

WHICH RULE GOVERNS THE ORDER OF THE DAYS OF THE WEEK IN ARTIFACTS FROM THE ROMAN AGE TO THE 17TH CENTURY?

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Abstract: I show in the present work some artifacts from the Roman Era up to the 17th century related to the name of the days in a critical way. In each of them there are the 7 planetary Gods of Mediterranean culture related to the days of the week, and I discuss the enigmatic question of their order. Which rule do the planets follow so that the day of the Sun (Sunday) is followed by the day of the Moon (Monday) and so on? What did people know about the 7 planets? When was the time unit of the week established? In the end, we explore their harmonious and cyclic spatial arrangement. Moreover, in different languages the names of the 7 planets refer to different gods. In the ancient Roman world another system preceded it: *nundinae*, linked to market days and not to the sky. The studied artifacts are calendars, painted or engraved on marble tables, mosaics and bas-reliefs, Planetary tables published in medieval texts and two artefacts of the 17th century.

Keywords: Week of seven days; Gods-planet-name of seven days; Order of the days in the week; Artifacts related to the week; Seven point star; Nundinae.

¿QUÉ REGLA GOBIERNA EL ORDEN DE LOS DÍAS DE LA SEMANA EN ARTEFACTOS DESDE LA ERA ROMANA HASTA EL SIGLO 17?

Resumen: Muestro en este trabajo algunos artefactos desde la Época Romana hasta el siglo XVII de manera crítica. En cada uno de ellos están los 7 dioses planetarios de la cultura mediterránea relacionados con los días de la semana, y discuto la enigmática cuestión de su orden. ¿Qué regla siguen los planetas para que al día del Sol (domingo) le siga el día de la Luna (lunes) y así sucesivamente? ¿Qué sabía la gente sobre los 7 planetas? ¿Cuándo se estableció la unidad de tiempo de la semana? Al final, exploramos su disposición espacial armoniosa y cíclica. Además, en diferentes idiomas los nombres de los 7 planetas se refieren a diferentes dioses. En el mundo Romano antiguo le precedía otro sistema: el *nundinae*, ligado a los días de mercado y no al cielo. Los artefactos estudiados son calendarios, pintados o grabados sobre tablas de mármol, mosaicos y bajorrelieves, tablas planetarias publicadas en textos medievales y dos artefactos del siglo XVII.

Palabras clave: Semana de siete días; Nombres de Dioses-planeta de los siete días; Orden de los días de la semana; Artefactos relacionados con la semana; Estrella de siete puntas; *Nundinae*.

QUAL REGRA GOVERNA A ORDEM DOS DIAS DA SEMANA NOS ARTEFATOS DESDE A ÉPOCA ROMANA ATÉ O SÉCULO 17?

Resumo: Apresento no presente trabalho alguns artefatos desde a época Romana até ao século XVII relacionados com o nome dos dias, de forma crítica. Em cada um deles estão os 7 deuses planetários da cultura mediterrânea relacionados aos dias da semana, e discuto a enigmática questão de sua ordem. Qual regra os planetas seguem para que o dia do Sol (domingo) seja seguido pelo dia da Lua (segunda-feira) e assim por diante? O que as pessoas sabiam sobre os 7 planetas? Quando foi estabelecida a unidade de tempo da semana? No final, exploramos a sua disposição espacial harmoniosa e cíclica. Além disso, em diferentes idiomas, os nomes dos 7 planetas referem-se a diferentes deuses. No mundo romano antigo, outro sistema o precedeu: o *nundinae*, ligado aos dias de mercado, e não ao céu. Os artefatos estudados

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são calendários, pintados ou gravados em mesas de mármore, mosaicos e baixos-relevos, tabelas planetárias publicadas em textos medievais e dois artefatos do século XVII.

Palavras-chave: Semana de sete dias; Nomes de Deuses-planetas dos sete dias; Ordem dos dias da semana; Artefatos relacionados com a semana; Estrela de sete pontas; *Nundinae*.

