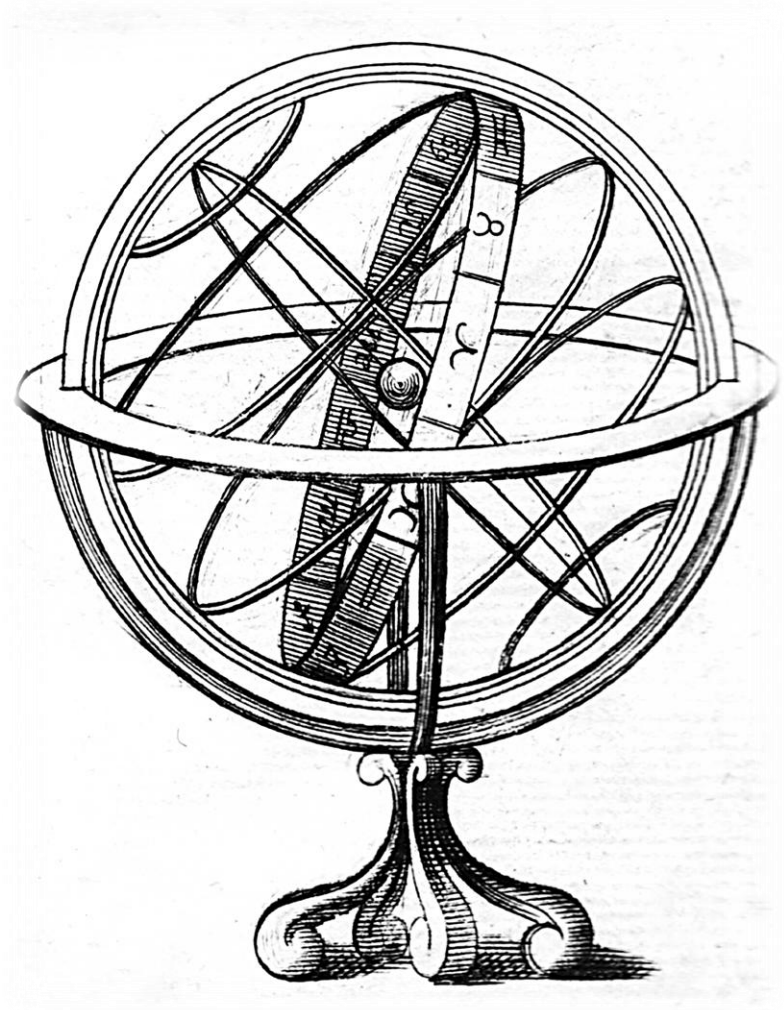
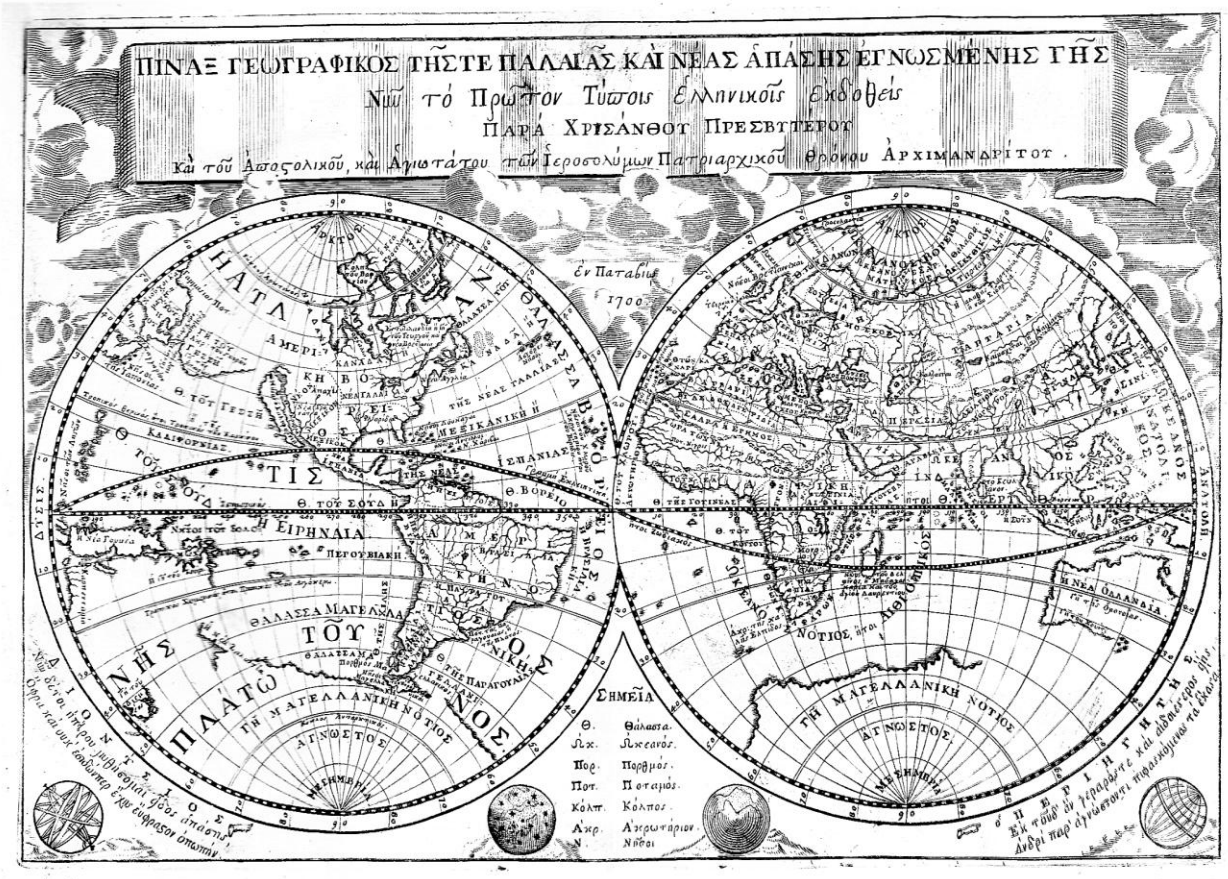
