been used as a time-telling device in practice, and whether it in fact was used (irrespective of what for)?

To start with the last question first: The nocturnal does not bear any obvious traces of use that allows us to confirm whether it was actually employed in practice (regardless of its intended function). Yes, the ivory is noticeably cracked, but this phenomenon appears to be more indicative of the natural properties of ivory than of the actual use of the instrument. Indeed, as Penelope Gouk has explained in her work on early modern ivory sundials: the "tusk [of an elephant where the ivory comes from] has to be seasoned and dried properly before use, to allow for natural shrinkage, otherwise it [the ivory] may later crack or warp" (Gouk 1988: 25–26). This may well have happened to the Oxford nocturnal. Similarly, the wood of the index arm is of a somewhat lighter color than the one used for the disks, which may suggest it has been handled frequently, or perhaps at least more often than other components with a darker color—alternatively, it could also mean that two different types of wood were used to fashion the object, but more research is needed to confirm this. Nevertheless, this does not in and of itself prove the object was used in practice.

To address the second question, whether the nocturnal could be used in practice as a time-keeping, altitude-finding, and tide-predicting device: First of all, it is key to note here that the index arm is still rotatable; the second disk (carrying the two pointers) cannot be

turned, but this is more likely due to the natural ‘aging’ of the object or a defect in the internal mechanism (perhaps a rusting rivet).¹³ Furthermore, it appears that all of the components required for the nocturnal to be used as a time-keeping, altitude-finding, and tide-predicting device—that is, the time, calendar and lunar scales; the latitude-correction tables, the central hole (necessary for sighting the Pole Star); the index arm, pointers, and inclusion of a handle—are incorporated into the instrument, thus certainly making it more plausible it could have been used as such. The central hole is noticeably smaller compared to the extant wooden versions, but hands-on engagement with the object confirmed that one can see through it (see also Fig. 16) (presumably enough to sight a bright star).¹⁴

An attentive and critical reader might recall furthermore that the nocturnal does not have any jagged teeth or raised bosses to count the hours in the dark, thus begging the question: how would, or could, a sailor (or any other user) have been able to tell the time at night without them?

Yet, we might counter this by pointing to the fact that the wooden nocturnals also do not have any teeth, and those appear to have been used at sea nevertheless (whether or not this was done successfully is of course a different question).

While there are thus sound reasons to claim that the instrument could have been used as a time-keeping device, other evidence can be marshalled to argue the opposite, the most important of which pertains to the material.

The Ivory — a Luxury Object

While I have not found any other nocturnals made of ivory, the use of this material in the construction of “scientific” instruments is itself not uncommon. Indeed, ivory was used in a wide variety of early modern instruments, ranging from diptych sundials, telescopes, and pillar dials, to rulers, sectors, and pocket globes (see for instance, Fig. 19 & 20), many of which have been preserved and have captured the attention of historians of science (see, for instance, Gouk 1988; Lloyd 1992; Talbot 2008; Raposo 2018).¹⁵ Most interesting for the purposes of this essay is that some of this scholarship has also reflected on the use of ivory as a material for construction—some of the conclusions about which might be helpfully extended to the Oxford nocturnal.

First, in some cases it appears that ivory could offer a practical advantage: For instance, in her work on *The Ivory Sundials of Nuremberg*, Penelope Gouk has highlighted the fact that “with respect to sundials, the white to cream colour makes an excellent background for detecting the fine shadow cast by the gnomons”—begging the question if this characteristic can also account for why the Oxford nocturnal does not have any teeth (Gouk 1988: 26).¹⁶ Could the white of the ivory have aided in sighting the hour marks at night? Practical advantages aside, however, Gouk then draws attention to a more important aspect of the

¹³ The moveability, and lack thereof, of the nocturnals’ various components was confirmed by the Deutsches Museum’s head of metal conservation, Thomas Rebényi. I am grateful for his help in this regard.

¹⁴ For examples of wooden nocturnals with a larger central hole, see the copy with inventory number AST0128 at the National Maritime Museum, Greenwich, London: <https://images.rmg.co.uk/as-set/16264/>; and the nocturnal made of pearwood (inventory number 36488) at the History of Science Museum in Oxford: <https://www.hsm.ox.ac.uk/collections-online#/item/hsm-catalogue-1409>

¹⁵ Ivory instruments can be found in the collections of various museums. In addition to the Deutsches Museum in Munich, see, for instance: The Germanisches Nationalmuseum in Nuremberg; The Adler Planetarium, Chicago; Historisches Museum Bamberg; History of Science Museum, University of Oxford; Kunstgewerbemuseum, Berlin; Science Museum, London; Mathematisch-Physikalischer Salon, (SKD) Dresden; The Whipple Museum, Cambridge.

¹⁶ The suitability of ivory for sundials is also mentioned by Pedro M. Raposo. See Raposo 2018: 189.

material: its cost. Indeed, she argues: “For centuries ivory had been a luxurious commodity which, along with gold and other precious materials, was limited in availability to the devotional and secular needs of church, crown and nobility [...]” (Gouk 1988: 28). Pedro M. Raposo makes a similar point when arguing that “ivory diptychs and the rarer ivory telescopes are especially illustrative of how ivory was valued not only for practical reasons, but also because the use of this material contributed to reinforce certain social meanings and functions embodied in those instruments”—especially noteworthy here is their understanding “as symbols of wealth and power” (Raposo 2018: 194). Indeed, he claims that “Ivory telescopes may be representative of the early optical arrangements of the instrument, but there is little doubt that they were meant to be looked at, more than to be looked through” (Raposo 2018: 193). Similarly, in his study of turned ivory telescopes, Stuart Talbot reasons that “[t]hese exotic and rare Ivory Telescopes were a wealthy nobleman’s way of illustrating astronomical, military, and naval understanding” (Talbot 2008: 7).