1 The week

In Latin “*septem manes*” means seven days, and in Italian it is «la settimana», in French “la semaine”, in Spanish “la semana”. The seven days are named with the 7 planetary gods of Mediterranean culture: the Moon, the Sun, Mercury, Venus, Mars, Jupiter and Saturn. There is an enigmatic question about their order, and the resting day.

The division into seven-day cycles was probably established in the West, by the Egyptians and the Babylonians, but not all researcher accepted it, perhaps because it was not completely precise with respect to the period from one Full Moon to the next: $7 \text{ (days)} \times 4 \text{ (periods of the phases of the Moon)} = 28$ that is near but not equal to the number 29, the days from one Full Moon to the other.

Asimov claims that Jewish people adopted it perhaps in the 6th century B.C. during slavery in Babylon. Also Schiaparelli, in “*L’Astronomia nell’Antico Testamento*” in 1925, discusses this theme.

The Roman Emperor Constantine in 327 a.C. adopted the week and put it in the Roman calendar. In the first centuries a.C. the 7 days cycle is adopted also in the Greek world.

2 Which knowledge about planets

In ancient times, the 7 planetary bodies visible to the naked eye were considered all “planets” because, observed from the Earth, they move between the fixed stars. The stars are fixed, in the same position one with respect to the other, so we can identify their image, the constellations: the planets, the Moon and the Sun move on the background of the fixed stars.

Our question is which knowledge about the 7 planets was used to establish the time unit of the week of 7 days and their order.

From the direct observation we can measure their rhythm and their speed in moving between the stars. This order is not directly related with the duration of their period of revolution, it is not an order of brightness or supposed distance. The week as we know it today stems from the seven planetary bodies put in order from the slowest, Saturn, to the fastest, the Moon, placed on a circle. This order refers to the angular velocity of displacement between the fixed stars and not directly to the time they need to complete a circle of revolution around the Sun (or the Earth in a geocentric model): this fact was particularly difficult to identify, in particular when referring to Mercury and Venus, the planets that are always near the Sun, observed from the Earth. Therefore, an order from the slowest to the fastest planet was established.

Which rule governs the order of the days of the week in artefacts from the roman age to the 17th century?

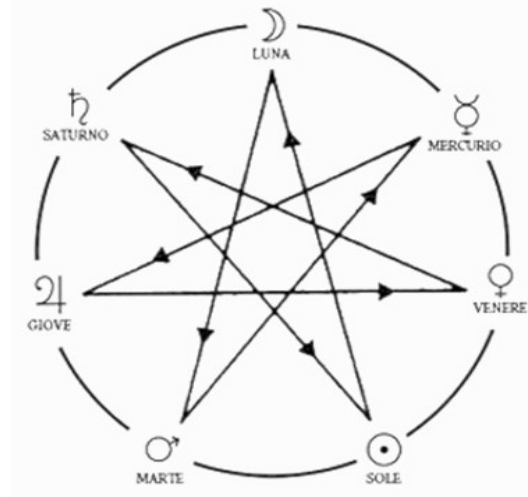


Fig. 1 - The seven pointed star.

But why do we go from Saturday to Sunday and from Sunday to Monday and so on? To answer this question, we must instead suppose a 24-hour cycle with 12 hours of light and 12 hours of night, that is repeated every day, in which each hour is dedicated to one of the seven planetary bodies so that every hour has a planet like Signore or Reggente of the hour (see Fig. 2 and 7).

In this organization every day takes its name from the planetary body of his first hour. In this way, we have the relation 24 hours: 7 planets= 3 with the rest of 3. In the circle of the planets ordered by the slowest to the fastest, there are Saturn, Jupiter, Mars, Sun, Venus, Mercury, Moon.

