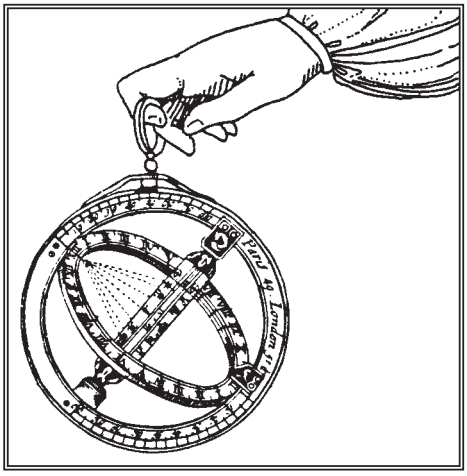

TESSERACT

Early Scientific Instruments

Special Issue:
Marking Time -- A Diversity of Sundials
Catalogue One Hundred Four
Winter, 2016/2017 $10

CATALOGUE ONE HUNDRED FOUR

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— David Coffeen, Ph.D.
— Yola Coffeen, Ph.D.

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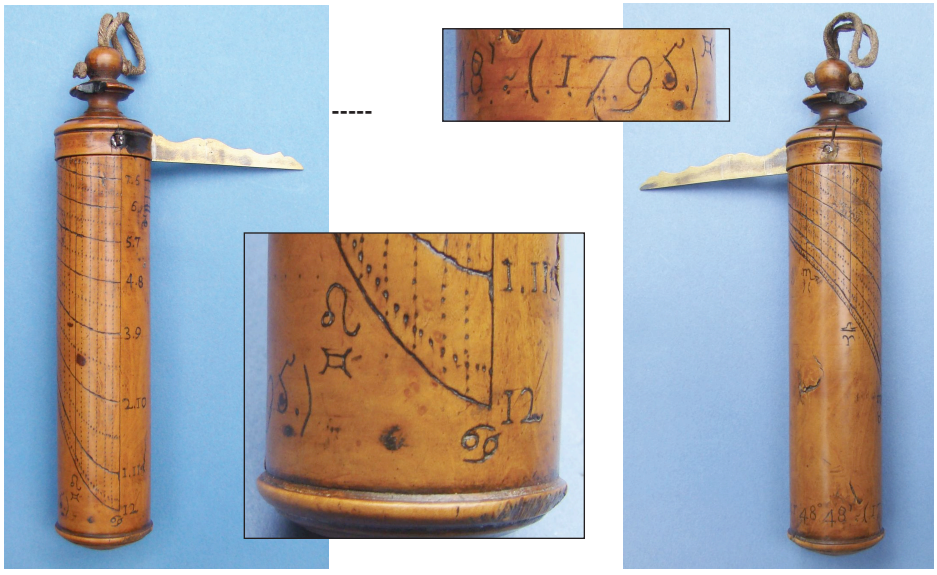
We continue to be amazed by the variety of sundials developed over the centuries. All use momentary shadows falling on pre-determined scales to tell the time, whether in ancient Egypt, or in medieval monasteries or mosques to know the time for prayers, or in the 17th century to reset your unreliable watch or clock. Sundials can be categorized in various ways, but a basic division is between "altitude" dials which measure the angular height of the sun, and "direction" dials which measure the angular azimuth or equinoctial position of the sun.

*** * * * * SOLAR ALTITUDE DIALS * * * * ***

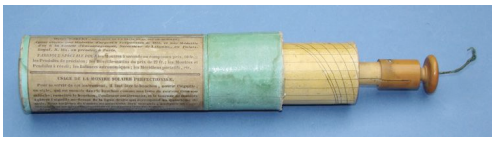
Altitude dials, even when portable, normally have no magnetic compass; the time is shown by the sun's height when the dial is oriented toward the sun, and the shadow of the tip of the gnomon, or the pinhole, falls on the appropriate date (i.e. solar declination or Zodiacal position) scale. Examples include pillar dials, cylindrical ring dials, vertical disk dials, Regiomontanus dials, etc. The very earliest sundials were all altitude dials. Here we offer a diversity of forms.

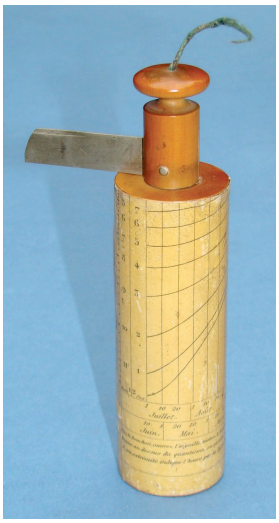


1. BEAUTIFUL FRUITWOOD PILLAR DIAL, French, 1795, signed "Pour 48°48'(1795)." Standing 6" (15 cm) tall, the dial has a shaped brass gnomon which folds to stow within the hollow wood cylinder. The body of the dial is hand engraved with curved hour lines every half hour from 4 am until 8 pm, crossed by vertical date lines marked with Zodiacal signs (representing the sun's position in the Zodiac) with subdivisions every five days. The wood has a wonderful patina and feeling of age and craftsmanship; the maker was probably a scholar rather than a professional instrument maker. Condition is fine noting a few age chips and small stains.

The vertical pillar dial is constructed for a single latitude, but requires no compass in use. Knowing only the date, you so align the gnomon, then suspend the dial turned so the sun casts the gnomon shadow vertically, and read the time along the graduated hour lines. This particular latitude falls just south of Paris, through, for example, Versailles.

A fine survival from a troubled period in France. $5950.

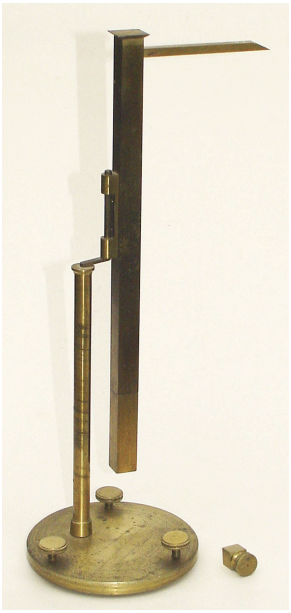


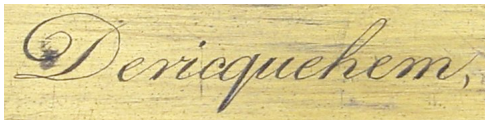


2. HENRI ROBERT'S PILLAR DIAL, French, mid-19th century, signed on the case "Henry Robert, Horloger de la Reine et du Duc de Nemours," hand numbered "48" on the case bottom (for the latitude). Standing 5" (13 cm) tall, the dial is made of a boxwood cylinder covered in varnished printed paper, with removable gnomon support with pivoting knife-edge gnomon and string suspension knob. The dial surface is printed with hour lines as a function of date. Condition is fine complete with much of the original card case, printed with instructions. The maker is well known as a distinguished clockmaker of Paris, once a pupil of Breguet. In use extend the knife edge horizontally, rotate it to the current date, suspend the ensemble vertically and rotate it until lined up with the sun. The gnomon shadow will be vertical, the very end of the shadow falling on the current time. The curves are laid out for a fixed latitude (here 48°) and we note a similar one produced by Robert for 49° (**Tesseract** Catalogue 59 item 16). An excellent example of his "montre solaire perfectionée." $1150.

3. FINE CYLINDRICAL RING DIAL, probably German, 1698 (and so dated). This substantial brass dial is 2.5" (6.4 cm) in diameter, mounted with a suspension ring and pierced with two oculus holes (for winter and for summer months). The inner surface is divided and punched with angled hour lines to be read along date bands labeled by the Zodiacal date. The outer surface has waviform and punched cross decoration, and as an *aide-mémoire* shows the calender dates when the sun first enters each of the twelve Zodiacal houses (e.g., for Aries "20 M"). Condition is excellent.

This form of ring dial is much more substantial than the common sheet brass ones, and by design requires no movement of the pinhole on a sliding band. Rather one suspends the dial vertically and, using the appropriate oculus, rotates it until the sunspot falls on the current date band, and reads the time on the hour lines. We have encountered a few similar dials, dated variously but all within a few years of 1700 (e.g., lot 3063 in the 1975 Greppin sale, and item 35 in *Astronomy Gnomonics,* 1968). $5500.





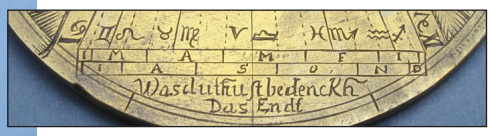
4. DERICQUEHEM'S "REGULATEUR UNIVERSEL" — A UNIVERSAL ALTITUDE SUNDIAL, French, second quarter 19th century, beautifully engraved on the base and along the upright "Dericquehem, rue du Colombier-Jacob, No. 18, à Paris." Constructed of clear lacquered brass, the "universal regulator" stands 12-1/2" (32 cm) tall, with its circular three-screw leveling base, cylindrical rear pillar, offset bracket, and swiveling square-cross-section column with horizontal 80 mm long gnomon hinged for portability. The vertical column is divided every millimeter from 0 (at the exact level of the gnomon tip) to 200, and then on to 250 mm when the auxiliary extension block is inserted in place of a square plug. This plug is intended to be removed, inverted, and suspended by a string from holes atop the column, to act as a plumb bob for accurate leveling of the device. Condition is very fine, the brass retaining much of its original lacquer, all complete but for a tiny knob atop the gnomon.

The use of this quite mysterious instrument is made clear in a book written by Dericquehem *Régulateur universel, instrument portatif et de nouvelle invention pour connaître l'heure vraie au soleil à tous les instants du jour et sur tous les points du globe*. We have located only a very few copies of this work, and note editions of 1824, 1828, and 1856. In it he instructs the user to level the instrument, allowing the plumb line to just graze the column edge, to extend the gnomon (checking if necessary that it is truly perpendicular to the column with an iron set square!), to swivel the column until the gnomon points toward the sun (i.e., toward the sun's azimuth), and to read (in centimeters, millimeters, and tenths) the length of the gnomon's vertical shadow falling on the column. The apparent (i.e., "true") solar time is then found by consulting the extensive tables in Direcquehem's book, where shadow length on the instrument is tabulated versus latitude (from 35° - 52°) and date throughout the year. Further tables give series numbers, corresponding to latitudes, for numerous towns in France and cities worldwide. The "regulator" was marketed as a device for accurately setting and correcting clocks and watches, and for determining terrestrial latitudes and longitudes.

The maker is known for an 1810 commercial guidebook giving tables of currency conversion, and for an 1815 investment guide "Guide des Spéculateurs à la Bourse." He also promoted improvements in railway systems. His Paris address no longer strictly exists; on 14 July 1836, rue du Colombier and rue Jacob were combined, henceforth named "rue Jacob." $5500.

5. UNUSUAL UNIVERSAL DISK DIAL, probably German, 17th century, with a tiny worn signature on the very edge "Zanu...." ?? The all brass dial is 2-3/4" (6.8 cm) in diameter, and rotates within a suspension arm over a full range of 0±90 latitude adjustment. Horizontal hour and half-hour lines ("Ante- and Post-Meridiem") are crossed by a swath of curved Gregorian date lines labeled by month and by Zodiacal house. A hinged gnomon pointer erects horizontally. The dial plate is hand-engraved with a list of 19 cities and their latitudes in degrees and minutes (half of them in Germany), floral scroll supporters, and a motto "Was du thust bedenckh Das Endt" (What you are doing, look to the end). Condition is fine, the rivets probably old replacements, the pin gnomon motion tight. The dial stows in a fitted round case.

This is a rare example of vertical disk dial usable anywhere. After setting it to your latitude, just extend the pin gnomon, suspend the dial vertically and toward the sun, and read the time where the shadow hits the current date line. $10,800.



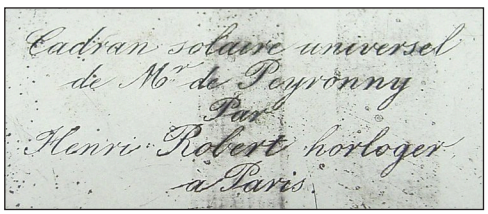
6. PEYRONNY'S UNIVERSAL SUNDIAL, French, mid-19th c. The silvered brass dial is 4" (10 cm) in diameter, beautifully engraved in script "Cadran solaire universel de Mr. de Peyronny Par Henri Robert horloger à Paris" and further stamped by the maker. The outer ring is engraved with a degree scale for all N/S latitudes. This ring has a triple-pivoted suspension with milled head on top, beautifully designed and crafted of brass with tiny blued steel screws, ensuring the dial can be held perfectly vertical while being easily turned. An inner disk can be freely rotated to set its central arrow against the latitude scale. The disk is engraved with a grid of solar declination lines crossed by arcs of 6am-6pm hour lines, one section labeled "matin" the other "soir." A very short central steel pin stows to the reverse, and can be pushed forward to serve as gnomon for light at grazing incidence. In use the disk is set to the user's latitude, the dial is suspended so that sunlight just grazes the surface, casting a long shadow of the central pin across the grid of lines. The spot where this shadow crosses the correct solar declination line (for the user's date) gives the apparent solar time read along the hour scale. The correct time

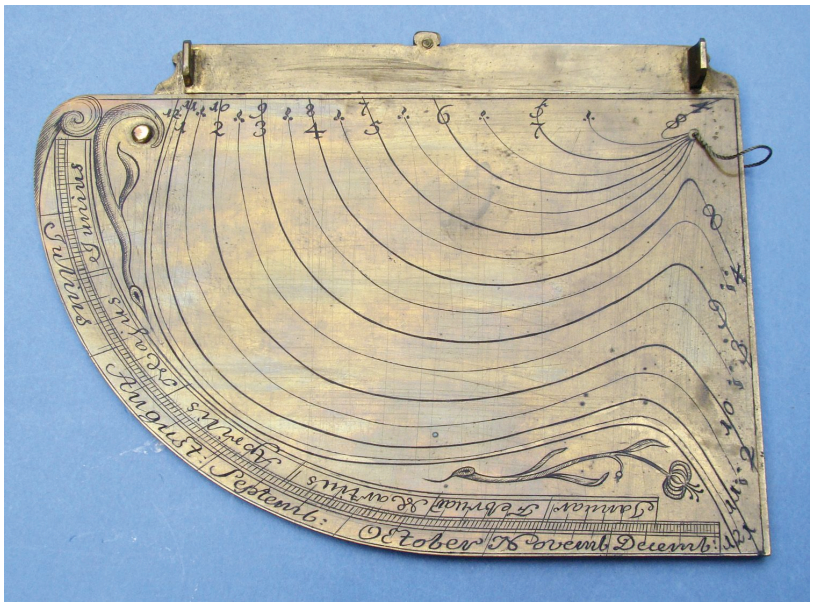
is found anywhere on the earth, knowing only the date and latitude. This is an evolved form of the universal ring dial. It is exquisitely crafted, like a watch, with tiny screws and very fine engraving, and is in excellent condition retaining most of its silvering.