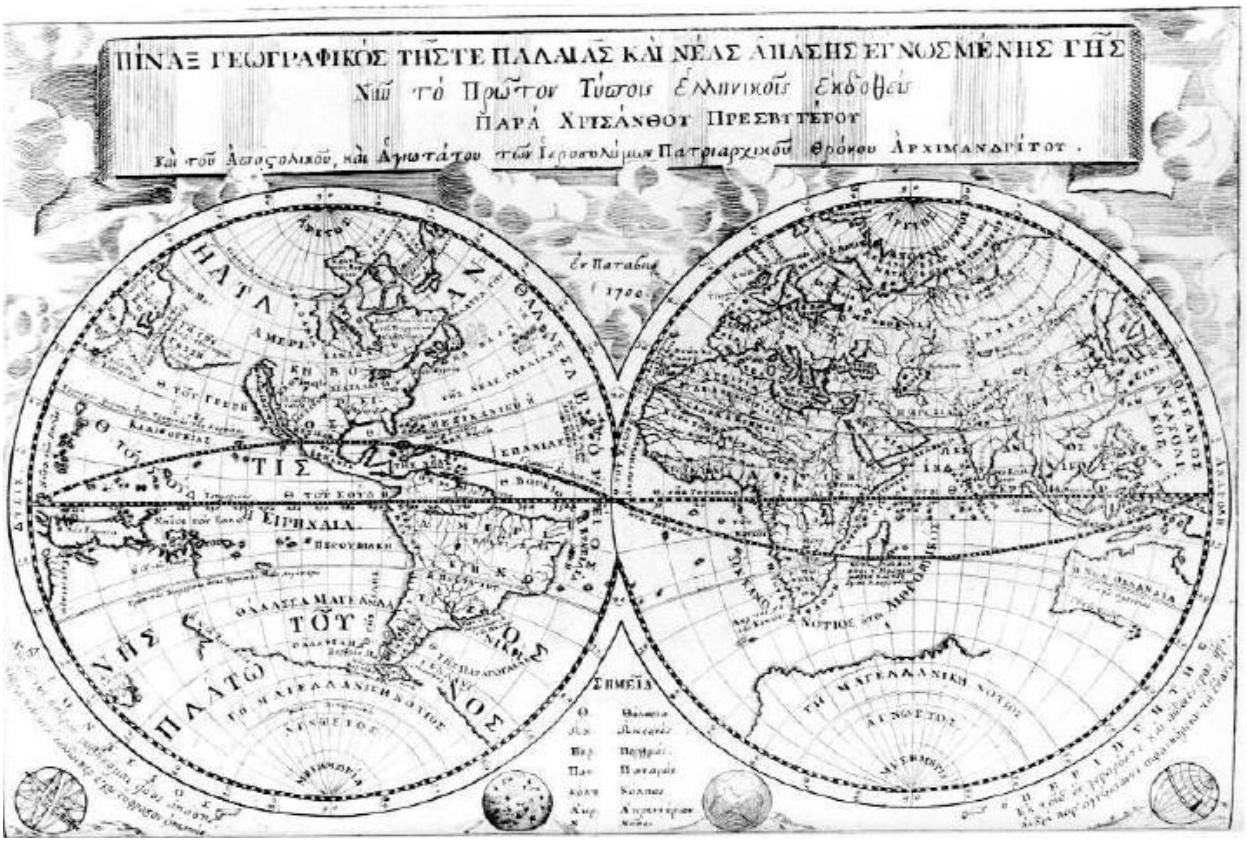