If the first hour is dedicated to the Moon, it is Monday, the second hour is dedicated to Saturn, the third to Jupiter and so on. Also the 8th, the 15th and the 22th hours are dedicated to the Moon, so that the first of the next day is dedicated to Mars and it is Tuesday. In fact, if we connect the seven planetary bodies, in order from the one to which the first hour of a certain day is dedicated, for example the Moon that is Monday, to the one to which the first hour of the following day is dedicated, in the example Mars that is Tuesday, and so on, we obtain the current order of the days of the week. Graphically a seven-pointed star appears with a harmonious and cyclic spatial arrangement (Fig. 1).

We can observe this order on the Disk of the planetary hours of Giovanni Paolo Gallucci, 1588 from Venice (Venetijs) (Fig. 2).

The typology of hours in ancient times, until one or two centuries ago, were

- Equal or equinoctial and unequal or temporary, taking into account their duration, respectively either equal in every period of the year, or different in different months.
- Italian, Babylonian or French, taking into account their beginning moment, respectively: the sunset, the sunrise or midnight.

It is interesting to observe that the beginning of the day in Figure 2, is at

sunrise in Babylonian hours, and in that moment the day changes his name: in 1588, in Venice, Babylonian hours were still used.



Fig. 2 - Paolo Gallucci 1588.

3 The names of the gods of the week in other European languages

Moreover, in different languages the 7 planets assume different names that hide or reveal their mythical origin and the relationship with the names of the planets, male or female.

In Italian, for example, the days from Lunedì to Venerdì (Monday to Friday) refer to the gods of Greek-Latin mythology: Lunedì to the Moon, female, Martedì to Mars, the red planet for Mars the god of war, Mercoledì to Mercurius the fastest planet and the running god, Giovedì to Jupiter the king of the gods. Sabato (Saturday) is linked to Jewish culture from Shabat, the day of rest, and Domenica (Sunday) to Christian religious culture, from dominus that means Lord in Latin.

In English, Monday is the day of the Moon, Tuesday derives from Tiw the god of war; Wednesday is from Woden or Odin the king of the Nordics; Thursday, from Thor the god of lightning and storms; Friday may derive from Frigga, the wife of Odin and queen of the gods or from Freia, the northern goddess of beauty, the Latin Venus. Saturday from Saturn and Sunday from the Sun.

In German, Friday becomes from *Freitag* (*Tag* means day in German), Thursday is *Donnerstag* - *Donner* means thunder, Tuesday is *Dienstag* and *Dieg* is the Germanic name of *Tiw*, Wednesday is *Mittwoch* that means "mid-week". Saturday, *Sammstag* or *Sonnabend*, that is "Sunday evening", a legacy from the era when the day began with the sunset, therefore the "evening before".

In the Christian world they began to call *dominica* (day of the Lord) the day of the Sun, than began the first day of the week, and in the rejection of widespread paganism, the other days became *feria secunda*, *feria tertia*, and so on. Someone claims that this term generated the absurdity that the working days (*feira*) became nominally festive. The innovation had an ephemeral life and ended with Constantine, as already mentioned, but it remained in use in Portugal where the days are still called *Segunda-feira*, *Terça-feira*, *Quarta-feira*, *Quinta-feira*, *Sexta-feira*, where the word *feira* may also descend from the *feria*, that is the market, as will be seen later on regarding the Roman *nundinae*. Saturday is *Sábado* and Sunday is *Domingo*.

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For the Jews the seventh day of the week became a sacred day, dedicated to the Lord: a day of prayer and rest called *Shabbat* that is "rest" and is the last day of the week, in relation to the biblical account of creation in Genesis. The Jews call the planet Saturn "*Shabtai*", that is the planet of the *Shabbat*.

The early Christians appointed Sunday their sacred day, the day of Christ's resurrection. For Muslims the day of prayer is Friday. In some traditions, Friday is considered an unlucky day still now, perhaps because it is the day of the crucifixion of Christ.