Fig. 19 Ivory Quadrant. Sixteenth Century. Inventory number: 56112. Source: Deutsches Museum, Munich. © Konrad Rainer (CC BY-SA 4.0).



Fig. 20 Ivory Diptych Sundial. Jacob Karner, c. 1640, Nuremberg. Source: Deutsches Museum, Munich, Inv.-Nr. 19652. © Konrad Rainer (CC BY-SA 4.0).

The argument that instruments served purposes that went beyond the practical does not just apply to those fashioned of ivory, but has been made about many other “scientific” instruments, including nocturnals. For instance, in his discussion of an early modern brass nocturnal, Karsten Gaulke—noting the impracticality of its short index arm—argues that the instrument should probably be considered “an artful demonstration of astronomical knowledge” (Gaulke 2007: 238).¹⁷ Likewise, the National Maritime Museum, Greenwich has suggested that the silver nocturnal in their collection was probably meant as a showpiece.¹⁸ Indeed, speaking about sixteenth-century instruments, Jim Bennett, in his typically insightful and eloquent way, has pointed out that many purportedly practical instruments

seem to be as much for making an impression as for solving any immediate problem. They do not confine themselves to what is practical but extend far into what is ingenious and what is decorative. [...] They may be elaborate,

¹⁷ “Es ist daher viel wahrscheinlicher, dass es sich bei dem Instrument um eine kunstvolle Demonstration astronomischen Wissens handelt” (the English translation is mine) (Gaulke 2007: 238).

¹⁸ “Silver nocturnals are very uncommon. This was probably made as a show piece [sic].” A showpiece for what or for whom is not clear. See the entry for this object in their online catalog: National Maritime Museum Greenwich, London, inventory number AST0135: https://www.rmg.co.uk/collections/objects/rmgc-object-10297?_gl=1*1qjw5*up%20*MQ%E2%80%A6*ga*MTAyOTAy-MzU5NS4xNzYwNT%7CwMjlx*ga_4MH5VEZTEK*cE3NjA1%20MjAyMjAk-bzEkZzAkdDE3NjA1MjAyMjAkajYwJGwwJGgw*ga_7JJ3J5DBF6*cE3NjA1MjAyMjAk-bzEkZzAkdDE3NjA1MjAyMjAkajYwJGwwJGgw

richly decorated, unnecessarily complex or impossibly delicate for the life of robust action they profess to assist (Bennett 2003: 133).

In light of these arguments about the use or function of instruments, and considering the inclusion of ivory (a luxury material) in the Oxford nocturnal, coupled with its elaborate design, I think it is reasonable to assume that one of the main purposes of this nocturnal too was social rather than practical: an instrument with which a wealthy figure could display his status and knowledge of astronomy and navigation.

The Handle — an Educational Tool

Does that mean that it was not used at all? Not necessarily.

In the previous section I stated that evidence can be marshalled to argue that the nocturnal was not used at sea, some of which pertained to the ivory, which I just discussed. The other regards an element of the nocturnal which—as keen observers will have noticed—has not been discussed yet, and which I argue provides a clue about another possible purpose and use of the instrument: the handle inscribed with numbers and zodiac signs.

To reiterate, there are twelve zodiac signs and twelve numbers carved onto, in between, and below the knuckles (Fig. 21 & 22). Beginning at the top left knuckle, reading from left to right, and from top to bottom, they are:

$\approx$, Υ , Π , ∂ , 31, 31, 31, 31, $\P$, H , $\mathfrak{M}$, $\mathcal{Y}$, $\mathfrak{V}$, $\mathfrak{D}$, 31, 28, 31, 30, 31, 30, $\underline{\mathfrak{A}}$, $\mathfrak{X}$, 30, 30



Fig. 21 Close up of the hand attached to the bottom disk of the nocturnal. Source: Deutsches Museum, Munich. Photography by author.



Fig. 22 Close up of the sleeve bearing the inscription 'OXON'. Source: Deutsches Museum, Munich. Photograph by author.

Some readers may have already recognized that the numbers on the hand and knuckles correspond to the number of days in the months—1x28 (for February), 4x30 (for April,

June, September, and November), and 7x31(for January, March, May, July, August, October, and December).¹⁹ This said, more readers may now also understand the relation between the numbers and the knuckles, but for those who do not: The numbers and zodiac signs may look haphazardly placed, but are in fact positioned in such a way that they correspond to the sequence of months in a year.²⁰ As such, the knuckles form a handy tool to count and remember the number of days in a month, the method for which has been described by the physicist, mathematician, and former professor of natural philosophy and astronomy at University College, London, Dionysius Lardner (1793–1859) in his *Museum of Science and Art* (1855)—for clarity, I have translated Lardner’s explanation into a diagram (Fig. 23):

When we close the hand there are four projecting knuckles of the four fingers, with depressions between them. If we give the knuckles and intermediate depressions the names of the successive months, recommencing from the first knuckle, after having once gone over them, we shall find that the months of thirty-one days are those which fall upon the knuckles. Thus, the knuckle of the first finger is January, that of the second March, that of the third May, and that of the fourth July. Recommencing then, that of the first is August, that of the second October, and that of the third December (Lardner 1855: 152).