The maker was Henri Robert (1794 - 1874), distinguished inventor and clockmaker of Paris, once pupil of Breguet. The inventor was Mr. de Peyronny; he is recorded as a "capitaine du genie" (captain of engineering) in Cherbourg, and was a distinguished graduate of the Ecole polytechnique. He announced his invention of the "universal and perpetual" sundial in 1854 in the periodical *le Cosmos,* and proposed its construction in card, or for greater precision, in brass.

The present example is complete with its original fitted wood case covered in red Morocco leather and lined in red velvet and red silk. But most important, the case bears the remains of three paper labels which give the remarkable provenance. The large shaped label is printed twice with the name "Charles N. Bancker" and signed in ink "Cardan Solaire Universel" and with the names of maker and inventor. Other labels are printed "267" and "12." We thus have one element of the extraordinary Bancker collection, formed in the 19th century by this Philadelphia businessman, and described by the Abbé Moigno as follows: "this collection of optical instruments is certainly the most numerous and most brilliant that exists in the world. It embraces in itself more riches than all our cabinets of France, and perhaps of Europe, united." Unfortunately it was dispersed in a three-day auction of 787 lots, in 1871. Copies of the catalogue have survived, and indeed as lot 267 we find listed, misspelled as on the case label, "Cardan's Solaire Universal Dial." The collection has been discussed in a paper by A.D.C. Simpson (in *Journal of the History of Collections,* 1995).

We know only one other example of Peyronny's invention (**Tesseract** Catalogue 5 item 26). It is slightly larger (5-1/4" d.) and has a calendar scale connected to the lines of solar declination, eliminating the need for a table of date / declination. Quite remarkably, that sundial also belonged to Bancker, listed as item 271 in the auction. It seems clear that Bancker ordered examples of the finest scientific instruments of the age, some so rare that no other may have survived. $9500.





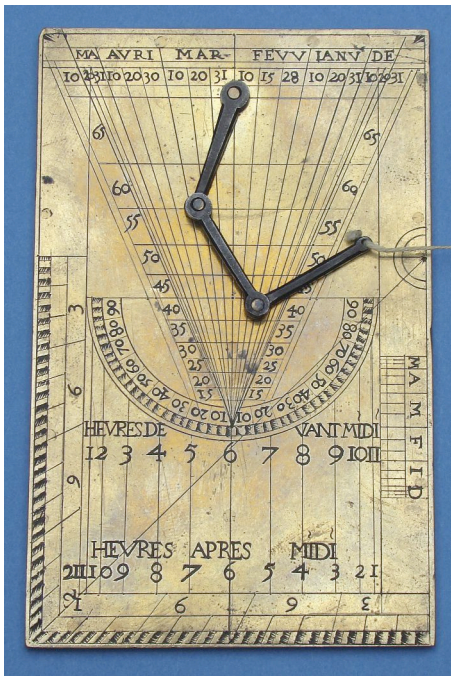
7. ELEGANT VERTICAL PLATE DIAL, possibly German, 18th century. The 5-1/4" x 4" (13 x 10 cm) dial is finely engraved on the plate's front, plain on the back but mounted with a sighting arm which extends to 55° above the edge of the plate. The border is finely engraved with a full Gregorian calendar scale in Latin divided every day, the interior with wonderfully arcuate hour and half-hour lines from 4 am to 8 pm. Graceful floral designs follow the curves. It is pierced at the apex for plumb/bead line. Condition is excellent, complete with the shaped case of heavy card covered in marbled paper.

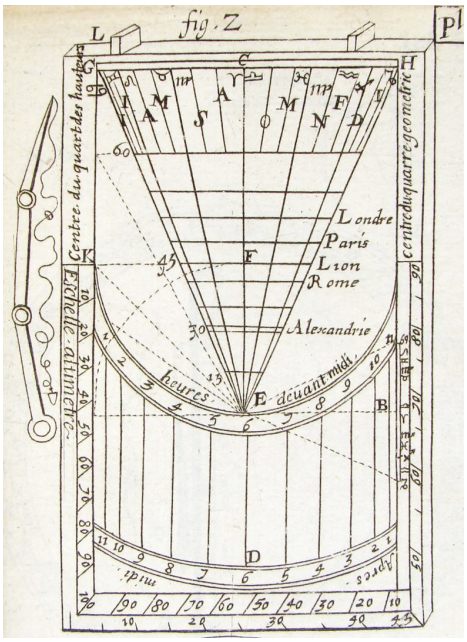
This is a very rare form of vertical dial, somewhat like that shown in Plate 31 of the first edition (1760) of Bedos de Celles' *La Gnomonique Pratique*. It is a form of horary quadrant, and three pages of text are devoted to its construction and use. We have located three examples of the Bedos form, a beautiful French brass one in the NMM (p. 247-9 of their sundial catalogue), and two Italian ivory ones at Oxford. But ours differs in the powerfully recurved hour lines, placement of the sighting arm and plumb suspension, etc., and seems unique. $12,000.

8. EXCEPTIONAL GILT-BRASS VERTICAL DISK DIAL, VARIABLE IN LATITUDE, German/Polish, 1670, signed "IOHANN WOTKE IN BRESLAW 1670." Very finely crafted with all details in relief, it is 2-1/4" (6 cm) wide. When the dial is suspended vertically, sunlight passing through a pinhole falls on a non-circular hour scale divided every 15 minutes and labeled every hour 4 am - 8 pm. To adjust for the changing solar declination, the pinhole is on a rotating arm settable against the scale of dates (divided every five days and labeled with the first six months, and Zodiacal signs, of the year on the face, the second six on the reverse). A fine sunface rotates with this arm, its four pointers indicting the lengths of day and night, and times of sun rise and set, throughout the year. Finally an ingenious twin-swivel suspension mounting allows use throughout most of Europe, from 39° to 66° North latitude. Setting the lower swivel's index arm against the degree scale simultaneously shifts the upper swivel's position, changing the balance of the dial thus tilting it to correct for the change in latitude.

Condition is very fine throughout with light wear to the gilding.

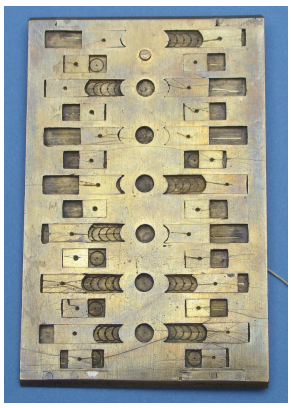
The fine craftsman eludes us. The non-circular hour scale, giving greater precision, is discussed by Cowham (*A Study of Altitude Dials,* 2008, pp. 18-19). Another dial of this form is #83 in the published exhibition *Portable Sundials Selected from Hungarian Collections,* 1995. And an almost identical one is in the British Museum. Van Gent has searched worldwide to find about 20 related dials, a couple with the perpetual calender, a couple with the twin swivel for latitude adjustment. $13,500.





(Dom Pierre de Sainte Marie Magdeleine, 1691)

9. REGIOMONTANUS DIAL, French, c. 1700, the 2-3/8" x 3-3/4" (6 x 9.5 cm) brass plate mounted with a three-segment brachiolus of blackened brass, supporting a plumb line with lead weight. The plate is engraved with a triangular grid of latitudes (15°-65°, every 5°) and dates (1 December to 31 May, divisions each one third of a month), parallel hour lines am and pm ("Heures devant Midi" from midnight to noon, and "Heures après Midi" from noon to midnight, graduated every hour), and a shadow square with hachured scale (0-12 twice, divisions every one-fifth unit). The reverse bears a complex, mysterious system of brass sliders, with 14 small square ones each slidable to reveal single circles, alternating with 14 long curved-end ones slidable to reveal from 0 to 5 circles. Is this mysterious panel designed for mathematics, or for counting, or for a game? Quality is very high and condition very fine. Sight vanes are lacking, as is a little bead to slide on the plumb line.



In use you set the string suspension point to the date and latitude, pull the plumb line to the correct date on the edge scale and slide the bead to this position, then let the plumb hang free while aligning the top edge with the sun. At this moment, the time is shown by the position of the bead within the hour lines. You can also readily read the times of sunrise and sunset for any date and place (see Cowham, *A Study of Altitude Dials,* 2008, pp. 31-32).

Here we have a fine example of the universal altitude dial invented by Regiomontanus (1436-1476). Such vertical dials are discussed by Archinard (*Les Cadrans Solaires Rectilignes,* 1988). $9500.

[132.] (No. 1408. des offic. Catalogs.)

H. SCHMEISSER'S
patentirte **hemisphärische Sonnenuhr,**
verfertigt und ausgestellt durch
A. MEISSNER,
Mechanikus in BERLIN, Friedrichsstrasse No. 71.

Die **hemisphärische Sonnenuhr** besteht aus einer halben Hohlkugel und stellt ein Bild des Himmelsgewölbes dar, auf dem der tägliche Lauf der Sonne das ganze Jahr hindurch zur deutlichen Anschauung kommt. Ein über den Rand gespanntes Fadenkreuz, dessen Kreuzpunkt das Centrum der Kugelfläche bildet, wirft im Sonnenscheine einen Schatten auf dieselbe und der **Kreuzpunkt** dieses Schattens verfolgt genau denselben Weg im Innern der Hohlkugel, den die Sonne am Himmel zurücklegt, und zwar an jedem Tage des Jahres einen ganz bestimmten Bogen, der ihm durch die darin befindliche Zeichnung vorgeschrieben ist, er giebt dabei die Tageszeit bis auf Minuten genau an. — Ein kleines von dem Kreuzpunkte der Fäden herabhängendes Pendel dient zur richtigen Aufstellung für den

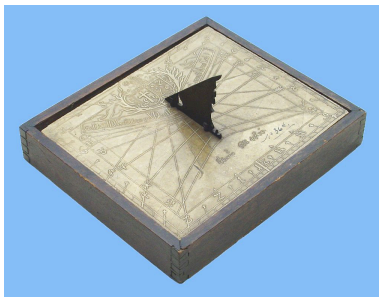
10. PRECISION SCAPHE DIAL, German, c. 1860's, signed "H. Schmeisser, Patent, 1861, A. Meissner, Berlin." A 5-1/4" (13 cm) diameter hemispherical copper bowl is set within a 6" tall ceramic pedestal stand patterned like marble and set with three leveling screws. Orthogonal wires cross the top of the bowl, with plumb bob hung from the center. The interior of the bowl is fully and very finely engraved with hour circles (4 am - 8 pm, divided every five minutes), these crossed by date circles (every few days from January to June and back). A circular calendar gives the equation of time correction every five days, and a degree scale permits tilting the dial for use at various latitudes (divided every half-degree from 30 to 63). Condition is fine with some darkening of the copper, and old repaired breaks in the base plate.

In use this scaphe is tilted to the correct latitude, then rotated until the crossed-wire shadow falls on the current date line. The time is then read directly. $4800.

* * * * * SOLAR DIRECTION DIALS * * * * *

Direction dials use the azimuth of the sun, or its equinoctial position, to find the local apparent solar time. Some are fixed to pedestals, permanently mounted N-S. Portable ones normally include a magnetic compass for easily setting it pointing toward geographic (i.e., astronomical) north. The compass needle will point toward magnetic north, so it is necessary to correct for the difference, which varies over time and from place to place. In Western Europe this "magnetic declination" varied from roughly 10° East in 1600, to 10° West in 1700, to a maximum of 25° West in London in 1800, and now back toward 0° in modern times. Examples of direction dials include your standard fixed garden dial, "Butterfield" and equinoctial dials, universal ring dials, magnetic azimuth dials, globe dials, etc.

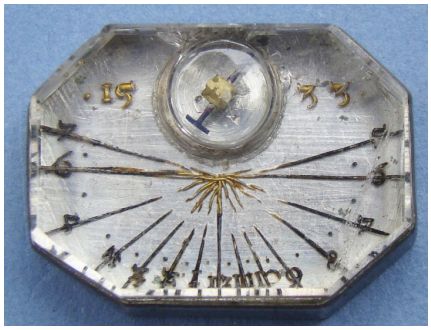
*** * DIRECTION DIALS: Horizontal (fixed latitude) * ***



11. SOLNHOFER STONE SUNDIAL WITH DATE HIDDEN IN A CHRONOGRAM, German, 1723, bearing arms labeled "GA ZN," the latitude (47°33'), and a Latin motto which conceals the date (1723). The 6-3/4" x 8" (17 x 20 cm) block of very finely grained Solnhofer stone is acid-etched with a fine projection of chapter ring (divided every quarter hour from 4 am to 8 pm) and Zodiacal calendar. It is set with a shaped brass gnomon with oculus for the calendar scale, and is mounted in a dovetailed softwood frame. Condition is very fine throughout, noting an old scratch and some quite small edge chips.