4 The artefacts: gods, planets and iconography

The artifacts presented are calendars painted or engraved on marble tables from Roman times, mosaics, bas-reliefs and Planetary tables in medieval texts or clocks, and two artifacts of the 17th century, which are complementary astronomical apparatus in monumental sundials in Rome.

Among such artifacts, some have symbols of planets, others have the facies of the gods with their characteristic sign: the Moon with the crescent on the head, *Mercurius* with the *caduceus*, Venus with beautiful hair, the Sun with the rays, Mars with the helmet, Jupiter with the lightning and Saturn like an old man. Their order is sometimes from the slowest to the fastest and sometimes the order of the days in the week.

The original Astrologic Zodiacal Greek-Aegyptian Board named *Tabula Bianchini*, of the 2nd century a.C. in marble, is in the *Musée du Louvre* in Paris. A plaster cast is in the *Museo della Civiltà Romana* in Rome (Fig. 3).



Fig. 3 - Tabula Bianchini.

The three Egyptian deans in the picture are connected to the sign of Aries and only one of them to the sign of Taurus. Egyptians divided the days into decades, hence the "deans". The faces of the seven planetary divinities follow the sequence: Mars, Sun, Venus, Mercury, Moon, Saturn, Jupiter, Mars, Sun, in counterclockwise order (Galluzzi, 2009, p. 145).

A metal artifact from about 500 a.C., with 13,5 cm of diameter, has a circle engraved with the 7 planetary faces in clockwise order of speed, from Saturn to the Moon. It is in London in the Science Museum. The caption in Lo Sardo, p 242, indicate a "Byzantine Astrolabe, one of the oldest examples of geared mechanisms ... The

external staircase shows the names of the most important Greek cities, with their respective latitudes. Unknown origin.” (Fig. 4).



Fig. 4 - The byzantine artefact.

In Italice, a Roman town near Santiponce north of Seville in Spain, there are a large number of rooms with well-preserved mosaic floors: among them there is a room with the mosaic of the 7 planetary gods in the order of the days of the week, in counterclockwise order, with Venus, the only female god besides the Moon, in the center (Fig. 5).

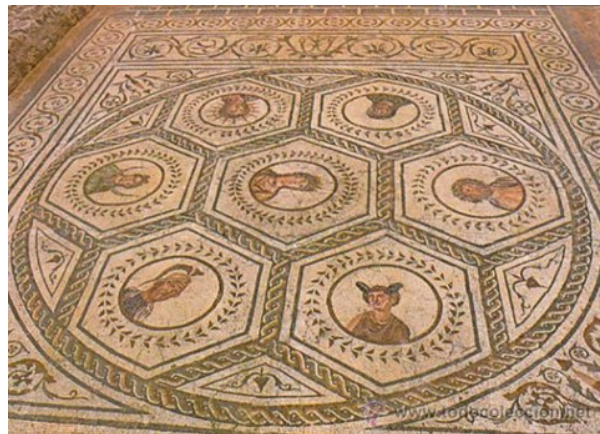


Fig. 5 - Italice – Planetary room (photo N.L.).

In the *Museo della Civiltà Romana* in Rome there is another plaster cast (1930) from the Roman era, found in a *domus* in the Esquilino in Rome, of considerable astronomical interest. It is an object, called “lunar astrological calendar” (Galluzzi, 2009, p. 152). Seven holes, where sticks could be placed, indicate the days of the week in their actual order, from Saturday to Friday. In the center the circle of the 12 months and, on the sides, the holes of the 30 days of the lunar month. A copy of the XIX century of the artifact, is in the Museum of Wurzburg in Germany (Fig. 6).

Which rule governs the order of the days of the week in artefacts from the roman age to the 17th century?