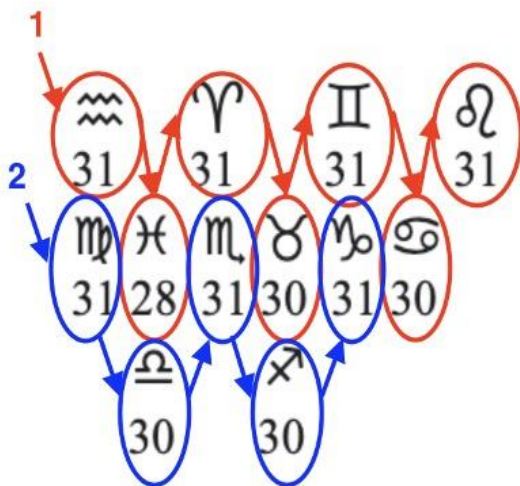


Fig. 23 Visualization of how to count the number of days per month on one’s knuckles, using a transcription of the zodiac signs and numbers on the handle of the nocturnal shown in Fig. 24. Diagram by author.



Fig. 24 Close up of the handle of the nocturnal script ‘OXON’. Source: Deutsches Museum, Munich. Photograph by author.

Lardner adds that the counting on one’s knuckles could be accompanied by a short rhyme:

Thirty days hath November,
 April, June, and September,
 February hath twenty-eight alone,
 And all the rest have thirty-one (Lardner 1855: 152).

¹⁹ This was established during the group analysis of the object.

²⁰ This was established during the group analysis of the object.

These same lines appear in a couple of nineteenth and twentieth century books on the introduction of arithmetic to juveniles and children (Stoddard 1865: 58; Downes & Paling 1918: 367), and a quick Google search furthermore shows that the method of counting on one's knuckles while muttering those same lines (albeit in slightly altered, modernized form) is still used today to teach children the days of the months. I want to pause here for a moment, for as interesting as this may seem, it begs the question how it relates to the nocturnal? To explain what I am getting at here, we have to briefly return to Lardner. The discussion of the knuckles and accompanying rhyme is part of a section in Lardner's work on "Common Things," and more specifically on "Time," regarding which he notes: "The difficulty of recollecting which months have thirty-one and which only thirty days, has been so generally acknowledged, that various technical aids to the memory have been contrived by which they may be at any moment ascertained" (Lardner 1855: 152).

What Lardner helpfully draws our attention to is the use of the hand, and specifically the knuckles, as an aid to memory and learning—a phenomenon which, as the late Claire Richter Sherman has shown, can be traced as far back as Antiquity (Richter Sherman 2001).²¹ Indeed, what the discussions by Richter Sherman and other contributors to *Writing on Hands: Memory and Knowledge in Early Modern Europe* reveal is that the hand was employed as a teaching tool and mnemonic device in a wide variety of fields and for a diverse range of activities: from arithmetic, and calendrical calculation, to singing, and teaching the deaf.

Furthermore, to come back to the business at hand, there is evidence that the hand also played a role in the use of scientific instruments. Better yet, some early modern authors suggested the hand was a scientific instrument. For instance, in his *Instrument-Buch* (1533) Peter Apian suggested how the hand (and specifically the fingers) could be employed for determining the time at night—in other words, it could function as a nocturnal (*Nachtuhr*) (Fig. 25) (Apian 1533). Likewise, the anonymous author of *Astronomia Teutsch* (1545) included an illustration of the hand as a sundial (Fig. 26) (Anonymous 1578). Finally, relating to the practice of navigation and the training of mariners, Margaret E. Schotte, in her *Sailing School. Navigating Science and Skill, 1550–1800*, has argued that early modern sailors sometimes used a method of counting on their fingers and knuckles along with the muttering of rhymes to calculate numbers pertinent to the tides and preparing a vessel for its approach to port (Schotte 2019: 35–37). Although it is not clear and more research is needed to determine if early modern sailors also used their knuckles and rhymes to count and memorize the days in the months, or if they ever incorporated those mnemonics in scientific instruments, thereby linking their methods more directly to the hand(le) of the nocturnal; the use of the hand in a navigational and educational setting is nevertheless instructive.

What it boils down to is that while individually the instances I have just discussed are removed in time from the Oxford nocturnal (probably made in 1745), and may therefore have no direct bearing on it, collectively, and when read alongside each other, they are evidence of how the hand has been used and understood throughout history as a tool for learning, counting, and memorization. Grounded in that context, I argue, the hand(le) on the nocturnal can be considered a—quite possibly unique—material expression of that same long-standing and still-persisting phenomenon. Seen in that light and coupled with the use of the luxury material ivory, it is reasonable to assume that the nocturnal served as an educational tool for the wealthy, and additional evidence pertaining to the production and sale of instruments in eighteenth-century England helps strengthen this hypothesis.

²¹ I am grateful to Margaret E. Schotte and Suzanne Karr Schmidt for bringing this book to my attention.