Solnhofer stone, found in southern Germany, is particularly suited for fine etching, and often served as lithographer's stone. The specific latitude agrees with almost the southern tip of Germany (e.g., Lindau, Bregenz), and parts of Austria. The date is revealed by adding all of the capitalized letters (taken as Roman numerals) in the motto, a technique used by Renaissance scholars in a period of classical revivalism.

A very fine example, deserving of further research into the elaborate heraldic arms with its bishop's(?) miter. $4950.



12. MINIATURE ROCK CRYSTAL AND SILVER DIAL, probably German, 1533 (and so dated). An eight-sided plate of cut quartz crystal is set into the fitted silver base, the whole 1" x 3/4" x 1/4" (26 x 19 x 8 mm). The underside of the quartz is engraved and enamel-filled (black and gold) with hour numerals and lines from 5 am to 7 pm, dots every half hour, symbolic sun's rays, and the year. Numeral shapes are consistent with an early German origin. A hollowed-out cavity contains a tiny pivoted compass needle. Condition is excellent, complete with a later fitted wood case.

This most unusual horizontal dial has no apparent shadow-casting gnomon, until one notices a small depression cut into the upper surface of the crystal, just above the center where the hour lines converge. In sunlight this simple depression casts a very clearly defined spot shadow on the lower surface (of chapter ring over silver). So we seem to have here a sort of "optical dial;" aligned N-S, the shadow traverses the crystal and gives the apparent solar time immediately. We have seen no similar dial, but it reminds us of the "optical" water-filled chalices, where the shadow position is governed by refraction of the light through the liquid. $9500.

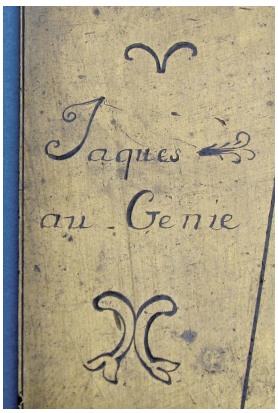
13. IMPORTANT PEWTER DIAL, French, 1792, signed by the maker "Pellie...à Paris." Measuring 9-3/8" (24 cm) overall, it has a central circular horizontal dial of cast pewter fitted with a triangular iron gnomon, and mounted via eight lugs with an external cast pewter band. The dial has a fine sunface, within rays of light (the symbol of the "Sun King" Louis XIV), a chapter ring divided every five minutes from 4 am to 8 pm, an "Equation Du Soleil" giving the correction every 10 days (noting "Xbre" for "Décembre"), and the inscription "Nec Pluribus Impar" ("Not unequal to many," the motto of Louis XIV), and "48D 50M, Fabrique de Paris." There are four mounting holes in the lugs, and the outer band bears the eight principal directions and a 0(1)360 degree scale shifted 10° westward. The North point is indicated by the fasces, the South by a Phrygian cap. There are wonderful Revolutionary inscriptions: "La Nation, La Loy, La Liberté, L'Egalité, Fraternité A nos Concitoyens," and finally the presentation "Dédié et Présenté A La Convention Nationale L'an Premier De La République Française, 1792." The reverse of the dial bears the apparent maker's name, Pellier (a clockmaker in Paris), and a 32-point rose retaining, curiously, a *fleur-de-lys* north point, as well as indication of a magnetic meridian 22.°5W, quite right for late 18th c. Paris. Condition is fine, noting a few paint spots and scratches.

This dial records a moment in the remarkably turbulent period of the French Revolution. 1789 saw the storming of the Bastille prison and the birth of the Assemblée Nationale. The French Kingdom (the constitutional monarchy of Louis XVI) was established September 1791, and the First Republic was founded at the National Convention 22 September 1792. The Reign of Terror would begin one year later.

A couple of related dials are known, notably a central dial only, apparently in copper (NMM catalogue pp. 81-2), a full pewter one, quite similar but two years earlier, mentioning "Le Roy" and presented to "Nos Seigneurs de l'Assemblée Nationale en Mars 2ème Année de la Liberté Française," and finally a twin to ours in Munich (*Zeit von den Gestirnen,* 1978, item 51). A fascinating dial of historical importance.

$11,500.

A FORERUNNER OF JULIEN LE ROY'S PRECISION SUNDIAL?




14. FINE NOON DIAL, French, c. second quarter 18th c., signed "Jacques Le Maire au Génie à Paris." The 3-3/4" x 6-1/2" (9.5 x 16.5 cm) horizontal brass plate is mounted with a vertical panel fitted with a precision oculus 1-7/8" (4.7 cm) above. The plate is engraved with radiating lines every quarter hour from 11 am to 1 pm, and with the twelve signs of the Zodiac placed at the approximate distances to the spot of sunlight (as the elevation of the noontime sun varies with season). The plate is pierced with three mounting holes, two of them elongated for adjusting the dial exactly North-South. Condition is fine, the brass darkening and a bit spotted.

European noon dials seem quite rare, but we have had Japanese ones (**Tesseract** Catalogue 92 item 17, and also 99/14).

Jacques Lemaire worked c. 1714-1762. Member of the Société des Arts, he constructed some of Julien le Roy's innovative sundials. We note his precision dial enabling determination of true geographic north (**Tesseract** Cat. 87 item 11). $4500.

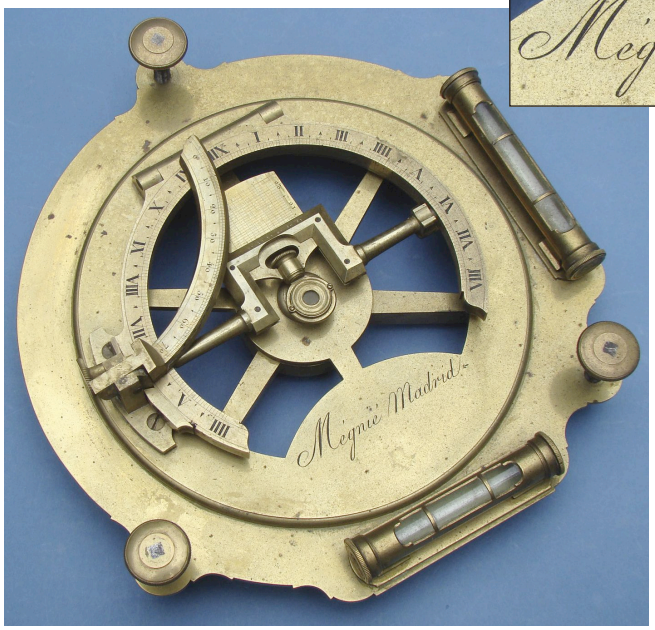
15. EARLY GILT-BRASS OVAL DIAL, French, mid-17th c., the dial measuring 2-1/8" (5.4 cm) long with inset glazed and silvered compass, unusual chapter ring divided each hour in Roman numerals (around the oval) and in Arabic numerals (around three sides of a rectangle), and finely shaped hinged and spring-loaded support for the string gnomon engraved "48" for the latitude (approximately that of Blois, for example!) A lovely rose is hand engraved at the center. Condition is very fine throughout. It is a rare and quite early form, interesting for offering the user a choice of numeral systems. It can be compared with the earliest silver oval "Butterfield" type dials (see **Tesseract** Catalogue 46 Item 15 and 58/20), which have central roses but only single (Roman numeral) chapter rings, and hinged metal gnomons rather than the string gnomon support. $5500.

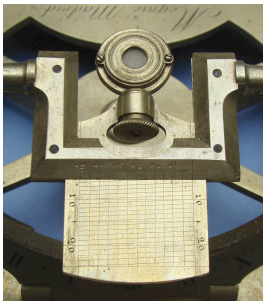
*** * DIRECTION DIALS: Equinoctial (variable latitude) * ***

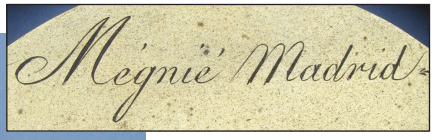
16. EXQUISITE EDMUND CULPEPER INCLINING DIAL IN SILVER, English, c. 1700, signed in block letters "Culpeper Fecit," and bearing two different forms of certification punch marks. Constructed as a 2-3/8" (6 cm) wide horizontal dial with folding 60° gnomon, the dial plate is hinged and can be raised against the 0°-60° latitude arc. As it is raised, the gnomon edge (which must be set parallel to the earth's axis) tilts lower and lower, until it is horizontal for use at the equator. There is an inset glazed compass with fine 32-point rose engraved on the silver, the rose plate actuated underneath to rotate against an outer ±30° scale of magnetic declination. The instrument is designed with aesthetic balance, with its elegantly shaped gnomon supporters and gnomon edge, and with unadorned surfaces contrasting with the exquisite floral engraving on the gnomon, etc. Condition is excellent, complete with the shaped wood case bound in black fishskin, and carrying a printed table of "Latitudes of Places" (by Culpeper?, although its errors differ from errors on our **Tesseract** Catalogue 46 item 14).

The dial bears several tiny "J" shaped tax punches, as used for silver from 1814-1953 indicating transit through Holland. And a tiny swan-shaped *poinçon* punch is a French control mark (1893-1970) applied when sold at auction.

Edmund Culpeper advertised "Mathematical Instruments *of all* forts in Gold, *Silver Brafs Ivory* & *Wood*." (see **Tesseract** Cat. 22 item 20). But most customers must have opted for brass. Silver Culpeper instruments are so rare we know only a group of drafting tools (**Tesseract** 88 / 27) and the present elegant inclining dial. $12,000.







17. GRAND UNIVERSAL EQUINOCTIAL DIAL WITH PRECISION *OCULUS,* Spanish by a French maker, c. 1790, beautifully signed "Mégnié, Madrid." This all brass horizontal sundial has main plate measuring 7-3/4" x 8-1/4" (19.5 x 21 cm) overall, set with three leveling screws, crossed spirit levels, and freely rotatable central circular dial plate. The latter is set with a large hinged chapter ring engraved with scales in both Roman and Arabic numerals, divided every five minutes from 4 am to 8 pm. This equinoctial ring is inclined against a hinged latitude arc divided every half-degree 0° to 70°. The hour ring has a crossbar carrying the gnomon, which swivels flat for stowage, upwards for summer when the sun is above the celestial equator, and downwards for winter. But rather than the typical needle gnomon, we have an oculus with a tiny lens, swiveling and adjustable vertically for solar declination from 0° to 23-1/2°, with readout by a grid of transversals to five arcminutes. Condition is fine throughout.

In practice one levels the instrument, sets the oculus for the exact solar declination (published in date tables, commonly available at the time), and then *rotates* the dial plate until the little spot of sun falls exactly on the hour circle, and reads the time at that spot. By elevating the oculus to the solar position, and forcing the sunspot to fall on the circle, one has automatically aligned the instrument with geographic north *without recourse to a magnetic compass*.

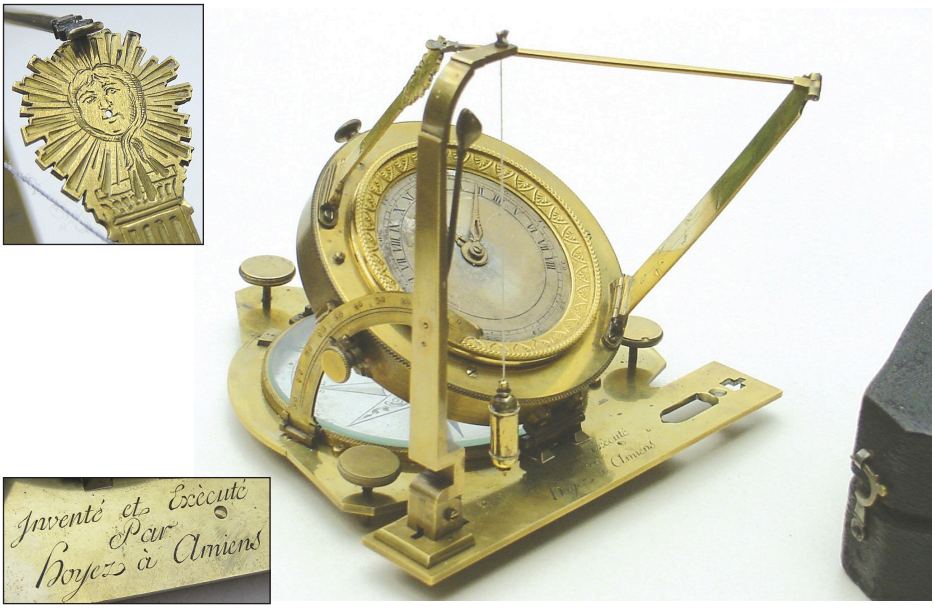
This innovative sundial is well described (in nine pages) and illustrated in the 2nd (1774) edition of Bedos de Celles' *La Gnomonique Pratique*. The author describes the practicalities of construction in great detail, and characterizes the instrument as a "newly invented sundial"; we note it was not present in his 1760 first edition (see item 31 below). We are aware of only a few examples of this sophisticated dial, most rather smaller (for example the Time Museum one, sold in 2004, is described as 5-1/4" in diameter).

The maker was Pierre Mégnié, a fine craftsman engaged by Lavoisier, Cassini, etc. He left Paris for Madrid in 1786 (under a fiscal cloud), returning seven years later.

A fine example of a rare dial. $11,000.

18. EXCEPTIONAL EQUATORIAL RING DIAL WITH ADJUSTABLE UNIVERSAL TIME BAND, Northern Italian or German, c. late 17th century, made of brass 3" (75 mm) in diameter, with traces of gilding. The elegantly shaped suspension engages circular slots on either side of the dial, and adjusts for North latitude (0° - 90°, divided every degree). The bridge, with its sliding pinhole sight and seashell shaped "button," is decoratively engraved and divided by Zodiacal house and by date (Gregorian calendar). The inner ring swivels out (on finely engraved pivots) into the plane of the equator, and is divided with a full twice-12 hour scale. *In addition*, an inner sliding band, divided every 1/2 hour from 0 to 24 hours, can be set at any correspondence with the chapter ring, providing direct readout of time in another equal hour system (e.g., Italian or Babylonian hours), in another city, or correction for the equation of time to give mean rather than apparent solar time, etc. We have seen this clever adjustable time band on only three or four dials, including one by Nicolaus Blondeau (see **Tesseract** Catalogue 12 item 24). We have never, however, seen it treated in the literature!