QVIS, QVA HORA, QVOLIBET DIE, PLANETA												
DOMINATUR OPE HORARUM IN ÆQUALIUM SEV PLANETARUM												
HOC ORDINE FACILLIME DEBERENDITVR												
HORA DIEI	1	2	3	4	5	6	7	8	9	10	11	12
HORA NOCTIS	iii	iiii	v	vi	vii	viii	ix	x	xi	xii		
DIE DOMINICA	☉	♀	♁	☿	♂	♃	♄	♅	♆	♁	♂	♃
DIE LVMAR	☿	♂	♃	♄	♅	♆	♁	♂	♃	♄	♅	♆
DIE MARTII	♂	♃	♄	♅	♆	♁	♂	♃	♄	♅	♆	♁
DIE MERCVRII	♁	♂	♃	♄	♅	♆	♁	♂	♃	♄	♅	♆
DIE IOVIS	♃	♄	♅	♆	♁	♂	♃	♄	♅	♆	♁	♂
DIE VENEREI	♀	♁	♂	♃	♄	♅	♆	♁	♂	♃	♄	♅
DIE SATVRNI	♄	♅	♆	♁	♂	♃	♄	♅	♆	♁	♂	♃

Fig. 6 - Table of calendar.

In Rome, we can see two Tables of hours of the planets, one in the Gallery of the Convent of the *Minimi* at *Trinità dei Monti*, and another one in *Palazzo Spada*. They are complementary astronomical apparatus of the monumental catoptric sundials in those places. They were realized by Emmanuel Maignan (1601-1676) of the *Minimi* friars. The Tables of hours indicate the planets that regulate every hour of the day and every hour of the night, in each one of the 7 days of the week: this was certainly important in medicine for example and in the collection of medicinal herbs (Lanciano, 2013; 2018) (Fig. 7).



Fig. 7 - Roma – Convento di Trinità dei Monti (photo N. L.).

In Vienna in the *Kunsthistorisches Museum* there is a Table Clock from South Germany, dated 1545, an artifact partially painted on iron, copper alloy. (KK856): there is one disk with the symbols of the planets from the Moon to Saturn, another with the figure of the gods of the days of the week, named with A (Sun), B (Moon), ... G (Saturn) and another one, in the back, with the gods in the order of the planets from the slowest to the fastest, from Saturn to the Moon. The three discs have the clockwise order.

5 And before?

The 7 days cycle is not written in nature, but it is a cultural choice, as we have seen. The week has not always been this way because it is one of those time periods organized in a culture, that is, local and arbitrary. While the day or the duration of the year are marked by the Sun, the month and the week are arbitrary organizations. Nature dictates the moments of the Equinoxes and the Solstices, the moments of the Full or Black Moon, but not the day of the beginning of the year or the number of the hours in a day.

In the Roman world, the choice of a time unit, in between the day and the month, is also present, similar but not equal in duration to the week of 7 days: the *nundinae*, linked to the market days and not to the sky. In fact, around the second century b.C. the beginning of the year was moved from the Idus of March to the Kalendae of January, by the consul Marco Fulvio Nobiliore. In this same period the days of the month began to be grouped *inunits* of eight days, the so-called *nundinum* (nine), as they counted both the day of departure and the day of arrival, in a system called "inclusive". The 8 *nundinae* were indicated by the first 8 letters of the alphabet A B C D E F G H and were the interval days between one market and another. In Italian, today, the phrase "*da oggi a 8* (from today to 8)" is still used which means next Tuesday, if today is Tuesday.

Since the days of the year are not a multiple of 8 and, in the Roman calendar, the year always began with the letter A, the *nundinal* letter indicating market days was the same for one year but different from year to year.

I show two examples: the so-called *Fasti Antiates* and *Fasti Verulani*.

The first is a Roman calendar, the only republican calendar preserved; it is a fresco found in the *Villa di Nero* in Anzio, 84-46 b.C., before the Julian reform of the calendar. It is *Fasti Anziati* or *Antiates* with *nundinae* and 12 months plus one that is intercept. Next to the names of the days in addition to the K initials of *Kalendae*, Non for Nonae and Idus for Eidus, also adjectives such as *Fastus*, *Non Faustus*, *Endotercisus*, *Comitialis* were added. The calendar is shown in the *Museo Nazionale Romano* in *Palazzo Massimo* in Rome (Fig. 8).