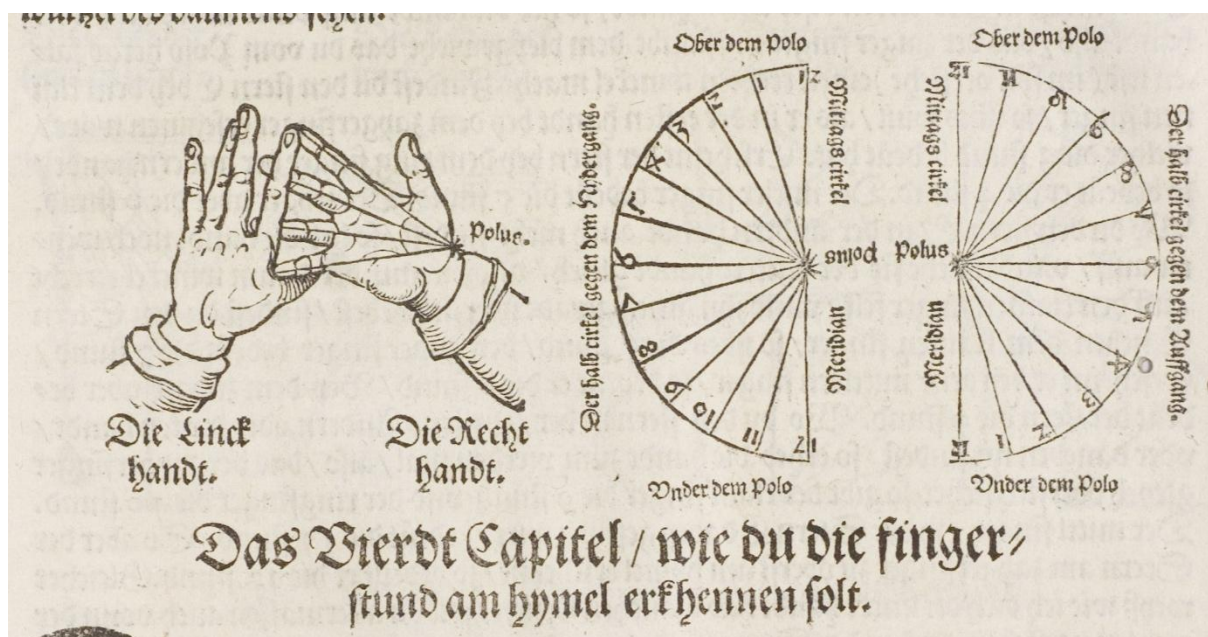


Fig. 25. Detail from a page in Peter Apian's (1533) *Instrument-Buch*, p. 93, showing how to use the hand, or rather fingers, to determine the time at night. Source: Sächsische Landesbibliothek – Staats- und Universitätsbibliothek (SLUB) (Creative Commons, Public Domain Mark 1.0). PURL: <http://digital.slub-dresden.de/id288355148>



Fig. 26 Detail from a page in *Astronomia Teutsch: Himmels Lauff, Wirckung unnd Natürliche Influenz der Planeten unnd Gestirn Auß grundt der Astronomie nach jeder Zeit, Jar, Tag unnd Stunden Constellation* (1578), fol. 38v, depicting the hand as a sundial. Source: Universitätsbibliothek, Heidelberg (Creative Commons, Public Domain Mark 1.0). DOI: <https://doi.org/10.11588/diglit.35715>

While nocturnals can be found in many museum collections, and are referenced in early modern writings, they also appear in a different source: the tradecards of seventeenth- and eighteenth-century English (and especially London) instrumentmakers. “Tradecards,” as M. A. Crawford explains,

were portable advertisements, usually printed on sheets of paper, which were handed to a prospective customer or included with goods purchased [...] They were a means of advertising products or services and thereby attracting customers to the owner’s shop. They often included a variety of details about the proprietor and his business, and illustrated his wares (Crawford 1985: 453).

While some instrumentmakers promoted a more specialized expertise, Alexi Baker has argued that “it became increasingly common as the 18th century progressed for instrument makers and diversified retailers in Britain and its colonies to sell a wide range of instruments rather than specialize in one category” (Baker 2012: 16). Two cases in point are the illustrated tradecards of the London instrumentmakers Thomas Tuttell (c.1674–1702) and Edmund Culpeper (1660–1738), which show the variety of instruments they sold: from globes, armillary spheres, and compasses to rules, surveilling instruments, and, nocturnals.²²

Tradecards sometimes also included information on what kind of materials instrumentmakers worked with, and it is these advertisements that I want to highlight here. For instance, another one of Thomas Tuttell’s tradecards not only shows a nocturnal (in the middle of the far left pane), but also includes a written advertisement, stating that he offered “Globes, Spheres, Mathematical Books and Instruments for Sea & Land: with many other curiosities in Gold, Silver, Steel, Brass, *Ivory*, & Wood.”²³

Similarly, after having announced “several sort of new contrived microscopes,” an advertisement of Edmund Culpeper also promoted the fact that at the shop of this “Mathematical Instrument-Maker, at the Cross-Daggers in Moor-Fields,” “all Gentlemen and others, that are Mathematically inclin’d, may be furnished with all kinds of Instruments in Silver, *Ivory*, Brass and Wood, useful in those Studies.”²⁴

Putting text and image together, what such advertisements suggest is that instrumentmakers like Culpeper and Tuttell could have made ivory nocturnals. Whether or not they actually did is unclear, and it is important to keep in mind, as Baker and Crawford have stressed, that the claims made on these advertisements were not always realistic, sometimes exaggerated, and still others entirely invented (Baker 2012: 17–22; Crawford 1985: 459–462). In other words, conclusions drawn from them “must be of a tentative nature” (Crawford 1985: 459). Nevertheless, the fact of the matter is, we have evidence—in the form of an actual object—that ivory nocturnals were made. This considering, what these tradecards thus do, at the very least and if anything, is offer a possible context within which the Oxford nocturnal may have been made: consumer culture. Moreover, to come back to the point of this section, these tradecards sometimes list their target customers. For example, Edmund Culpeper’s tradecard promoted his shop “at the Cross-Daggers in