All free surfaces of the dial are engraved with 21 cities (named in Latin) and their latitudes, including Monachium (Munich), Taurinum (Turin), and Argentoratum (Strasbourg). Ten countries are represented, all in Europe, but Italy, especially northern Italy, has by far the largest representation. The decorative style is typical of late 17th / early 18th century German examples. We suggest this dial is either German for the Italian market, or North Italian in origin. It is a most elegant, technically interesting dial in fine condition throughout. $8500.



19. SPECTACULAR MECHANICAL MINUTE-DIAL SUNDIAL FROM AMIENS, French, c. late 18th c., signed "Inventé et Exècuté Par Hoyez à Amiens." This marvelous clock-face dial is of brass, the baseplate 5-1/8" x 4-3/4" (13 x 12 cm) and mounted with leveling screws, plumb fixture, glazed compass, and equinoctial mechanical dial. The plumb support is hinged, locking vertically and horizontally with spring support and carries the original turned brass bob and clever spring mechanisms for suspending and stowing the bob. The compass has a silvered rose divided every degree and numbered every 10°, with eight directional pointers beautifully engraved. There is a settable indicator of magnetic deviation, a tapered needle with red stone pivot, and a concealed needle lifter. A hinged latitude arc is divided 0° - 90° every degree, and supports the unlatched hinged dial assembly. The latter has twin hinged sight vanes, one of gilt brass shaped and engraved with a sunface in a blaze of glory atop a Doric column, the sunface pierced with a tiny pinhole, the other vane engraved with a Zodiacal calendar. The vanes are supported by a strut, and the assembly rotates atop a gearbox, driving the two hands around the silvered dial face, with its divisions every minute from 4am to 8pm. The dial is surrounded by a decorative gilt ring embellished with festoons or gadroons. Condition is excellent, complete with the original shaped wood case covered with black fishskin and lined with green velvet and gold banding.

In use the dial is leveled, oriented to true north, and inclined to the observer's latitude. The sight assembly is rotated until the spot of sunlight through the pinhole falls on the opposite calendar scale, showing the present position of the sun in the Zodiac. The hour and minute hands show the time.

Such mechanical dials were expensive at the time, and are rarely seen today. We note a somewhat different execution of the same principle by Gaspard of Lunéville, in northeast France, also in the 18th c. (see **Tesseract** Catalogue 55, item 18). Hoyez was clearly a superb craftsman, listed in Tardy's dictionary of French horologists with dates 1768 - 1806. Marcelin lists him for the present dial, and also for an inscription "gravé par Hoyez à Cambray," Cambrai being less than 100 kilometers from the northern cathedral city of Amiens. $22,500.

*** * DIRECTION DIALS: Magnetic Azimuth * ***

20. HENRY SUTTON'S FORM OF MAGNETIC AZIMUTH DIALLING COMPASS, English, c. third quarter 17th century, unsigned. Set in an eight-sided wood mount, 4-3/4" (12 cm) across, the compass has a fine printed card, a most elegantly shaped needle, and a circumferential wooden degree circle. The card has degree scales, twice-12 hour scales, calendar scale, solar declination scale, and 32-point rose. Condition is good noting a couple of age cracks and the wood housing cut on one side (where it may have attached to a plane table).

A similar dial face is shown on Henry Sutton's 1654 trade card (see Derek Price in Singer et al., 1957), along with instructions to direct the south side of the compass card toward the sun, and read the time where the north end of the compass needle (in summer; south end in winter) crosses the hour lines along the proper parallel of solar declination (as read from the central circular table). A very rare dialling compass.

The Museum of the History of Science in Oxford holds a boxwood diptych sundial mounted with a similar compass card, and owns a variant slightly earlier unmounted card signed "Henry Sutton Londini fecit *1653.*" The card design has been discussed in detail by Jim Bennett (*Sphaera* issue 10). $4800.

21. MAGNETIC AZIMUTH SUNDIAL, French, late 19th century, signed "J. Decoudun." The 1-1/8" (3 cm) diameter glazed case is made of plated brass and mounted with pendant ring. It contains a fixed brass arc with compass directionals, and a floating compass card printed with hours from 6 am to 6 pm and set with stone pivot. Condition is very fine noting some darkening to the silvered arc.

In use one aligns the case with the sun, and reads the time from the calibrations on the floating card. The maker is recorded by Marcelin for a sundial -- probably this one -- in a 1986 Paris auction. But Decoudun is known for his 1888 extinction exposure meter, and for a new form of pneumatic hydrometer. He also advertised -- from his 8 rue de Saint-Quentin, Paris, address -- the availability of a safe oil-burning bed reading lamp. This is the only example of his magnetic sundial we have seen. $495.

22. EARLY MAGNETIC AZIMUTH COMPASS DIAL, German, c. late 17th c., the 2-1/4" (5.6 cm) diameter gilt brass case with cover finely engraved inside (translating from the German) "A means the first 15 days in each month; B the last 15 days in each month." It goes on to explain that when sunlight passes through the slit, the magnetic needle will point to the hour. The base contains a fine compass needle under very early (probably original) glass, and has an edge slit (recut twice, perhaps to correct for changing magnetic declination), and a stack of six reversible chapter rings (six labeled "A" and six "B," each finely engraved with two "symmetrical" month names and with a full scale of daylight hours). Condition is very fine noting wear to the gilding.

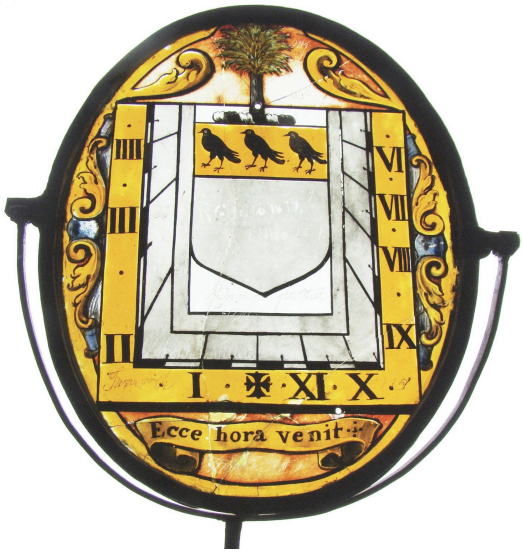
This simple but elegant sundial finds the time by measuring the azimuthal direction to the sun through the course of the day. The compass needle establishes the north direction, the slit is aligned with the sun direction, and the needle points to the time on the hour scale. The sun's apparent motion in azimuth varies with the seasons, with the solar declination, so it is necessary to select the correct chapter ring for the current date.

Extremely rare, noting an almost identical example in the Przypkowski Sundial Museum in Jedrzejow, Poland. (ex: Greppin collection, 1975, lot 3034; Time Museum). $12,000.

*** * DIRECTION DIALS: Miscellaneous * ***

23. MINIATURE SCAPHE DIAL IN A NETSUKE, Japanese, c. mid-19th century. This lovely little 1-7/8" (4.8 cm) diameter pancake-shaped netsuke is made of finely-grained wood, bearing a reddish-brown lacquered scene of a child riding on the back of an ox. It is pierced through the center, and constructed in halves, the base with inset compass (with 12 directionals) and tiny 7/16" (11 mm) diameter scaphe with pin gnomon and five black on gold numbered hour lines. In excellent condition, this is a rare example of a *kagami buta* type netsuke. This flattened disk form often conceals a mirror (from which derives its name) but here keeps handy for the wearer, a time-keeper and direction-finder.
(ex: John Read collection). $1150.

24. STAINED GLASS WINDOW DIAL, probably European, c. second half 17th century. The oval glass is leaded to an 8-1/2" x 11" (22 x 28 cm) iron frame, supported on a modern stand. The very bubbly glass is painted to the interior in shades of orange, red, blue, green, grey, and black, and pierced with two small mounting holes for a gnomon. The chapter ring has 12 noon downward, but with asymmetric spacing of am and pm hours, thus designed for a declining (non South-facing) window. The central coat of arms has three ravens surmounted by a tree, and below in a banner is the motto "Ecce hora venit" (Behold, the hour is coming). The sides have symbolic floral decor, and various owners(?) have scratched names and dates (1751, 1793, 1879) especially in the blank central area. Condition is fair, with various repaired breaks to the glass.



This is a very rare survival, one of only some dozens of stained glass dials recorded. They had been especially popular in Germany and in Britain (for which see the article *Shedding a Glorious Light* by C. St. J.H. Daniel, 1987). The present dial is quite similar in format to one dated 1664, surviving in a great hall in Staffordshire. $9500.

25. REMARKABLE TERRESTRIAL GLOBE SUNDIAL FOR ALL SEASONS, probably German, 17th/18th century. The globe is an 11-5/8" (30 cm) diameter hollowed-out wooden sphere, bearing much-effaced terrestrial cartography painted in manuscript on a greyish/white ground. Various words are still legible (e.g., "Tropicus Cancri, Mare del Nort, Mare Canandense, Linea Horizontalis, Primus Meridiani, Iaponia), and areas that appear soiled are actually worn outlines of Africa, Europe, etc. Seemingly superimposed on this are circles of the horizon, equator, meridian, and ecliptic, the latter three divided every degree in alternating red and black or white squares. The equator is numbered every 10° of longitude, but also labeled (every 15°) with a chapter ring of twice-12 hours throughout the day.

The globe is mounted by wood thread to a lovely turned oak base, fixed at a latitude of 52° (consistent with N. Germany, e.g. Magdeburg, or even central Poland, e.g. Poznan), and standing 17" (43 cm) tall. A rotating shaped brass "meridian" ring is supported by a polar axis which runs through an ingenious wooden spindle with surface plugs on each end. The ring is divided every degree from equator to the the poles, again with the early style of alternating hachured squares. The ring broadens out in the central ±23.5°, i.e., between the Tropics, where it is engraved with Zodiacal houses the sun follows through the seasons. Condition is reasonably good, the globe with several long

stable age cracks, and the surface quite worn.

This is a form of globe dial, which would be set N/S in sunlight, and the ring rotated until its shadow on the globe surface disappeared under the ring. The time could be read immediately on the equatorial scale.

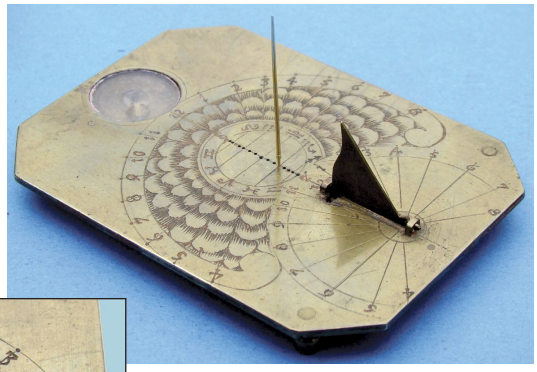
A small ivory globe dial, again with rotating shadow vane, is found in the Elskamp collection (Henri Michel, 1966, item 34), and a massive stone example is in Switzerland (see *Cadrans solaires neuchâtelois,* 1986). A good description of globe dials, with and without shadow vanes, is found in *Mathefis Juvenilis: Or a Course of Mathematicks for Young Students,* 1708, pp. 407-411.)

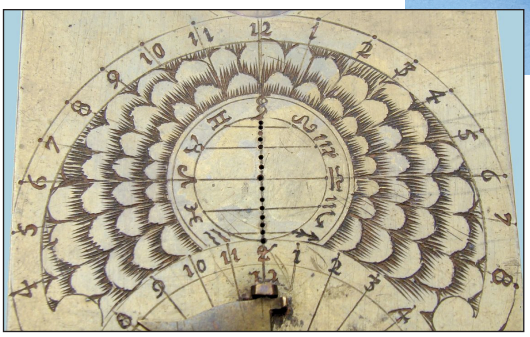
But the most surprising example is found in the Oberösterreichisches Landesmuseum in Linz, Austria, and is very similar to ours (see Wawrik, 2011, in *Der Globusfreund,* no. 57/58, pp. 50-70). Again the wooden globe has manuscript terrestrial cartography, which they date c. 1630, overlain by red coordinate lines and with hours full circle. A semicircular calibrated brass shadow vane is free to swing around the globe, for time telling. Their globe is only half the size of ours, the surface in very much better condition, but the base and shadow vane are late replacements/modifications. Extraordinary finds -- two such terrestrial globe sundials. $18,000.

26. VERTICAL DIAL FROM A DIPTYCH, German (Nuremberg), late 16th century, signed "Paulus Reinman." This 2" x 2-1/2" (51 x 66 mm) ivory plate is divided every 15 minutes from 6am to 6pm, as a vertical direction dial analogous to a south-pointing mural dial. It would be used with a string gnomon, and has punched and engraved decoration. The outer surface is beautifully engraved with an image of the Greek Demeter (Roman Ceres), goddess of harvest and agriculture. She is depicted here with the bounty of the harvest, with full headdress, sitting in the woods alongside sheaves of grain. Condition is very fine.

Paulus Reinman was one of the finest craftsmen of ivory sundials. Born c.1557, his finest examples include engraved scenes, whether illustrating instruments in use (see Gouk, *The Ivory Sundials of Nuremberg, 1500-1700,* p.127*),* a memento mori (p.98), or Old Testament scenes (p.97). Rare. $2950.