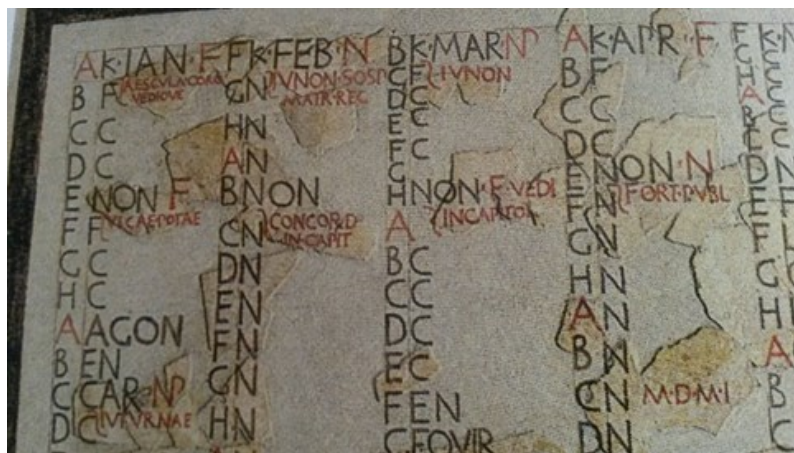


Fig. 8 - Nundinae from Fasti Anziates From the caption “Rilievo dei Fasti Anziati, da A. Degrassi, *Inscriptiones Italiae*, XII Fasti et elogia, fasc. 2, fasti anni Numani et Juliani, Roma 1963 (Paris, 2014, p. 13).

Julius Caesar, in 46 b.C. added to festivities or *feriae*, related to the gods, some military victories. With the Julian reform the intercept month is eliminated, and the leap year is established, with other changes.

Augustus (27 b.C. - 14 a.C.) rewrites the new topographical organization of cities and also the organization and order of time. The calendar changes, made by Augusto, are at the service of his propaganda and constitute a real revolution, with the addition of new festivities in honor of his person and people of his family. Thus, he changes the times dedicated by the population to *ludi*, rituals and celebrations.

The second Roman calendar is a Table of *Fasti Verulani* found in Veroli, near Rome, in 1922. It is one of the more than 40 calendars of the time from 36 b.C. to 37 a.C. found in central Italy. The slab, already used as a covering of a sepulcher, refers to the first months of the year: IAN (*uarius*), FEB (*ruarius*), M (*artius*), with the number of days of each month shown below. The letters of the alphabet that repeat from A to H indicate the dates of the markets (*nundinae*), the other letters indicate the days *fasti* (F), *comiziali* (C), *nefasti* (N), holidays (NP), *endotercisi* (EN) and a lot of indications of Augustus festivities.

The new calendars are very large and were made public, painted on plaster or engraved on marble or on manuscripts, and displayed in the cities of the Empire.

6 The didactical work about the seven-pointed Star

"Time was indeed created together with the sky" Plato

To investigate and understand the current order of the names of the days of the week, linked to the ancient Greek gods and to the heavenly bodies, we devised different tools and different actions.

The iconic artifacts and representations studied have been the starting point for didactic laboratory actions:

- to calculate how to divide a circle into 7 equal parts
- for bodily, rhythmic, dynamic, cyclical actions, like a dance and
- for the construction of original dynamic models in cardboard or wood.

7 Didactical questions: a geometric problem

The problem, more advanced from a geometric point of view, is to divide the circle into 7 equal parts: only with the Euclidean instruments, the line and the compass, we cannot divide the circle into 7 equal parts. In fact, various approximate methods have been devised in the course of time. An example, in architecture, is in the dome of the Pantheon in Rome with 5 cycles of $28 = 7 \times 4$ drawers (Lanzisera, 2015-16).