²² For Thomas Tuttell’s tradecard, see the Science Museum Group Collection, Obj. Nr.: 1934-123. <https://collection.sciencemuseumgroup.org.uk/objects/co65709/thomas-tuttell>. The nocturnal is depicted in the upper-right corner of the print; For Edmund Culpeper’s tradecard, see the Science Museum Group Collection, Obj. Nr.: 1934-115. <https://collection.sciencemuseumgroup.org.uk/objects/co65701/edmund-culpeper>. The nocturnal is depicted in the mid-bottom pane.

²³ My emphasis. See the Science Museum Group Collection, Obj. Nr.: 1934-113. <https://collection.sciencemuseumgroup.org.uk/objects/co65699/thomas-tuttell>. The nocturnal is in the mid-left pane.

²⁴ My emphasis. See the Science Museum Group Collection, Obj. Nr.: 1934-121/32 <https://collection.sciencemuseumgroup.org.uk/objects/co8002182/edmund-culpeper>.

Moor-Fields,” as a place where “all Gentlemen and others, that are Mathematically inclin'd, may be furnished with all kinds of Instruments in Silver, Ivory, Brass and Wood, useful in those Studies.”²⁵ Alexi Baker has situated the types of instruments advertised by individuals like Culpeper in early modern English consumer culture: “The retail sale and export of instruments as stylish luxuries gathered momentum with the general growth of consumer culture in early modern London and other large British cities. By the 1700s, browsing the contents of shops had become a popular pastime for genteel individuals” (Baker 2017: 7).

As for the purposes of these instruments, Crawford has claimed that “a great many instruments were sold, not for scientific research [as they sometimes claimed] but for home education,” and that “when it came to the all-important task of earning a steady income, it must surely have been professional users of instruments and the well-to-do public wishing for [such] home education who provided the main markets” for instrumentmakers and retailers (Crawford 1985: 472; 479). From this I would surmise that the ivory nocturnal from Oxford may well have been made for and used by a gentlemanly figure, “mathematically inclin'd” and member of a “well-to-do public,” as a tool for home-education.

The tradecards just discussed helpfully tap into one other issue that still needs to be addressed. Namely, the fact that the nocturnal was not made in London, but in Oxford. In the last section I will therefore reflect on the object's provenance and, by extension, its maker.

Maker and Provenance

The question of attribution or authorship is perhaps the most complicated matter to navigate regarding this object. First, the nocturnal was not signed, and bears no master mark that could tell us more about the craftsperson who made it.²⁶ We know from the inscription “Oxon” (from the Latin *Oxonia*) on the handle of the nocturnal, that it was manufactured in Oxford, though this is not necessarily helpful, for as Gloria Clifton has pointed out: “London was the principal centre of scientific-instrument making in the British Isles and, until the second half of the eighteenth century, there was only a handful of practitioners in the provinces” (Clifton & Turner 1995: xi). Indeed, David Bryden has equally argued that, at least “in the 17th century, there is limited evidence of instrument making in Edinburgh, Dublin, Bristol and Oxford. The provincial nature of this activity is emphasized by the fact that where the antecedents of the first practitioners are known, they were London-trained craftsmen” (Bryden, 1984: 4).²⁷

Nevertheless, a good starting point to search for Oxford makers is the SIMON research project, developed by, among others, Gerard L'Estrange Turner, Michael Crawford, and Gloria Clifton. SIMON, short for “Scientific Instrument Makers, Observations and Notes,” is a database of all makers and retailers of scientific instruments working in the British Isles between the mid-sixteenth and the mid-nineteenth century (or more specifically between 1550–1851) (Clifton & Turner 1995: xii). A list of over five thousand British makers and retailers was published by Clifton in *Directory of British scientific instrument makers 1550–1851* in 1995. This overview has formed the basis for and has been updated into a digital database—not yet publicized—which now also includes makers and retailers working after

²⁵ See the Science Museum Group Collection, Obj. Nr.: 1934-121/32 <https://collection.sciencemuseumgroup.org.uk/objects/co8002182/edmund-culpeper>.

²⁶ Except in citations and cases where a maker's identity has been established, I am employing the terms ‘craftsperson’ and ‘craftspeople’, instead of ‘craftsman’ and ‘craftsmen’ to allow for the possibility of female makers.

²⁷ Bryden mentions Robert Davenport in Edinburgh and John Prujean in Oxford as examples for these London-trained craftsmen from the provinces.

1851. I am very grateful to Rebekah Higgitt from the National Museums Scotland for consulting this unpublished SIMON database for me and generously providing me with a list of currently-known Oxford makers and retailers (see Tab. 1 below)²⁸:

Although we now know which makers and retailers—at least to our knowledge—were working in Oxford between approximately 1630 and 1898, the list shown in Tab. 1 unfortunately does not provide any new leads or many clues on the possible maker of the nocturnal. First of all, using the estimated date of manufacture—1740–1750, probably 1745—proposed by the Deutsches museum as our guide, there are only three possible candidates out of a total of twenty-nine Oxford makers (marked in blue in Tab. 1) that were alive and working during that time: John Hawting (s. 1745–d. 1791); a maker and seller with the last name Fletcher (w. 1744) ; and Thomas (I) Williams (a. 1750–1800).