The celestial globe (spherical astrolabe) of Ptolemy from the book of Chrysanthos Notaras, Presbyter and Archimandrite, an important scientist and astronomer and later Patriarch of Jerusalem. Chrysanthos worked at the Paris observatory with the great astronomer Cassini, as mentioned in his book. Chrysanthos proposed that Cassini synchronize the clocks in Paris and Guyana in America using the eclipse of the Jovian satellites in order to measure the distance between the Earth and the Sun. Chrysanthos Notaras' book entitled "Introduction to Geographical and Spherical Studies" was probably printed in Venice and published in Paris in 1716 for the education of the Greeks. Although it seemingly largely rejects the heliocentric system, Chrysanthos promotes it by presenting the good qualities of it.

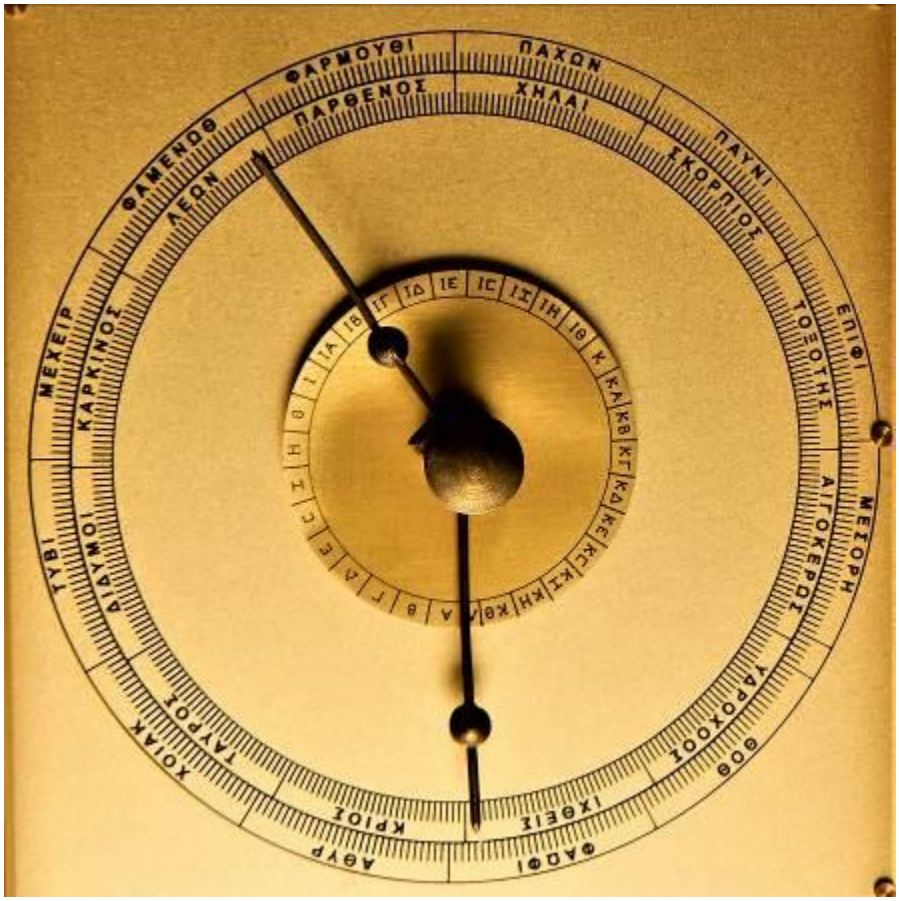
1700/1716, World
Chrysanthos Notaras, Patriarch of Jerusalem,
['Geographical map of the Ancient and Modern World, Padua 1700', in his Introductio ad geographiam, et sphoeram..., Paris, 1716. Reduced and simplified version of map no. 10. See also nos 33 and 50].
Padua, 235 x 350 mm.
Loc. Gennadius Library GT 133.1q





.

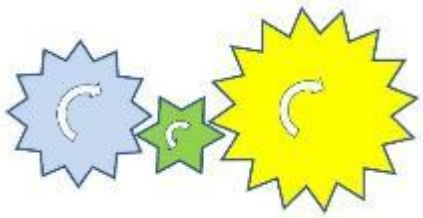
To the memory of the first Governor of Greece. Great statesperson, Capodistrias established Greece as a European state. Played a prominent role in Switzerland's political institutional organization and in asserting Switzerland's permanent status as a neutral country and he was the author of the Swiss Confederation's first constitution. Former minister of foreign affairs of Russia.
The National Kapodistrian University, that I have the honor to serve for over 50 years, is named in his honor.