*** * * * * MULTIPLE DIALS * * * * ***

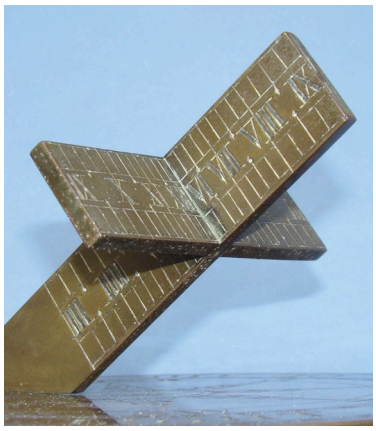




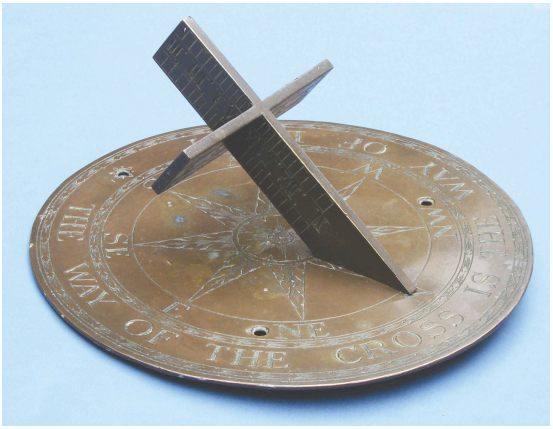
27. REMARKABLE DOUBLE ANALEMMATIC HORIZONTAL POCKET SUNDIAL, French, c. second half 17th century, the eight-sided all-brass dial plate measuring 2" x 2-11/16" (5 x 7 cm). The plate is engraved with a circular chapter ring divided every hour from 4 am to 8 pm, with a circular Zodiacal calendar scale, and with a semi-elliptical hour scale divided again from 4am to 8pm. The circular chapter is engraved with radial hour lines, and set with a hinged gnomon; the Zodiacal circle is crossed by a straight meridian line of 14 holes for inserting a vertical pin gnomon at the appropriate date position; and the field within the elliptical chapter is filled with engraved floral petals aligned with the hour lines. There is also a small inset glazed magnetic compass with good early needle and directionals labeled "Nor, Sud, Est, Oest," and bearing an engraved fleur-de-lys north mark. The underside is plain, with two feet, compass box, and gnomon spring. Condition is fine with a separate brass pin gnomon and the original pebbled leather covered wood case lined in white and reddish satin.

The double analemmatic dial was described by J.L. Sieur de Vaulezard in 1640. Its big advantage was its independence of knowledge of magnetic north, and thus independence of the magnetic compass. Knowing the date, one places the vertical pin gnomon in the appropriate position, sets the dial on a horizontal surface, and rotates it until both sundials read the same time, which is the correct apparent solar time. This instrument is also equipped with a small compass, for convenience and in fact as a means for determining the magnetic declination, the local difference between astronomical north and magnetic north. The double dial is particularly interesting, and has been constructed in various forms (see for example Thomas Tuttell's version, **Tesseract** Cat. 50 item 20). The present miniature variant, with its insertable pin gnomon, and with its pocket case reminiscent of those of Butterfield-type dials, is otherwise unknown to us.

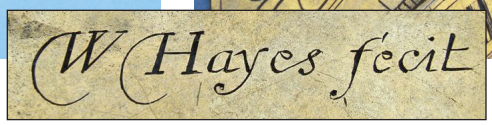
$9500.



28. CRUCIFORM DIAL, English, c.1900, mounted to an 8" (20 cm) diameter brass base plate fully engraved with an eight-pointed floral rose of directions, with running leaf tip designs, and with the motto "The Way of the Cross is the Way of Light," and with the maker's logo punched underneath. The cross itself is inclined and divided on both sides of both beams with scales of hours, every quarter hour from 3 am to 9 pm. During the passage of the sun, shadows cast by the ends of the arms move progressively across eight different scale segments. Condition is very fine. It is a rare, if late, example of the cruciform dial.
$2800.



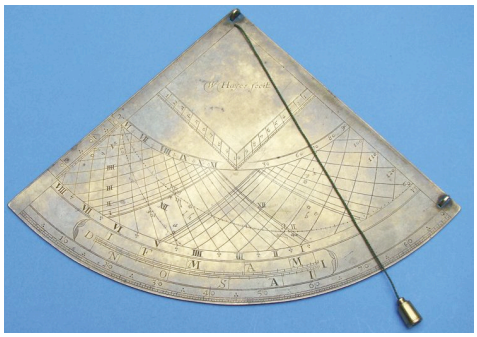
29. SILVER POLYHEDRAL SUNDIAL MEDAL, French, 1858, *poinçonné* and stamped "Argent," signed "Compagnie des Notaires d'Avallon (Yonne)," and bearing a Latin motto "Scire Legem, Colere Justitiam." In fine condition, the 1-1/4" (33 mm) wide octagonal silver medallion was issued to the society of notaries in the city of Avallon in France, and depicts an interesting openwork polyhedral sundial, vertically octagonal and horizontally octagonal, on pedestal. Eleven gnomons are visible in the view presented. Unusual.
$325.

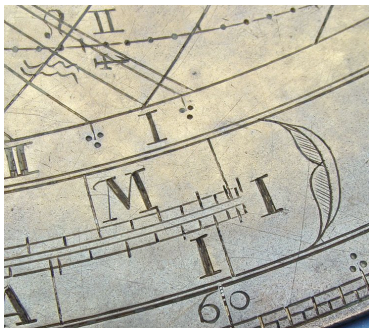


30. C O M B I N E D H O R O L O G I C A L Q U A D R A N T / H O R I Z O N T A L S U N D I A L, English, c. third quarter 17th century, signed "W. Hayes fecit." The front face of this 6" (15 cm) radius brass quadrant is finely engraved with the classic pattern invented by Edmund Gunter in 1618, published 1623. It has a projection of the sky (with several bright stars marked) crossed by curved hour lines and sun's azimuth lines, as well as arcs of the equator, tropics, horizon, and ecliptic. It is laid out for 51.5° north latitude. There is a folded calendar scale (still in the Julian system), a degree quadrant, and a shadow square. Edge sights and a (replaced) plumb bob allow time measurement as an altitude sundial. The reverse has a rotating plate with removable gnomon, forming a classic direction dial, further surrounded by a full degree circle. The apex is hand engraved with a five-petaled rose, and each spandrel with an exuberant fleur-de-lys. Condition is very fine noting light wear and partial browning.

The famous mathematical instrument maker, Walter Hayes, is recorded working in London from 1648 to 1687. Among his many apprentices were John Worgan and Edmund Culpeper (who succeeded him). Instruments by Hayes are rare in the marketplace, noting just one in past **Tesseract** catalogues (Cat. 95 item 16, a magnetic azimuth sundial). Cowham illustrates a second Hayes quadrant, with the same very distinctive left-pointing curled serif on the tops of most of the letters (*A Dial in Your Poke,* 2004, pp. 34 & 37). The reverse of his is also exuberantly decorated, with a smaller fleur-de-lys and two large flowing tulips (*A Study of the Quadrant,* 2014, p. 64).

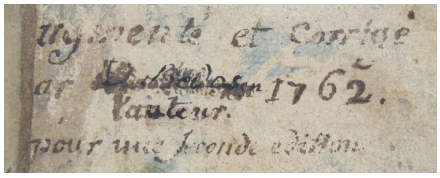
Here we have both a solar/stellar altitude dial in the form of a classic Gunter's quadrant, and a solar direction dial with angular readout. Cowham (2004) explains how the combination can be used, for example, in determining geographic north and thus performing angular surveying. A splendid early instrument. $17,500.

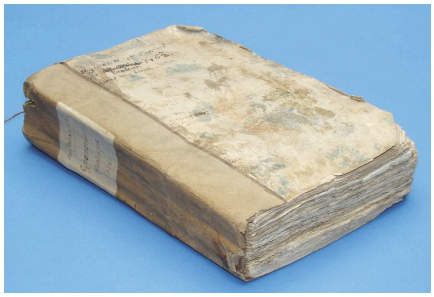


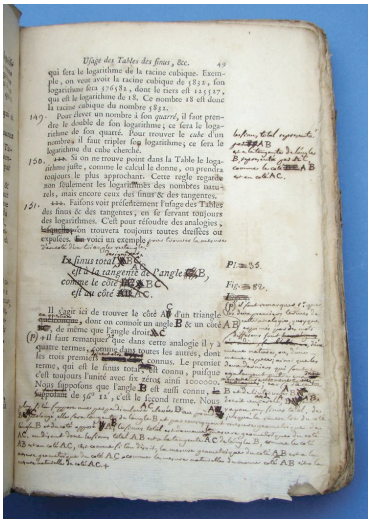


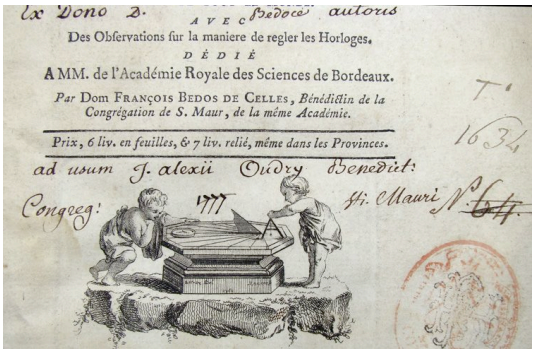
*** * MISCELLANEOUS * ***

A WINDOW INTO THE MIND OF A GREAT 18TH C. GNOMONIST









31. BEDOS DE CELLES' OWN WORKING COPY OF HIS DIALLING MASTERWORK, French, 1760+. This is the first edition of *La Gnomonique Pratique, ou l'art de tracer les Cadrans Solaires,* published in Paris in 1760. The volume measures 8-3/8" x 5-3/4" x 1-3/4" (21 x 14.6 x 4.5 cm), bound in apparently original colored paper, the spine recovered with paper tape. The book is annotated extensively in ink with a cover note (in French) "Augmented and corrected by the author in 1762 for a second edition," and a title page note "Ex dono D. Bedoce autoris ad usum J. alexii Oudry Benedict: Congreg: St: Mauri 1777," and with four past ownership/collection numbers. The many internal notes and corrections extend even to the figures, where corrections and adjustments were made. Condition is good with inevitable wear. There is almost no foxing or internal soiling, noting a few pages water stained.

It is clear that Bedos de Celles worked conscientiously here, resulting in a second edition published in 1774. We see his mind at work, making additions, deletions, corrections and recorrections, to what was already a splendid 400+ page guide to the construction and use of numerous forms of mural and portable sundials, illustrated in 34 fold-out plates. (Apparently lacking -- for a very long time, and perhaps removed by the author -- are a couple of plates, including a map of France.)

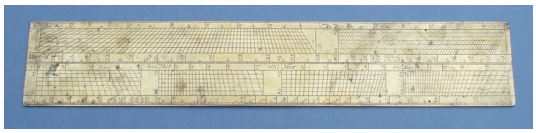
Dom Bedos was a Benedictine monk with the Congregation of St. Maur in Bordeaux. He gave this work to his colleague Oudry, Benedictine in the same congregation, two years before Bedos' death in 1779. His work went on to multiple further editions. $15,000.

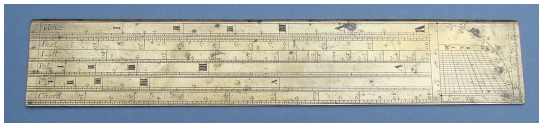
*** * * * * THE SUNDIAL MAKER'S ARSENAL* * * * ***

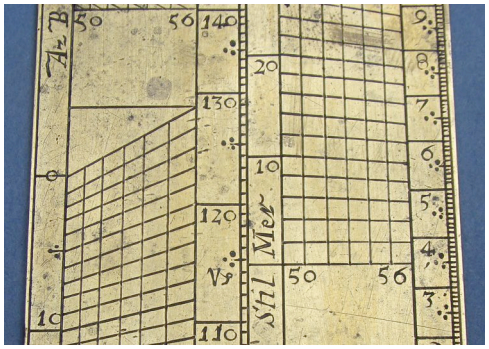
Among the rarest of instruments are the mathematical tools developed and used to layout mural sundials, pocket sundials, etc. The shadows of the gnomon, pinhole, etc., and thus the positions and shapes of the requisite hour lines, will depend upon one's latitude, the orientation of the dial, the shape of the dial's surface, the time of the year, etc. Considerable mathematics can be involved, and geometrical tools are designed to obviate the need for extensive calculation. We have sought these out over the past 35 years, and now are pleased to offer the 20 instruments as a single collection.

32. THE TESSERACT COLLECTION OF SUNDIAL-MAKING TOOLS, 17th, 18th, and 19th centuries. The instruments are described and illustrated below, and include three sciaterras (English, French, and Italian), a declinatory, seven sophisticated dialling rules (some known only in this one surviving example), a trigon of signs, an unrecorded dialling triangle, a "fundamental quadrant," layout plates, a Bion-type Italian "mobile horizontal dial," and an actual sundial mold.

The complete collection of twenty sundial-making instruments. $175,000.

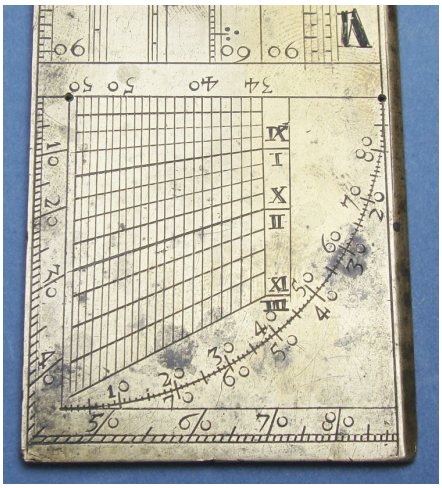




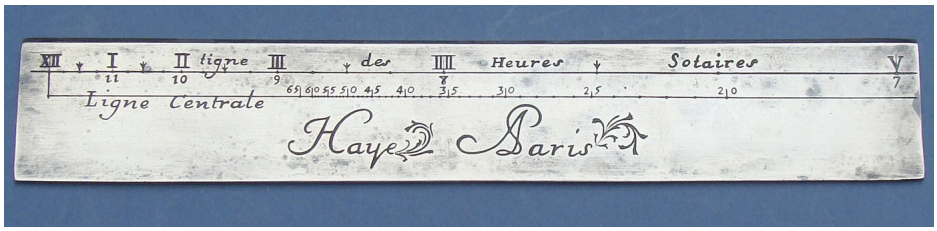


SOPHISTICATED DIALLING COMPENDIUM COMBINING MINIATURE QUADRANT / SQUARE, GRAPHICAL RELATIONSHIPS, AND SERLE'S UNIVERSAL RULE, English, third quarter 17th century. This unsigned (but attributed to Hayes) brass rule is 9-7/8" x 1-3/4" (25 x 4.4 cm), with one beveled edge and pierced with two holes for using a small plumb line with the quadrant or the shadow square. The front face is finely hand divided and engraved with six scales (Hour, Incl., Latt., Pol., P., Chord) just as specified by George Serle in his *Dialling Universal* of 1657. They permitted a sundial maker to lay out the correct hour lines "on all sorts of Planes whatsoever, and in any Latitude."