The first candidate, John Hawting, appears to have started his apprenticeship in 1745, making it unlikely that he would have already been able to fashion an object as complex as the ivory nocturnal, and I have not found any information on him except that which is already cited in Clifton. The second potential maker, with the last name Fletcher, was working during 1744, but here too there is no additional information on him, or on the last potential candidate Thomas (I) Williams (a. 1750–1800).

Legend For Table 1

Dates: I supplied these dates from the SIMON database with the codes and information from Clifton's 1995 *Directory*:

a. = assessed date based on a surviving instrument or publication

d. (by) = died by

d. c. = died circa

fl. = flourishing

s. = service, date when apprenticeship began

w. = working

Trade & [Guild]: Supplied with the information from Clifton.

IM = Instrument Maker

M = Maker

S = Seller

Notes: I added a note when a maker from the SIMON database list was not included in Clifton's *Directory*.

Blue marked names: potential candidates, if we follow the museum's estimated production date (1740–1750, probably 1745) as a guide.

SIMON ID	Last Name	First Name	Date 1	Date 2	Address	Trade & [Guild]	Notes
1337	ADAMS	Thomas (I)	1630 w.	1664 d.	Oxford	Smith, Locksmith Clock M	
8873	ALIETTI	C	1820	1835	Oxford	Watch M.	not in Clifton
126	BROOKES	Christopher	1639 w.	1651 w.	Oxford	[Grocers]	
4750	CAMPONOV	Angelo	1846 fl.	1846	Oxford	Baro M	

²⁸ There are currently two databases containing the SIMON dataset, an Access database on the servers at Royal Museums Greenwich, created by Gloria Clifton, and a Django database created by the AHRC-funded Tools of Knowledge project. Rebekah Higgitt has kindly consulted the latter on my behalf.

6401	CAVIGIOLI	L.	1850	1850	London, Oxford	Optician, Baro M, Thermo M Clock M, Artificial	not in Clifton
3485	COOKEOW	Thomas	1715 w.	1727 d.	Oxford	Math IM	
810	ELLIS	John	1756 w.	1757 w.	Oxford	Baro M	
1531	FLETCHER		1744 w.	1744	Oxford	Instrument S	
4401	HAWTING	John	1745 s.	1791 d.	Oxford	Clock M, Watch M, Whitesmith	
5101	HOBDELL	Henry Bashard	1832 fl.	1844 d. c.	Oxford	Clock M, Watch M, Silversmith	
8442	HOWELL	Thomas	1880	1898 d. by	Oxford	Optician	not in Clifton
210	KNIBB	John	1673 w.	1722. d.	Oxford	Clock M [Joiners]	
4406	LOCK		1800	1850	Oxford		not in Clifton
7266	MARSHALL	Thomas R.	1852	1852	Oxford	Clock M, Watch M, Goldsmith Optician	
459	MASTALLIO & TOIA	A. & ?	1800 a.	1800	Oxford		
1113	ORTELLI	A. (I)	1843 w.	1845	Oxford	Clock M, Watch M	
5668	ORTELLI & PRIMAVESI	A.& D.	1846 w.	1849	London, Oxford	Optician, Jeweller, Watch M, Clock M, Baro M, Thermo M, Looking- Glass M, Cutler	
1283	PANTIN	Nicholas	1651 s.	1663 w.	London, Oxford	[Clock- makers]	
4394	PEARSON	Richard (II)	1794 w.	1823 w.	Oxford	Clock M, Watch M	
7560	PFAFF		1820	1850	Oxford		not in Clifton
198	PRUJEAN	John	1664 w.	1706	1664	Math IM [Clock- makers]	
5484	SALMONI	Mark	1830 w.	1830	Oxford	Baro S, Thermo S	

7787	SAUNDERS	E.	1800	1850	Oxford		not in Clifton
7806	SCOTT		1800	1850	Oxford		not in Clifton
4396	SOWTER	John	1818 w.	1853 w.	London, Oxford	Clock M, Watch M, Silversmith Jeweller	
465	STONE	Nicolas	1622	1622	London, Oxford		not in Clifton
8049	TORRI	A.	1800	1850	Oxford		not in Clifton
3553	TRAFFORD	John	1783 w.	1783	Oxford	Math IM, Grocer	
539	WILLIAMS	Thomas (I)	1750 a.	1800 a.	Oxford		

Tab. 1 Table with list of Oxford makers and retailers from the SIMON database, organized alphabetically per last name, generously provided by Rebekah Higgitt, and supplied with information from Clifton's *Directory of British scientific instrument makers 1550–1851* (London, [Greenwich]: Zwemmer; National Maritime Museum, 1995). Blue marked names (Fletcher, Hawting, John; and Williams, Thomas (I)) are potential candidates if we follow the museum's estimated production date (1740–1750, probably 1745) as a guide.