The dial of the year and the zodiac (map of the sky) and the pointers of the Sun and the Moon

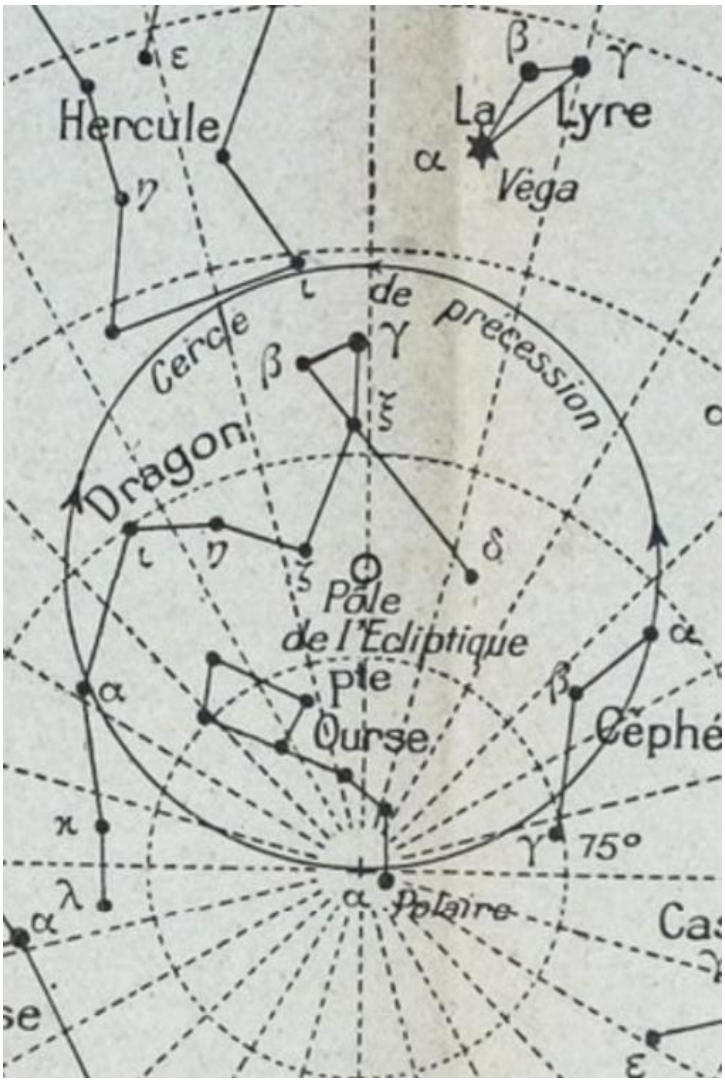
CT scan of the Antikythera Mechanism showing the solar gear.

CT scan of the Mechanism. Gears and the 'safes', arched plates that protect the gears from breaking as they rotate and deform under the strain of the torque that turns the gears, can be seen.



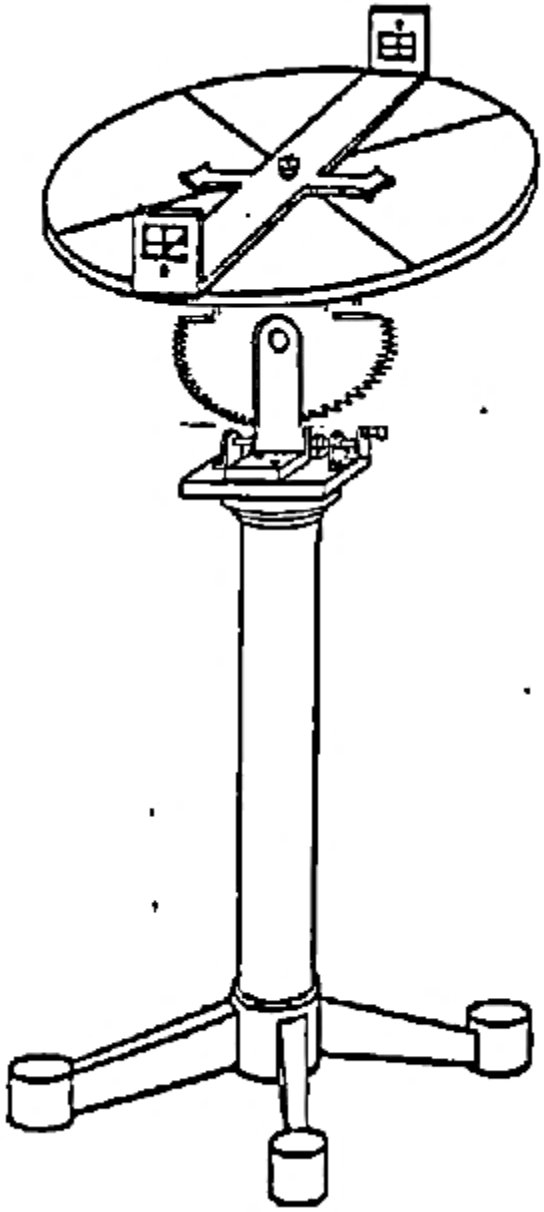
Example of a train of gears and their rotation

Section of the Mechanism user manual. The letters measure 2.5mm. From the form of the letters, archaeologists determined the era they were written (around 150 to 100 BC). Image by XM, using PTM method of Dr T. Malzbender et al, HP.