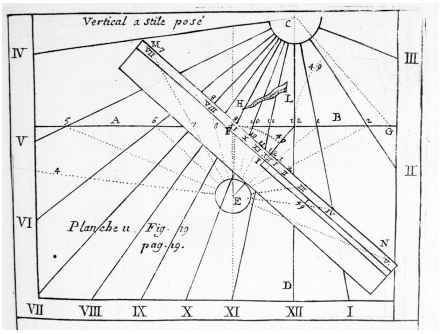
A small (1-5/8" square) quadrant is placed beyond Serle's scales, and has an arc of a quarter circle divided every degree from 0° to 90° and back, plus a shadow square also divided by degrees. Placed within the open space of the quadrant is a fascinating graph (a remarkable early use of such, especially being engraved directly on a scientific instrument), a plot of Hours (from 9 to 12 and back to 3), divided every quarter hour, as a function of latitude (from 34° to 56°, and thus covering most of Europe). The reverse is equally fascinating, finely engraved with an array of six graphs (Az A, Az B, Stil Ver, Incl Mer, Stil Mer, and Incl Mer, each versus latitude from 50° to 56° only, thus covering in depth all of England plus southern Scotland), plus several scales (two labeled Vers S, and Fitted Chord). Condition is very fine noting some stains. Two other examples of this rule are known, both signed by Walter Hayes, both in museum collections.



The rule is important not only for its sophisticated mathematics and rarity as one of the few known tools used to layout sundials throughout the land, but also for its remarkable presentation of the variables, allowing one to read out by direct interpolation the many aspects of sundial geometry for one's locale.

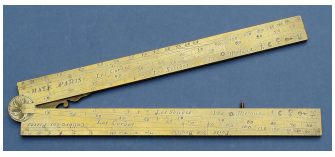


THOMAS HAYE'S DIALLING RULE IN SILVER, French, probably early 18th century, signed with flourishes "Haye A Paris." Measuring 6-1/8" x 1" (15.5 x 2.5 cm), this fine little rule is divided with two nonlinear scales, "ligne des Heures Solaires," and "ligne Centrale." In very fine condition, this rule was apparently made by etching rather than by standard hand engraving, and is hard to date.



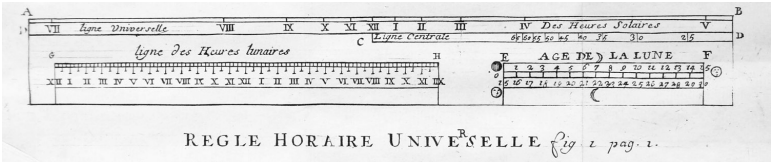
(le Sieur Haye, 1716)

Sieur Haye, "ingenieur," wrote, in 1716, on his newly invented universal rule, and how to lay out all manner of sundials with it. His notable book, *Regle Horaire Universelle pour Tracer des Cadrans...* ran to 88 pages plus 44 full-page plates. Haye himself was a fine maker, active 1697-1720 (see, e.g., the custom sundial item 19 in **Tesseract** Catalogue 15, and see the following item).

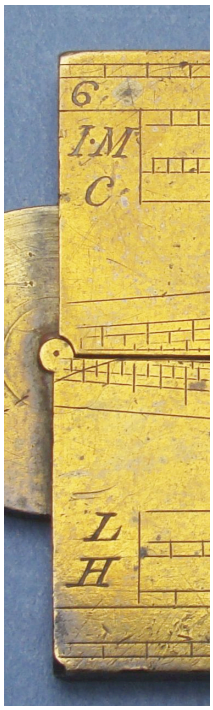


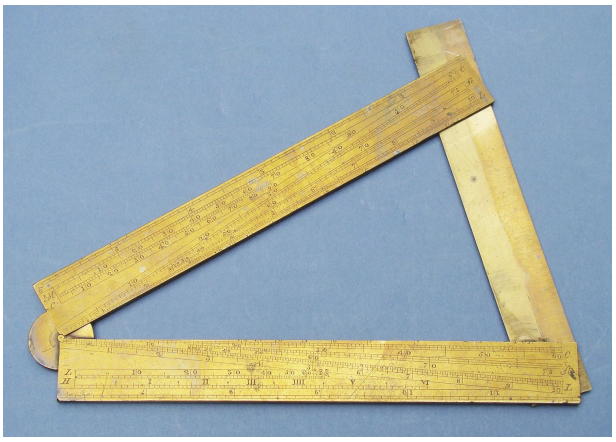
T. HAYE DIALLING SECTOR, French, early 18th century, signed "Haye à Paris." Made of brass, 6-3/4" (17 cm) long (closed), this is the classic form of French mathematical sector (see Bion) except that the two gunnery scales have been squeezed together on one side, and use diagonal lines to connect the scales, saving the space of another line of numerals. The other side has the two critical scales of his dialling rule, the "Ligne Horaire Universelle," and the unlabeled "Ligne Centrale" (see item above). Condition is very fine except for various dings.

We know of no other sector bearing Haye's scales, and for his rule can only point to the exquisite set at the Museum of the History of Science in Oxford, and to the item above.

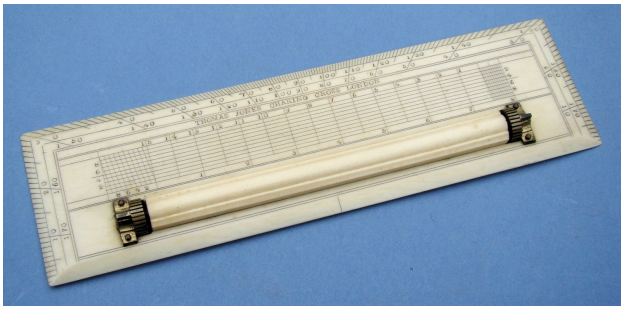


(le Sieur Haye, 1716)





ENGLISH SECTOR WITH DIAL-MAKING SCALES, c. late 18th c., brass, 6-3/8" (16 cm) long closed, opening with hinged stabilization strut, and very finely engraved on both sides with a full complement of scales of trigonometry, logarithms, polygons, proportional parts, equal parts, etc. This is the classic English sector, well described by Bion, but has an additional four scales of Inclinations of Meridians, Chords, Latitudes, Hours, all for the construction of dials. Condition is fine, noting slight bending at the hinge.

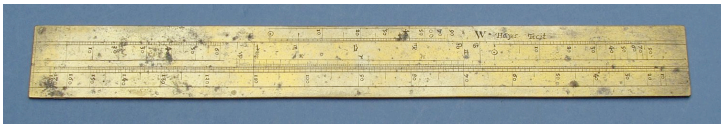


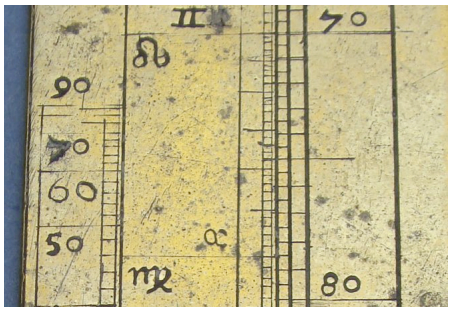
DIMINUTIVE GUNTER'S RULE / SCALE RULE / PROTRACTOR / ROLLING RULE, English, c. first half 19th century, signed "Thomas Jones, Charing Cross, London." This finely crafted ivory rule measures 6" (15 cm) long, with brass rollers and encased axle. The front is divided with a rectangular protractor and scale of equal parts with transversal interpolation. The reverse has six graduated scales of equal parts, and a fine battery of dialling scales: "Cho, Lat, Sin, Inc'l Mer, Tan, Hou, Rum, Lon, Sec." In very fine condition, it is an uncommon rolling rule fully equipped for dialling meaurements. Having served Jesse Ramsden, Jones went on to be an innovative maker, developing his own thriving business in central London.

AN UNRECORDED DIALLING RULE, English, c. 1840's, signed in lovely script engraving "Horne & Thornthwaite, London." This finely executed brass rule is 16" x 15/16" (41 x 2.4 cm), engraved on one side with a strongly nonlinear 0°- 90° "Latitude" scale, plus an "Hours" scale divided every five minutes from XII noon to VI pm (and of course useful symmetrically for the six hours before noon). The other side is divided 0(0.25)90 on a long scale of "Chords." In excellent condition, showing traces of a silver wash, it is complete with the original mahogany case.

This firm was in business from the 1840's until 1912, with periods when a third partner, Wood, was engaged and had his name added. They made a variety of instruments, specializing in photography apparatus.

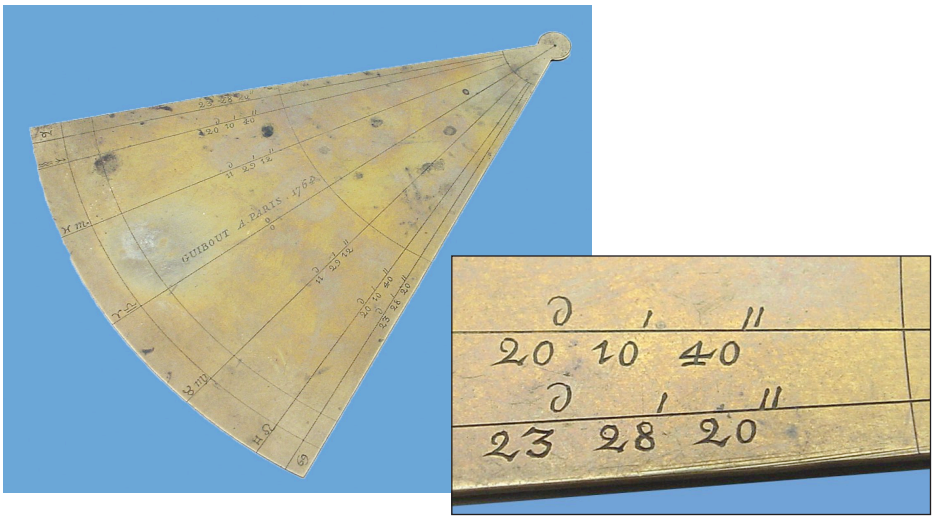
A fine rule bearing three essential scales for sundial construction.





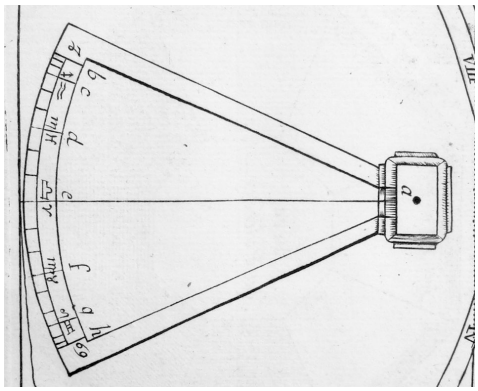
UNKNOWN DIALLING RULE, English, c. third quarter 17th century, signed "W*Hayes Fecit." Made of brass, 8-1/2" x 1" (21.5 x 2.5 cm), this finely marked rule has a total of ten unlabeled nonlinear scales, including an intriguing one of Zodiacal houses and their subdivisions. Condition is good noting some wear, pitting, and staining. Quality is high with very small punched numerals.

We have not found a published example of this intriguing rule. Walter Hayes was a fine craftsman (and see item 30 in this catalogue, the combined altitude/direction dial). In 17th century monographs Hayes was often advertised as a maker of newly invented instruments (e.g., a kind of dialling armillary contrived by J. Brown, 1661; the "double scale of proportion" by Seth Partridge, 1685; an equatorium by John Palmer, 1672; etc.).



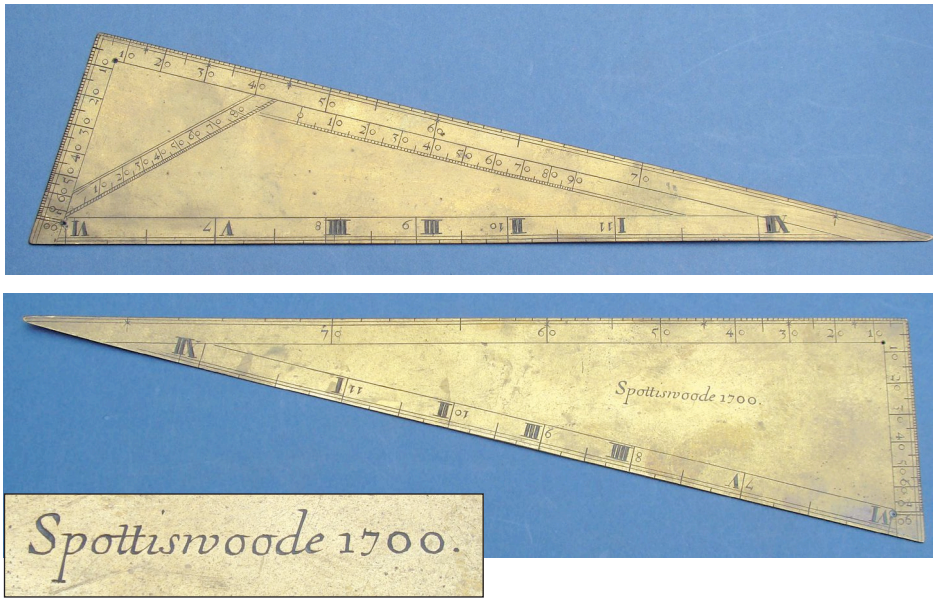
THE TRIGON OF SIGNS -- A RARE DIALLING INSTRUMENT, French, 1764, signed "Guibout à Paris, 1764." Constructed of brass, as a segment of a circle, the device is 5-9/16" (14 cm) in radius, and has a small extension pierced with a hole (for string) at the circle's center. The front is engraved with four concentric circular arcs, crossed by seven unequally spaced radial lines indicating (and labeled with) the first points of each of the twelve Zodiacal houses. Each passage is further engraved with the solar declination, given quite precisely in degrees, minutes, and seconds. Condition is very fine noting a few stains.