8 Didactical questions: the Seven Pointed Star Week and the rhythm of a Dance

During a residential course for teachers, Marcello Sala, a school teacher in secondary school, thought of adapting to this seven-points star, designed usually on a sheet, a seven-points star made with moving bodies in space: his idea was based on a physical action called four corners, taught to Cenci by Jairo Cuesta, actor belonging to Jerzy Grotowski's *Teatro delle Sorgenti*.

Later, we search for a suitable rhythm to accompany the synchronous movement of the participants and other movements rhythmic, even symbolic, linked to the seven planetary bodies, have enriched "the dance" of time after time.

We build a big star on the ground, on which we walk going from the Monday of the Moon to the Tuesday of Mars and so on (see Fig. 9). This can lead to a real dance in which up to 7 people move at the same time along the 7 sides of the star, in harmony and without clashing. It is a physical action in which the whole-body moves and it can be accompanied by a song that expresses the synthesis of the idea.

We can dance outdoors or in an empty hall, inside, where people can move freely, with purpose to accomplish slow routes or more fast, in synchrony with the others, with accuracy in the movement. We practice a walk in unison, to follow the choice of rhythm. The activity is sometimes aimed at discovery and understanding, other times at reworking of the scheme in which the days of the week follow one another in our calendar, through an integrated work of astronomy, rhythm and movement.

Seven little cards with the names of the seven days are placed on the ground in a circle of the week placed at regular intervals. The first person starts from the card of Monday and goes straight to Tuesday, then turns around and goes to Wednesday in order to draw with her steps the entire "seven-points star". When the first person gets back to Monday, start the round again and meanwhile a second person also moves and starts his dance, this time from Tuesday. The dance ends when all seven people have entered or, if you like, when, going back, only one remains.



Fig. 9 - The dance on the open air.

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Fig. 10 - the cards of the days, gods and their name.

On the cards we put symbols of the planet, the name of the associated day, but we look also for images of the Greek gods, and for the name of the day of the week in several languages.

9 Didactical questions: the construction of dynamic models

Several mobile models have been devised over the years to show how the hours and days of the week are connect and move about their cycles. I show some models in wood with nails and rubber bands, in cardboard with multiple discs that rotate one on the other in which the dexterity and understanding of the object and of the regularity help each other: they are original dynamic instruments.



Fig. 11 - The rotating model in wood.

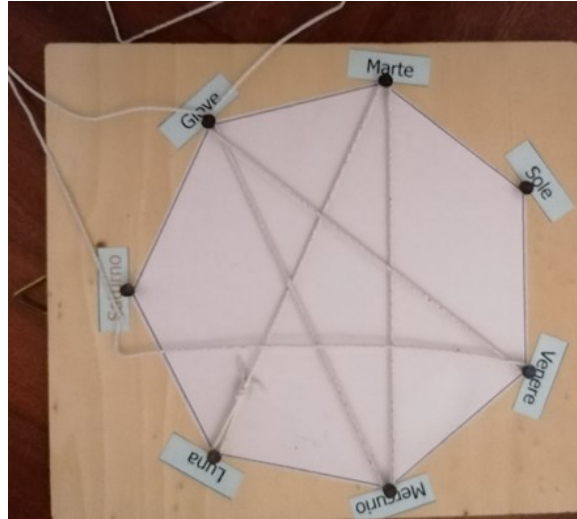


Fig. 12 - The model with a string.