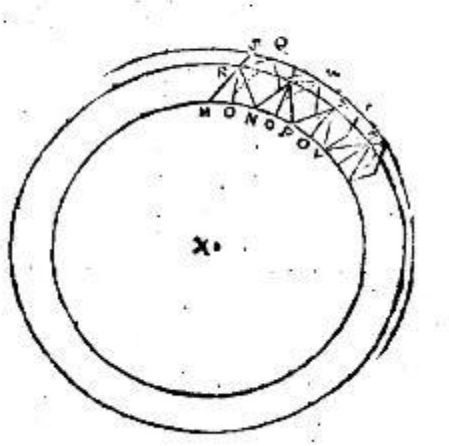
SKY_MAP_Astronomie-de-navigation_P_Constan_Paris_1920
The shift of the Earth's axis in the sky due to the phenomenon of precession of the equinoxes was first measured by Hipparchus and found to have a period of around 26000 years. Precession_N.gif (1134×1134) (wikimedia.org) Image by Mr. Tau'olunga

Sky map that show the wandering of the pole of the Earth in 26000 years, measured by Hipparchus.
Astronomie de navigation, P. Constan, Paris, 1920
The shift of the Earth's axis in the sky due to the phenomenon of precession of the equinoxes was first understood and measured by Hipparchus. He even estimated its period of around 26000 years.
Χάρτης του ουρανού που δείχνει την περιπλάνηση του πόλου της Γης σε 26000 χρόνια, μετρημένη από τον Ίππαρχο. Astronomie de navigation, P. Constan, Παρίσι, 1920
Η μετατόπιση του άξονα της Γης στον ουρανό λόγω του φαινομένου της μετάπτωσης των ισημεριών έγινε για πρώτη φορά κατανοητή και μετρήθηκε από τον Ίππαρχο. Υπολόγισε ακόμη και την περίοδό του περίπου 26000 χρόνια.

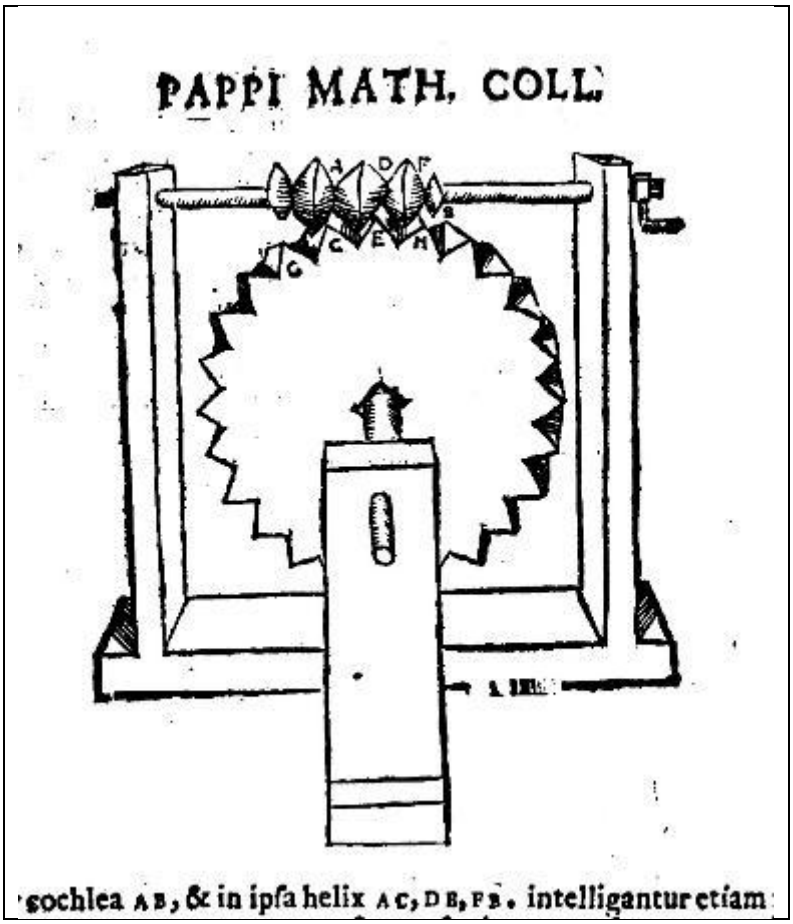


Dioptra is an ancient surveying and astronomical instrument.