This is a very rare example of the trigon, whose construction and use is described in detail in Bion. It enabled inscribing, upon various sundial surfaces, the arcs of the Zodiacal signs, to be read as the position of the shadow of the tip (or other index point) of the gnomon passes over them (as the sun enters a particular Zodiacal house). And Thomas Haye (1716, in *Règle Horaire Universelle pour Tracer des Cadrans*) gives extensive examples and illustrations of the trigon in use laying out many forms of sundials.



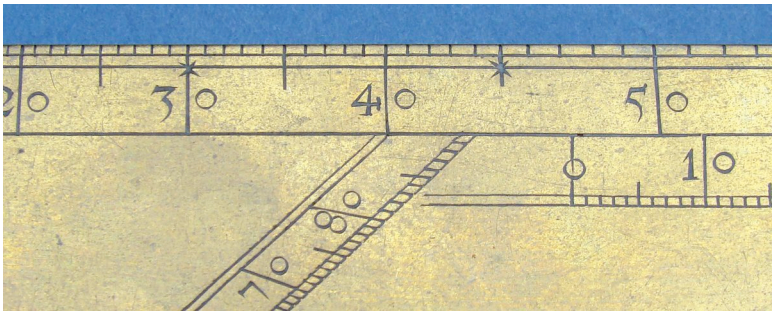
(le Sieur Haye, 1716)

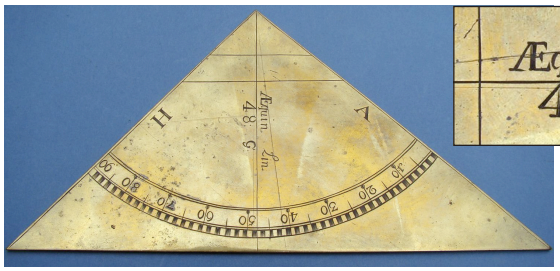
This is the first example of an independent trigon of signs dialling tool we have seen. Its maker was Joseph Simon Guibout, born 1715, apprenticed to Delure, recommended for his instruments by Bedos de Celles, and eventual master to Desnos. We note a fine surveying circle by Guibout (**Tesseract** Catalogue 84 Item 21).

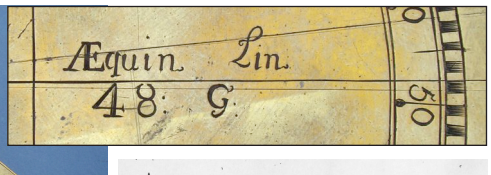


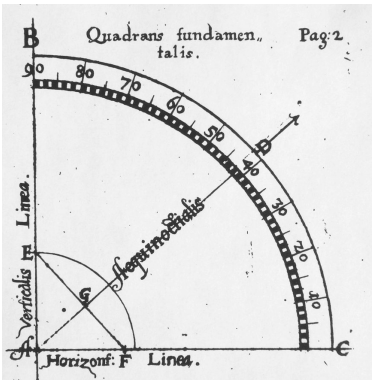
UNRECORDED DIALLING TRIANGLE WITH PROVENANCE, English, c. 1700, signed for the owner "Spottiswoode 1700." This elongated right triangle is thin brass, 8-5/8" (22 cm) long and 2-1/4" (5.7 cm) wide, pierced with two holes at vertices. Both sides are finely divided along all three edges, with a nonlinear scale 0(1)90, a steeply nonlinear scale 0(1)75, and by quarter hours from 6 to 12 and back again from XII to VI. One side has an additional inclination scale in degrees 0(1)90 and a nonlinear scale (chords?). Condition is excellent.

This seemingly unrecorded form descended in the Spottiswoode family and was purchased from the family estate. The family was large and illustrious, descending from King Robert III of Scotland, and including surgeon Dr. Robert Spottiswoode (1637 - 1680), his son Alexander Spotswood (noting the name change) who in 1710 became Lieutenant Governor of Virginia, and in the 19th c. William Spottiswoode the English mathematician and physicist (whose research collection was given to the Royal Society -- see *The Spottiswoode Collection of Physical Apparatus,* 1899), and the well-known printing firm of Eyre & Spottiswoode.





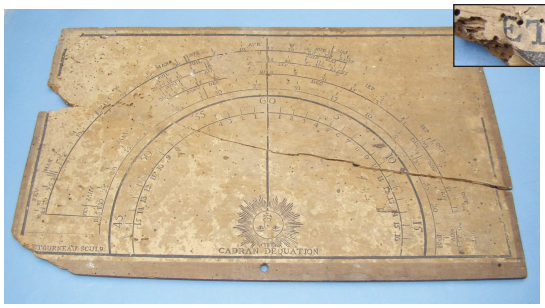




(Welper, 1672)

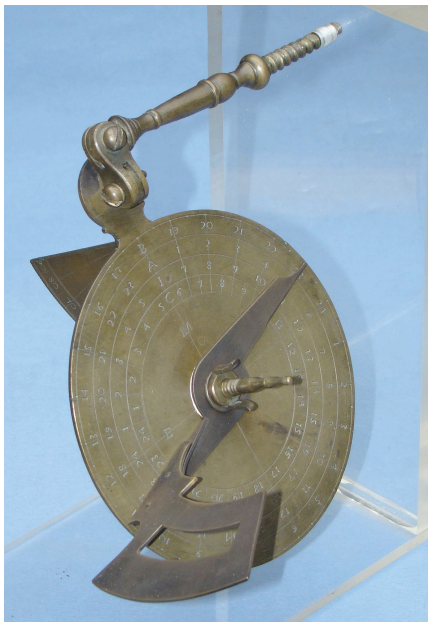
THE "FUNDAMENTAL QUADRANT," probably German, c. second half 17th c. This unusual right triangle is made of substantial brass plate, with unequal sides of 5-3/16" and 5-3/4" (13.2 and 14.7 cm), labeled respectively "H" and "A." It is ruled with a quarter circle divided (and hachured) every degree and labeled every ten from 0 to 90. The arc is cut by straight lines from the vertex, the principal one at 48° and so labeled as "Aequin. Lin." Condition is very fine. Designed for 48° latitude, it is thus appropriate for Augsburg, Munich, and near Strasbourg.

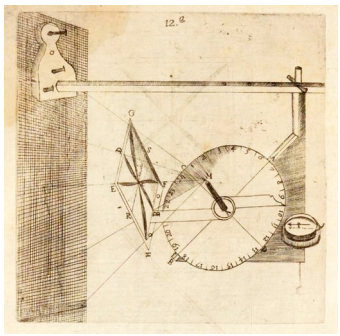
The quadrant was published and described in various editions of Eberhard Welper's *Gnomonica...,* from at least 1625. Welper (1590-1664) was a prolific mathematician, astronomer, and astrologer, born near Marburg and settled in Strasbourg. We know no other example of his quadrant.



SOLAR PANEL, French, c. 18th c. , the 20-1/4" x 12-1/2" (51 x 32 cm) wood panel mounted with a printed sheet entitled "Cadran D'equation" and for the engraver "...etourneau Sculp." A splendid sunface oversees multiple concentric semicircular scales. Deciphering it takes some time. Innermost is a band running from 15 through 0 to 16, aligned with one from 45 to 60 and on to 16. Outside these is a quadruply folded non-uniform calendar scale, with some months spanning very small angular extent (e.g., May), some very large (e.g., December). Condition is fair at best, with worming, and a repaired break to the panel, and considerable losses to the paper. Nevertheless it is a most rare, perhaps unique, survival.

The innermost scale is one of minutes (subdivided every ten seconds) difference between apparent solar time as shown by sundials, and mean solar time (which averages out variations due to ellipticity of the Earth's orbit). The outer band gives corresponding dates, as the "equation of time" analemma. These divisions can be placed in the "furniture" of a sundial. The engraver of the plate is unknown to us, and a leading letter may be missing, thus perhaps Détourneau or Létourneau. But "étourneau" is a good French word, meaning a starling.

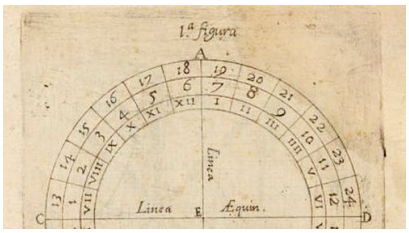




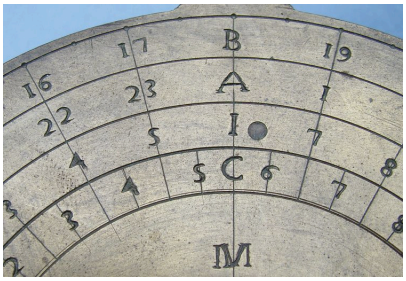
(Biancani, 1635)

ITALIAN SCIATERRA, c. second quarter 18th c. Made of brass throughout, this rare instrument has a 4-3/4" (12 cm) diameter main plate connected to a screw post by two-axis joint, and mounted with an orthogonal 0(1)90 degree quadrant with plumb bob, and fitted with a (later?) clampable alidade with windowed arc. The plate is divided with four concentric circular scales, with punched numerals: "B" 0(1)24, "A" 0(1)24 but offset six hours, "I" 0(1)24 offset 12 hours, and "C" 0(0.5)24 offset 11.5 hours. The central field has labels "M" and "E." Condition is very fine, the brass darkening uniformly.

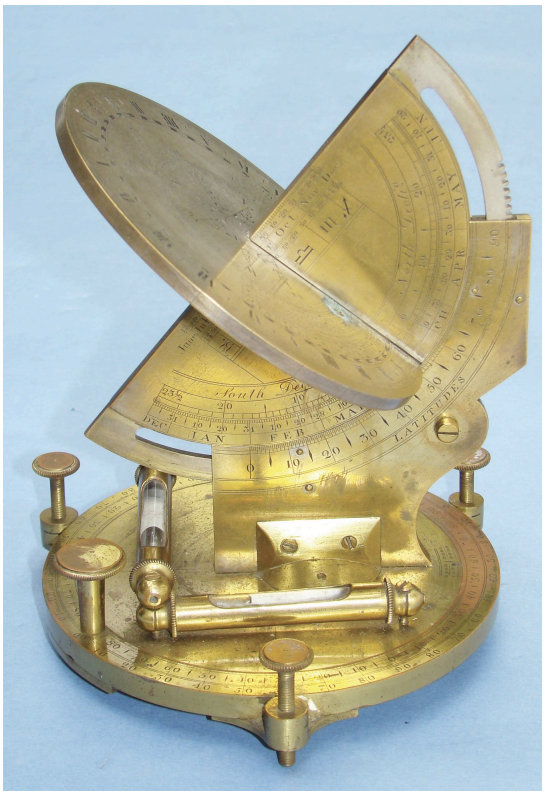
Designed for direct geometric layout of all manner of wall or table dials, usually using strings for projecting, the sciaterra is one of the very rarest of early instruments. Only a handful are known to us. A very similar Italian one (but with three not four scales) is in the Museo Poldi Pezzoli collection in Milan (inv. #4273). Here too the disk is articulated and screws temporarily to a wall or other support.



(Biancani, 1635)

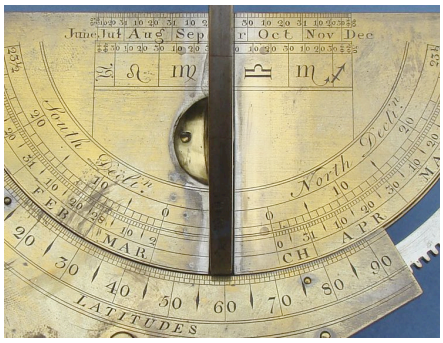


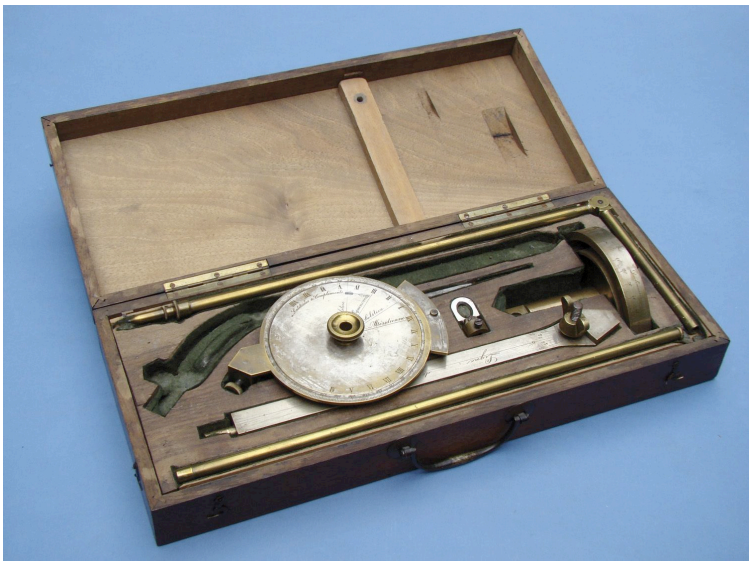
ENGLISH SCIATERRA, c. third quarter 18h c., signed "The Universal Dial & Dialing Instrument." Standing 6-1/2" (16.5 cm) tall, this superbly crafted instrument is made of part lacquered brass and part with traces of silvering. All surfaces are exquisitely engraved with scales and tables. The base has three leveling screws, crossed spirit levels, and geared rotation to the upper assembly with five arcminute vernier. A vertical plate carries a biplanar system with geared tilt adjustment for latitude settings 0(0.5)90. The system has a semicircle engraved with date/Zodiacal/solar declination scales, and fixed to this a circular disk with multiple hour scales, compass rose, "Sun's Azimuth" degree scale, and equation of time table. The disk has four small holes for projecting strings, and has running leaf-tip decoration. Condition is very fine with minor spotting and light wear. Craftsmanship and engraving quality are truly exceptional.