There is of course the possibility that the dating is off and the nocturnal was manufactured before or after 1740–1750, which could bring new candidates from Tab. 1 into focus; without more clarity on what the specific periodization of the nocturnal is based on, I do not think we should rule this out. However, even if that were the case: to date, there is no information in Clifton or the digital SIMON database that could offer a helpful lead. This is not a criticism; there simply is not enough information on Oxford makers—perhaps especially because it was not a center for the making of scientific instruments or ivory products. Moreover, I deem it unlikely that the nocturnal predates the eighteenth-century. First, because it seems that ivory, along with the expertise to work with it, only became more readily available in England by the late seventeenth or early eighteenth century (Gouk 1988: 32–35), begging the question how and where an Oxford craftsman would have been able to obtain the raw material and skills needed to make the nocturnal before then. Second, and this is more of a hunch, rather than a claim based on conclusive evidence, the typography of the inscription “Both Bears” does not strike me as pre-eighteenth century.²⁹ Another, perhaps more likely, possibility is that the nocturnal was fashioned by someone whose activities have simply not been recorded or preserved, either in the form of a signed object or in written records. In other words, it would seem that the search for the identity of the maker has led (at least for the time being) to a dead end.

There are nevertheless a couple of things worth taking into account when continuing our search for a possible maker. First, we might want to consider a potential division of labor, meaning that more than one craftsman may have been involved in the construction of the nocturnal, which would complicate the issue of ‘authorship’ and the search for its maker. The second thing to keep in mind is the question of where an Oxford craftsman

²⁹ I have conferred with Joost Depuydt, curator of typography & printing house heritage at Museum Plantin-Moretus in Antwerp, to see if a comparison of letterforms could help with the dating, but he indicated that it would be very difficult to relate the letterforms inscribed in the ivory to the typography in printed sources (Personal communication with Joost Depuydt, Spring 2025).

may have learned the skills to work with ivory, since, as previously mentioned, the two main centers for the production of ivory objects in early modern Europe were Nuremberg and Dieppe (Gouk 1988: esp. 28–35). Regarding the latter, historians have shown that “following the Revocation of the Edict of Nantes in 1685, when Protestant worship was forbidden in France, Dieppe craftsmen fled with other Huguenots to England and introduced their trades in London,” and according to Penelope Gouk, “by the early eighteenth century London was developing as an important centre for instrument making and ivory carving” (Gouk 1988: 32).³⁰ In his study of the Oxford instrument maker John Prujean (c.1630–1706)—equally listed in Tab. 1—David Bryden has furthermore shown that it was not uncommon for London-trained craftspeople to settle in Oxford (Bryden 1993: 263–264), a point that is suggestive of how the expertise for ivory carving may have traveled to the provinces. It is therefore not unreasonable to hypothesize that the maker of the nocturnal too may have been trained in London, and then later set up shop in Oxford. Searching for an Oxford maker (or makers) with connections to the capital might therefore be an interesting thread to follow.

We should take heed, however, not to focus too heavily on a craftsperson expert in ivory production. For, as the previously discussed tradecards and Crawford’s discussion of them help remind us: while “[t]he specialized skills of the early instrument makers often involved working in one particular material [...] about a century later [that is, the eighteenth century], trade cards show that makers’ skills could encompass all the major materials used for instruments” (Crawford 1985: 467) In other words, whoever made the nocturnal may well have been proficient in working with more than just ivory. It might therefore be fruitful, perhaps even behoves us, to set a wider material parameter when exploring the question of authorship. Before concluding this essay, I want to make a start with casting such an expanded material net by putting the ivory nocturnal in conversation with one made of silver. The instrument in question, already briefly mentioned in the introduction to this essay, is currently kept at the National Maritime Museum Greenwich (inv. nr. AST0135).³¹ Similar to the one in Munich, its maker is unknown and it is not dated either but the National Maritime Museum has estimated it was probably fashioned in the seventeenth or eighteenth century. As previously mentioned, and noted by the museum, the silver nocturnal resembles those made of boxwood in terms of its general design (note, for instance, the heart-shaped cut out in the handles of both the silver and boxwood nocturnals) and “scientific” components (that is, the time, calendar and lunar scales, and the latitude-correction tables).

Although the silver nocturnal approximates the one in Munich in that both are more decorative than their wooden counterparts, between the two, their decoration is nevertheless different—the silver nocturnal is devoid of maritime scenes or sea-like creatures; similarly, the Oxford nocturnal does not bear any scrollwork (as can be found on the handle and pointer of the silver nocturnal). There is, however, one other feature, found on both the ivory and silver nocturnal, that could point to a common hand: the zodiac signs. Astrological sigils are frequent components of scientific instruments, including those fashioned of ivory (see, for instance, Fig. 19), and, as such, their inclusion on the two nocturnals

³⁰ For a discussion of Dieppe craftsmen in London, see Murdoch 1984. See also Baker 2017, p. 10, who points out that the “[t]he French represented the single largest and most influential immigrant group in the instrument trade of early eighteenth-century London.”

³¹ For the silver nocturnal see, National Maritime Museum Greenwich, London, inventory number AST0135:

https://www.rmg.co.uk/collections/objects/rmgc-object-10297?_gl=1*1qjwth5*_up%20*MQ%E2%80%A6*_ga*MTAyOTAy-MzU5NS4xNzYwNT%7CwMjlx*_ga_4MH5VEZTEK*czE3NjA1%20MjAyMjAk-bzEkZzAkDDE3NjA1MjAyMjAkajYwJGwwJGgw*_ga_7JJ3J5DBF6*czE3NjA1MjAyMjAk-bzEkZzAkDDE3NjA1MjAyMjAkajYwJGwwJGgw

is not remarkable. What is noteworthy, however, is the particular form of two of these zodiac signs: specifically, the symbol for Gemini (♊); and that for Libra (♎). Zodiac signs appear to have been standardized throughout Europe since at least the thirteenth century, typically taking on the same shape: Gemini (♊) was generally represented by two parallel vertical lines positioned between two horizontal ones; Libra (♎), representing a scale, was depicted by an equal sign with a curve or dome.³² Looking at the symbols for these astrological signs on the ivory nocturnal, they appear to divert from their typical form, with the glyph for Libra missing its usual small dome (Fig. 27), and the one for Gemini shaped like a warped square (Fig. 28).