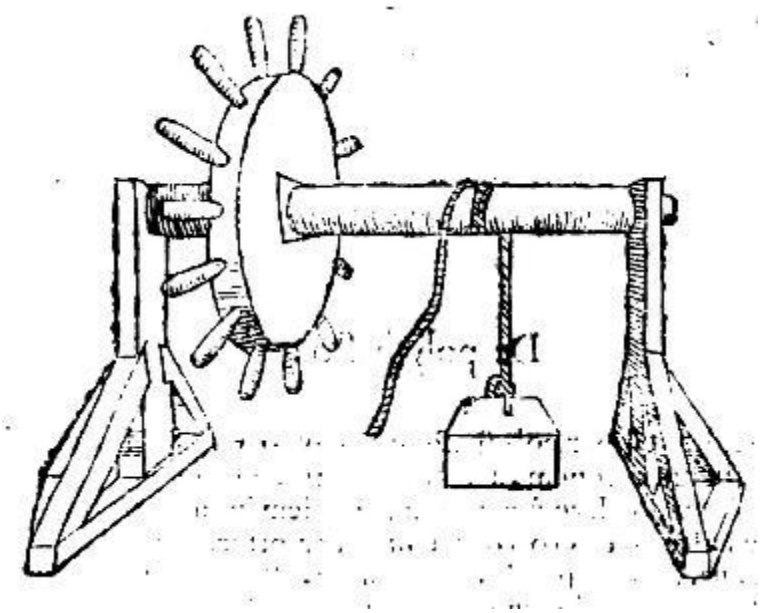
demonſtrauit Apollonius Pergæus; ſi igitur, & vtra
uæ deinceps ſunt vſque ad 8 bifariam ſecemus: & pe
es monoſtrophos, ab ipſis autem profunditatem quan
& à profunditate reliquum deſcriptæ helicis, facile h
olierimus, perfectam habebimus.



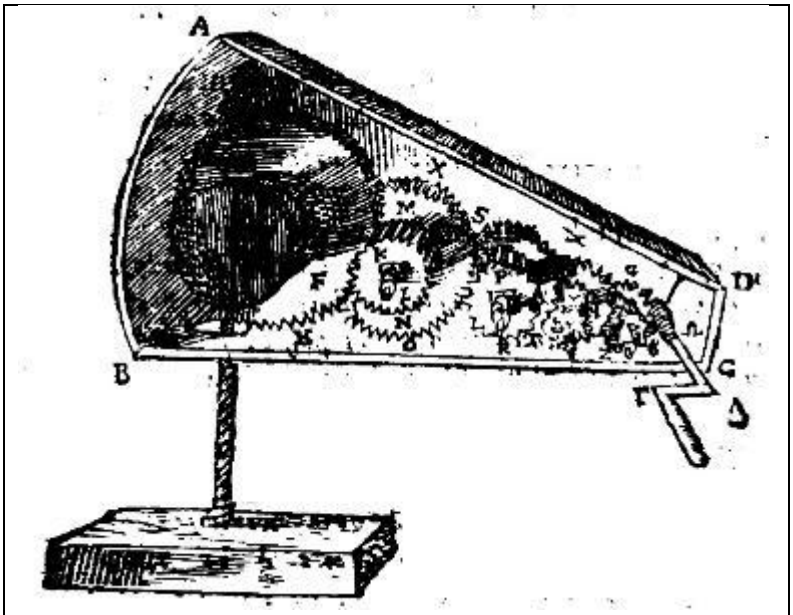
Gear construction by Pappus;



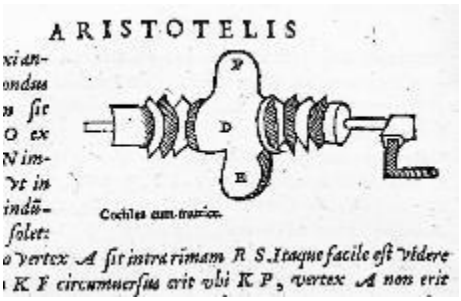
The book the mathematical synagogue of the Pappus of Alexandria instructs how to make complex structures, such as worm gears, like the one in the Mechanism of Antikythera.



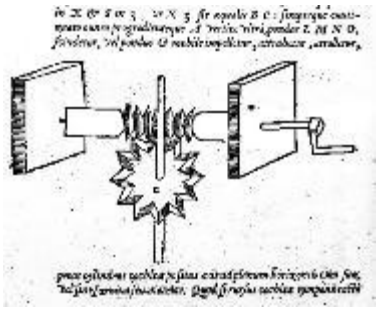
From the book the mathematical synagogue of the Pappus of Alexandria



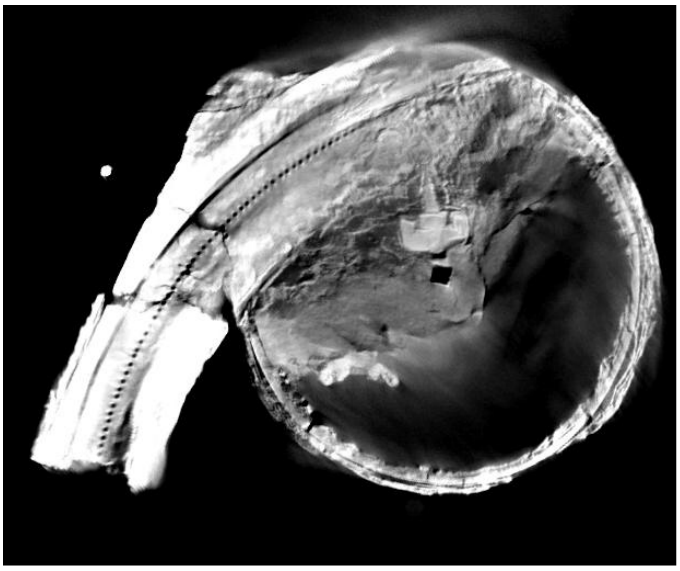
The book the mathematical synagogue of the Pappus of Alexandria gives both complex constructions and problems for the reader. Notice how complex this construction with numerous gears is



Worm shape from the older Latin version of Aristotle's Mechanics, Aikaterini Laskaridis Foundation.