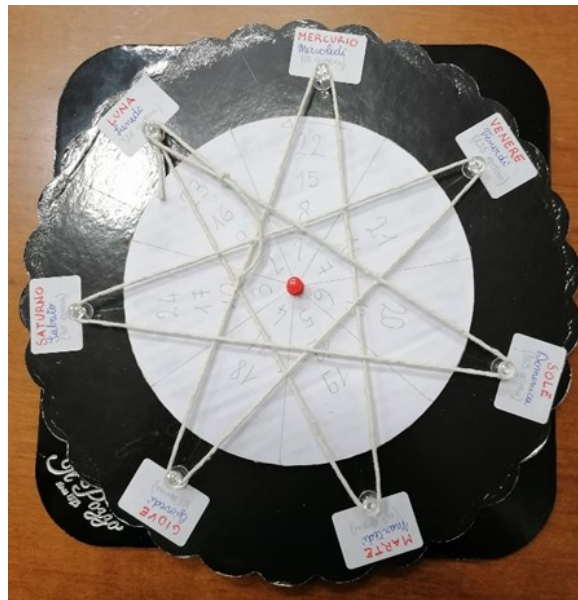


Fig. 13 - A second model with a string.

10 The seven ancient planets in the literature

In the work *Convivio* (1303), the Italian poet Dante Alighieri compares the seven heavens of the *Paradise* to the seven arts of the *trivium* and *quadrivium*: the Moon to Grammar, Mercury to dialectic, Venus to rhetoric, and the Sun to arithmetic, Mars to music, Jupiter to geometry and Saturn to astronomy.

Which rule governs the order of the days of the week in artefacts from the roman age to the 17th century?

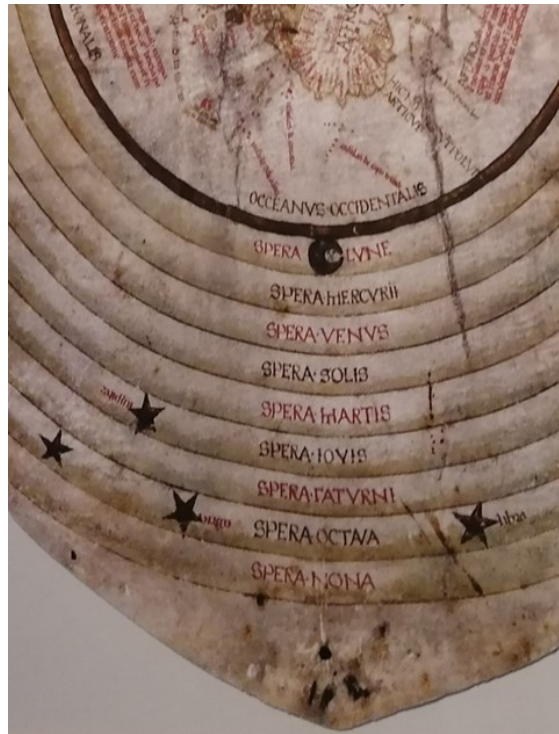


Fig. 14 - The 7 planetary skies in the Paradise of Dante.

11 A calendar proposal from a book by Asimov

A proposal for the revision of the calendar, however fallen on deaf ears, was advanced by Asimov in 1959 in his "The clock on which we live". The idea is to standardize the calendar and to drop each date on the same day of the week.

Since the non-leap year, the days are 365 which divided by 7 gives 52 weeks plus one day, so that if one year starts on Monday the next one starts on Tuesday.

- $365:7 = 52 \text{ weeks} + 1 \text{ day}$,
- so if one year starts on Monday, the next one starts on Tuesday

There are therefore, in the western calendars, some festive days that always fall on the same date, for example on May 1 the worker's Day, March 8th women's Day, December 25th Christmas, but on different days of the week. Then there are recurrences that instead fall on the same day of the week, but on different dates, like the Christian Easter on Sunday

- worker's Day always on May 1st
- Christian Easter always on Sunday

Someone has therefore proposed to call December 31 "day of the year" and to remove it from the cycle of the weeks, to bring in this way the days of the year to $364 + 1$. In doing so, all the dates of the year would always be on the same day of the week because $(364/7) = 52$.

- removed 1 day, eg December 31 = "day of the year"
- we would have the same calendar for all the years.

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