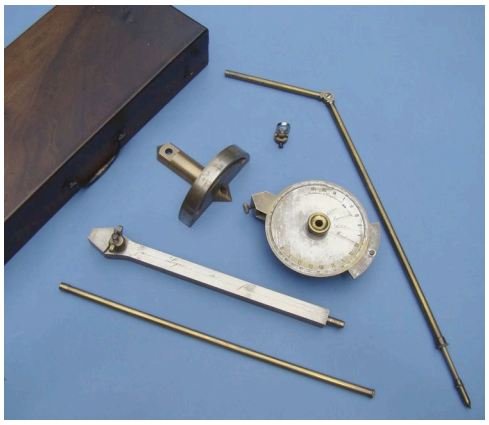


The form is described by Bion, and attributed to the Jesuit Ignace-Gaston Pardies who wrote of two dial-making "machines" in 1725 (*and see back cover of this catalogue*).

We have located a rather similar sciaterra at Oxford, that one from the Lewis Evans collection and signed by Heath and Wing, fine London makers listed working in partnership 1751-1773. Heath was the famous craftsman Thomas Heath, apprenticed to Benjamin Scott, and numbered among his apprentices Jackson, Adams (I), and Troughton (I). The present instrument certainly has the "feel" of Heath's work.

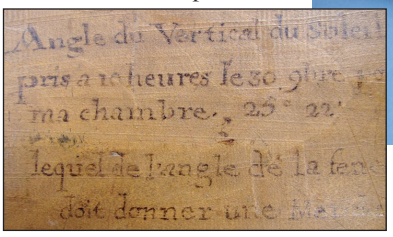






FRENCH SCIATERRA OUTFIT, c. early 19th c., the 13-3/4" x 5-3/4" x 2-5/8" (35 x 15 x 7 cm) fitted walnut(?) case holds a complex outfit, very sturdy and well made of brass, partially silvered. The semicircle has a ±90° scale of "Rapporteur De Déclinaison." This can carry a long rectangular bar with five-arcminute vernier, the centerline engraved "Ligne de foi." A rotating disk has a IV am to VIII pm equally divided scale, plus full degree circle labeled "Latitudes & Compléments," plus two-arcminute vernier, plus radial lines marked "Solstice, Equinoxes, Solstice," and "Méridienne." There is a long brass rod, plus a brass system of rods extending to 30" (77cm) with pencil marking tip. A plated oval fitting (oculus? guide?) rounds out the kit. Condition is very fine throughout, but assembly of this apparent sciaterra is not evident. Lacking are one (or two) important parts to the set. And there are neither instructions nor can we find any publication of this form. Of high professional quality, of the utmost rarity, it is a true brain challenge.

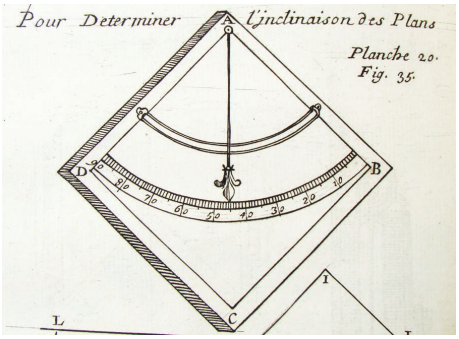
SUNDIAL LAYOUT PLATE, French, c. 1700. Mounted to an 11-3/8" x 8-7/8" (28.8 x 22.5 cm) wood panel is a sheet of heavily varnished laid paper bearing an inked semicircle divided every degree (with hachures) and labeled every ten. Rotating within is an inset hammered brass plate laid



out as a horizontal direction dial with divisions every quarter hour from 4:15am to 7:45pm.

On the reverse is inked "Angle du Vertical du Soleil pris à 10 heures le 30 9bre pour ma chambre 25°22' lequel de l'angle de la fenêtre doit donner une Méridienne," and "Angles du Cadran horizontale pour la latitude de Baume 47°21'" followed by a table of the angles from north for each quarter hour line (from 6 am to 6 pm) on a horizontal dial. Condition is good noting considerable wear and soiling to the paper.

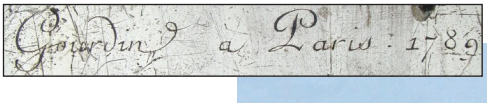
This panel permits layout of the hour lines once the angles are calculated for the given latitude. And indeed the brass plate is correctly divided for the given latitude of Baume, an historic town in eastern France.



(le Sieur Haye, 1716)

BRASS INCLINOMETER, probably German, c. 18th century, the 4-5/8" (12 cm) square plate mounted with a finely tear-shaped brass bob swinging (under guard bracket) against a 0(1)90 and 90(1)0 quadrant scale. When the straight side is placed against a vertical wall, the reading is 0° (or 90°). The corner opposite the apex is rounded, and the reverse is engraved with a simple scale of 4+1 Rhineland inches ("Rhynl. Duywen"). Condition is very fine, complete with the original fitted wood case.

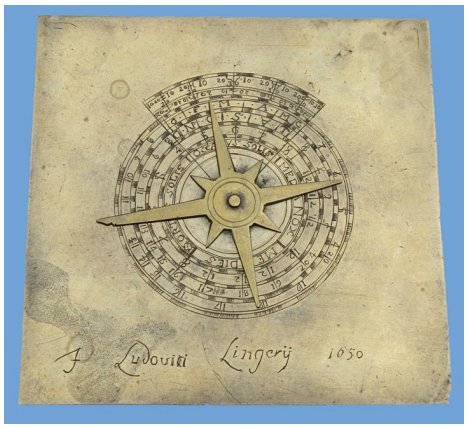
Essential for laying out sundials on walls of churches, great houses, town halls, etc., and for complex garden dials, this form is described in Haye's 1716 book *Regle Horaire Universelle*... as an important tool of the dial maker.



FRENCH DECLINATORY, 1789, signed "Gourdin à Paris, 1789." Measuring 5-1/8" x 4-3/4" x 7/8" (13 x 12 x 2 cm) overall, the instrument is constructed with hinged brass lid carrying hinged arc graduated 0(0.5)90 degrees, and brass inclinometer bob reading against semicircular 0(1)90(1)0 scale. The base is a wood block, partially brass-clad, with inset crossed spirit levels, gimbaled compass, and rotating sighting tube on the side. The glazed compass has 16-point silvered rose, circumferential 0 to 24 hour scale divided by one-eighth hours, external ring of compass directionals, partially blued needle, and lifter. The sighting side of the block is engraved "Côté à apliquer sur le toit," the other "Côté à apliquer sur le mur." Condition is fine noting losses to lacquering and silvering, and perhaps lacking a mounting underneath.

The declinatory is used to determine the declination of a vertical, or an inclined, plane destined to form a sundial. Bion (1758 English translation, pp. 227-9) gives a good description of its use, albeit with a different form of declinatory.

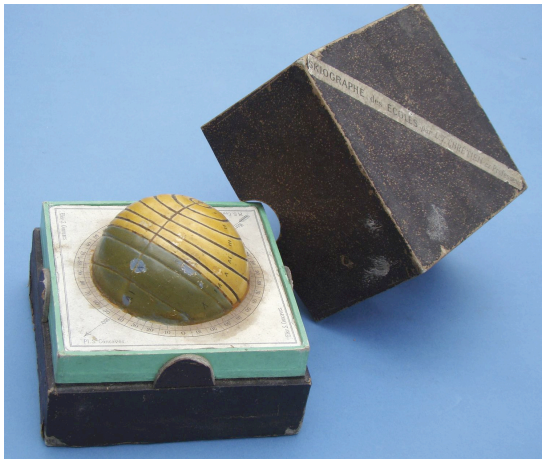
Pierre Gourdin followed Nicolas Bion, and Bion's son, under the trade sign "Au Quart de Cercle" on the Quai de l'Horloge in Paris. He is recorded working until 1801, and made the present instrument just at the commencement of the Revolution (see more on Gourdin under **Tesseract** Catalogue 66 item 39).



ITALIAN "MOBILE HORIZONTAL DIAL" FOR CONSTRUCTION OF SUNDIALS, 1650, signed "F. Ludovici Lingerÿ 1650." The 4-7/8" (12 cm) square hand-engraved brass plate carries a central horizontal sundial rotatable against a full circle degree scale divided 0(1)90 in each quadrant. The sundial itself has a low triangular gnomon, one set of hour lines running 6-12-6, crossed by another set 12-22 (Italian hours). The four corners are engraved with fleur-de-lys wind directions: "De Borea a levante," "Da Mezzo giorno a ponente," etc. Opposite sides are marked "T" and "M," as well as "Barte Del Muro" and "parte Del Sole," respectively. The reverse is mounted with an eight-pointed rotating index, the four long arms reading against concentric hour scales (times of sunrise, sunset, etc.), all as a function of date (with Gregorian and Zodiacal scales). Quality of craftsmanship is very modest, but it is an honest instrument, and condition is very fine.

We adopted the name of this instrument from Bion, and it is used for drawing dials upon any planes at any angles. See **Tesseract** Catalogue 83 item 10 for a fuller description. The maker and locale are elusive. Ludovici is a last name found in the areas of Lazio (including Rome) and Abruzzo; Lingeri is in Lombardy, around Milan and Como.

THE "SKIOGRAPHE DES ECOLES," French, c.1880, signed on the 4-3/8" (11 cm) cubed box "par L.V. Chrétien ex-Professeur." A 2-3/4" (7 cm) diameter plaster sphere is set in the center of a card horizon plate, the sphere incised and painted with eccentric circles labeled 0 to VI, the plate printed with a 4 x 90° circle, a meridian arrow, and corner labels (e.g., "Elev. S. Convexes"). Condition is generally good, with box wear and staining to the card near the sphere.



Patented by Prof. Chrétien in 1879 as a visualization aid, we have included it here for its relevance in understanding projections of the three-dimensional celestial and terrestrial geometry onto two dimensions, essential for the dialist.

RARE SUNDIAL MOLD, probably French, 18th century, measuring 4-1/4" (11 cm) square, constructed with an engraved copper plate backed and framed by iron. The plate is engraved, in reverse, with a horizontal sundial projection for the Northern hemisphere, divided every half-hour from 4 am to 8 pm. A decorative border is labeled with directions in Latin. A legend reads "elêo poli bassoae 45," and thus the plate was laid out for use at a polar elevation (and thus a latitude) of 45°, at a town whose Latin name was Bassoae, apparently. A motto reads "ante solem permanet nomê ei 9," translatable as "Before the sun was the name of God;" the meaning of the final "9" or "19" is not clear. The plate is further emblazoned with the seal of the Jesuit order: "IHS" (*not* in reverse) surmounted by a cross, with the three nails of the crucifixion below. Sides are notched I, II, and III, probably for original assembly, and one side of the iron frame has a spill-over lip. Condition is fine, with some rubbing and use.

In use the mold would be set horizontal, the plate probably coated thinly with a lifting agent, then molten pewter or lead poured in until it overflowed through the lip, and left to cool. A simple triangular gnomon would be mounted on the newly cast sundial.

This remarkable object was found in the vicinity of Billom, in the Auvergne region of France. Billom was an important town in Roman and Medieval times, site of a 13th century university and location of the first Jesuit college in France (1558). At a latitude of 45.7°, it could well relate to the origin of this 45° mold. But the name Bassoae (or could the first letter be "L"; could the third and fourth letters be "f" or "l"?) is not found in the standard lists of Latin town names. The closest early name we find is Bassacum (now Bassac) in the Charente, also at latitude just over 45°, and site of an ancient Benedictine abbey. An intriguing bit of research remains to be done!

(*image reversed)*

REFERENCE BOOKS — NEW COPIES
All are hardbound unless indicated.

SOME IMPORTANT DIALLING REFERENCES:

33. Ackermann, S. (ed.), HUMPHREY COLE: MINT, MEASUREMENT AND MAPS IN ELIZABETHAN ENGLAND, 1998, 106pp., paper, well illustrated. Includes a splendid catalogue of all known instruments by this most important maker. $35.

34. Cowham, M., A DIAL IN YOUR POKE, 2004, 212pp., fully illustrated in color. Impressive work on portable sundials, documenting remarkable collections. $60.

35. Gouk, P., THE IVORY SUNDIALS OF NUREMBERG, 1988, 148pp., illus., paper. Very important study, well-illustrated, large page size. $40.

36. Higton, H., SUNDIALS: AN ILLUSTRATED HISTORY OF PORTABLE DIALS, 2001, 136pp., extensively illustrated in color. A useful popular account, based on the wonderful collections at the National Maritime Museum. $50.

37. SCIENTIFIC AND TECHNICAL INSTRUMENTS OF THE QING DYNASTY. THE COMPLETE COLLECTION OF TREASURES OF THE PALACE MUSEUM, 1998, 289pp. This splendid volume is in Chinese, but the 247 large color plates all have English captions. Includes many unusual sundials. $295.

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(Pardies, 1725)
see item 32