Fig. 27 Detail of Fig. 9, showing the symbol for Libra on the ivory nocturnal, lacking its usual dome. Source: Deutsches Museum, Munich, Inv.-Nr. 20941 © Konrad Rainer (CC BY-SA 4.0).



Fig. 28 Detail of Fig. 9, showing the symbol for Gemini on the ivory nocturnal, looking like a warped square. Source: Deutsches Museum, Munich, Inv.-Nr. 20941. © Konrad Rainer CC BY-SA 4.0).

While they are still recognizable as Gemini and Libra, and may just be small variations of standardized forms, such deviations become interesting in light of Gerard L'Estrange Turner's work regarding the "Attribution of Unsigned Instruments." In this appendix to his *Elizabethan Instrument Makers. The Origins of the London Trade in Precision Instrument Making* (2000), Turner stresses the importance of examining the "engraving style, the decoration, and other distinguishing craft features" to aid with postulating "a maker or date for unsigned, undated instruments" (Turner 2000: 285).³³ Most important for the purposes of this section is Turner's point that much like a person's handwriting, "[p]lanetary and Zodiac sigils [along with letter and number forms engraved or punched into instruments] can also be highly personal" (Turner 2000: 287; 293).

Taking cue from this insight, Turner's point prompts us to ask if the deviation in form of the Gemini and Libra symbol on the ivory nocturnal can be read as idiosyncratic expressions of a particular craftsman? Interestingly, to date, I have only found one other instrument with zodiac signs where the symbols for Gemini and Libra take on the same form as that

³² I am grateful to the following scholars for their helpful comments and insights regarding the standardization and appearance of zodiac signs in the early modern period—any mistakes or misunderstandings in the interpretation of these symbols are mine: David Juste, Stephen Johnston, Darrel Rutkin, Barbara Bienias, Karl Galle, and Thony Christie.

³³ Many thanks to Stephen Johnston for recommending this book.

on the ivory copy: the silver nocturnal at the National Maritime Museum Greenwich.³⁴ Indeed, on this instrument too, the symbol for Gemini looks more like a warped square, and the glyph for Libra comes without a dome—thus raising the question if this overlap in form could point to a common hand? It would be premature at this point to assume that it does, and more careful analyses and further research needs to be done before we can (reliably) attribute these instruments to the same craftsperson. Nevertheless, the similarity is noteworthy and in the absence of any other leads that could shed light on the nocturnal's maker, the resemblance between the two might be well worth teasing out.

Conclusion: A More Befitting Box?

In this essay, I have focused on an ivory nocturnal from Oxford currently in the collection of navigation and time-keeping instruments of the Deutsches Museum for Science and Technology in Munich. Aside from its provenance in Oxford, and an estimated date of manufacture, not much is known about this unusual nocturnal and it has raised a variety of questions, including: What it is, what it was used for and by whom; who made it and why?; and how can we account for its use of ivory, elaborate design and unexpected origin in Oxford?—complex matters that I have tried to navigate and answer through a material culture approach coupled with evidence from textual and visual sources.

Despite the incorporation of all components necessary for a nocturnal to function as a time-keeping, altitude-finding, and tide-predicting device, I have nevertheless argued that it is unlikely it was made with that purpose in mind or has been used as such. Instead, based on its inclusion of ivory, elaborate design, and inscribed handle, I have proposed it probably served as an educational tool for a wealthy and mathematically-inclined member of eighteenth-century English consumer culture.

While I was able to suggest answers to some of these questions, the mystery surrounding its possible maker remains, and additional research is needed to help provide more insights into who may have fashioned the nocturnal. First, it might be productive to do a more extensive search through museum collections for additional examples of ivory nocturnals, or other objects of this material that were fashioned in Oxford or England. A more thoroughgoing and systematic comparative analysis between the zodiac signs on the ivory nocturnal and those on other instruments might furthermore allow us to identify possible patterns and establish connections between them, which could offer new leads to a potential maker. Finally, it could be fruitful to further (and more-systematically) mine early modern sources and objects for traces of other eighteenth-century or earlier references (either textual, visual or material) to the use of one's knuckles and the muttering of rhymes to count the number of days in the months (especially in a navigational setting), which may help to contextualize the nocturnal and confirm the manufacture date, or pinpoint a different one.

As a bookend, and to return to the container with which I opened this essay: Whether the Oxford nocturnal better befits the historical boxes which I have suggested here than the one in which it currently resides remains to be seen. Indeed, perhaps only time will tell.

³⁴ For the silver nocturnal see, National Maritime Museum Greenwich, London, inventory number AST0135: https://www.rmg.co.uk/collections/objects/rmgc-object-10297?_gl=1*1qjwth5*_up*MQ...*_ga*MTAyOTAyMzU5NS4xNzYwNTJwMjIx*_ga_4MH5VEZTEK*cze3NjA1MjAyMjAk-bzEkZzAkdDE3NjA1MjAyMjAkajYwJGwwJGgw*_ga_7JJ3J5DBF6*cze3NjA1MjAyMjAk-bzEkZzAkdDE3NjA1MjAyMjAkajYwJGwwJGgw

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