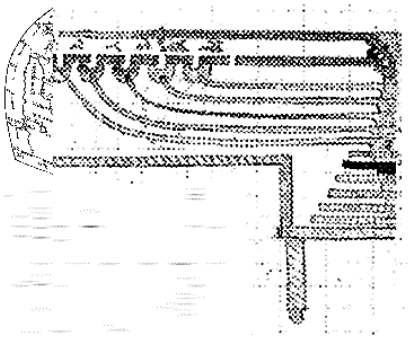


Composite machine with worm screw from the oldest Latin version of Aristotle's Mechanics, Aikaterini Laskaridis Foundation.



Section of the Mechanism with the 365 holes imaged with the X-Tek CT scanner Systems Bladerunner made especially for our study by Mr. Roger Hadland et al.

Image of ray device made by Democritus' nuclear physicist Char. Caracalos and obtained stereoscopic images of the Mechanism with which Derek de Solla Price made the study of the Mechanism with counts of the teeth of the gears by Emilia wife of Caracalos.



ΕΧΩ ΝΕΟΤΕΡΗ
A schematic of a planetarium by Albert Rhem, 1910

Να βγάλω νεότερη φωτογραφία
The Proclus house and philosophical school, south of Acropolis.

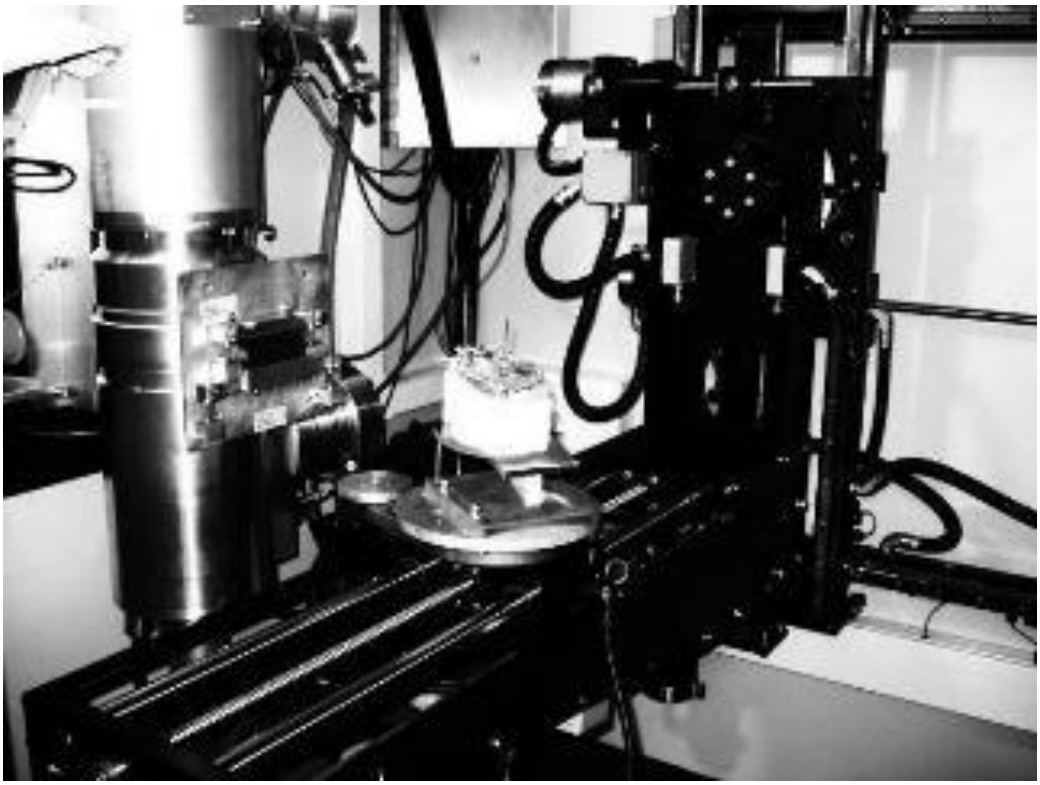
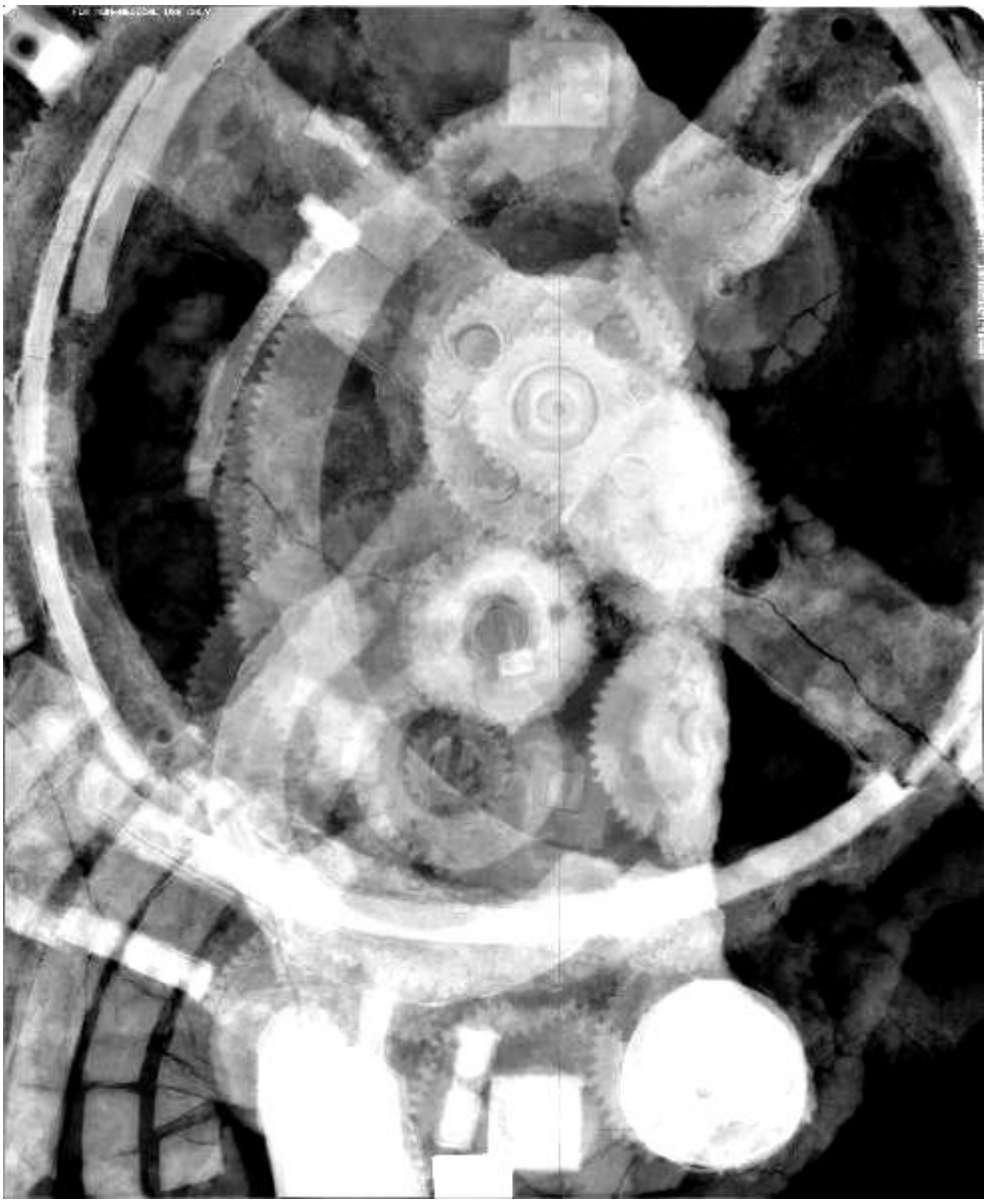


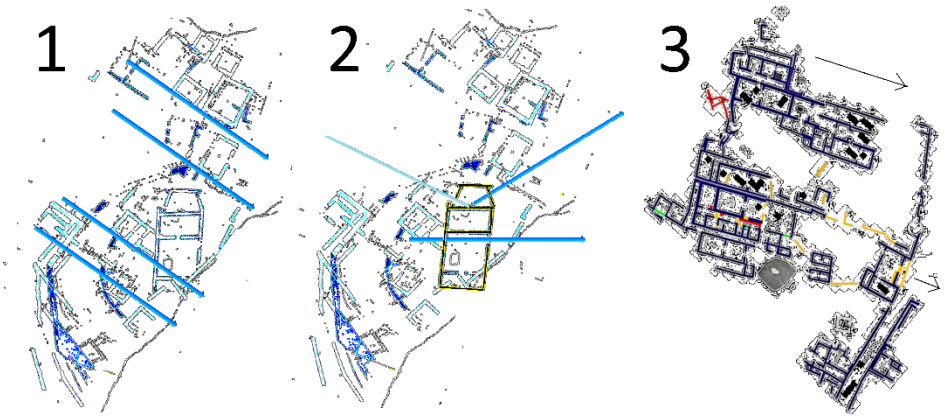
Photo of Proclus house (old photo 1955?)

The X-Tek Systems BladeRunner CT scanner with fragment A while we prepare it to take the measurements of 5000 X-ray images, which we process, composite and make the CTs on our computer and conduct our study.

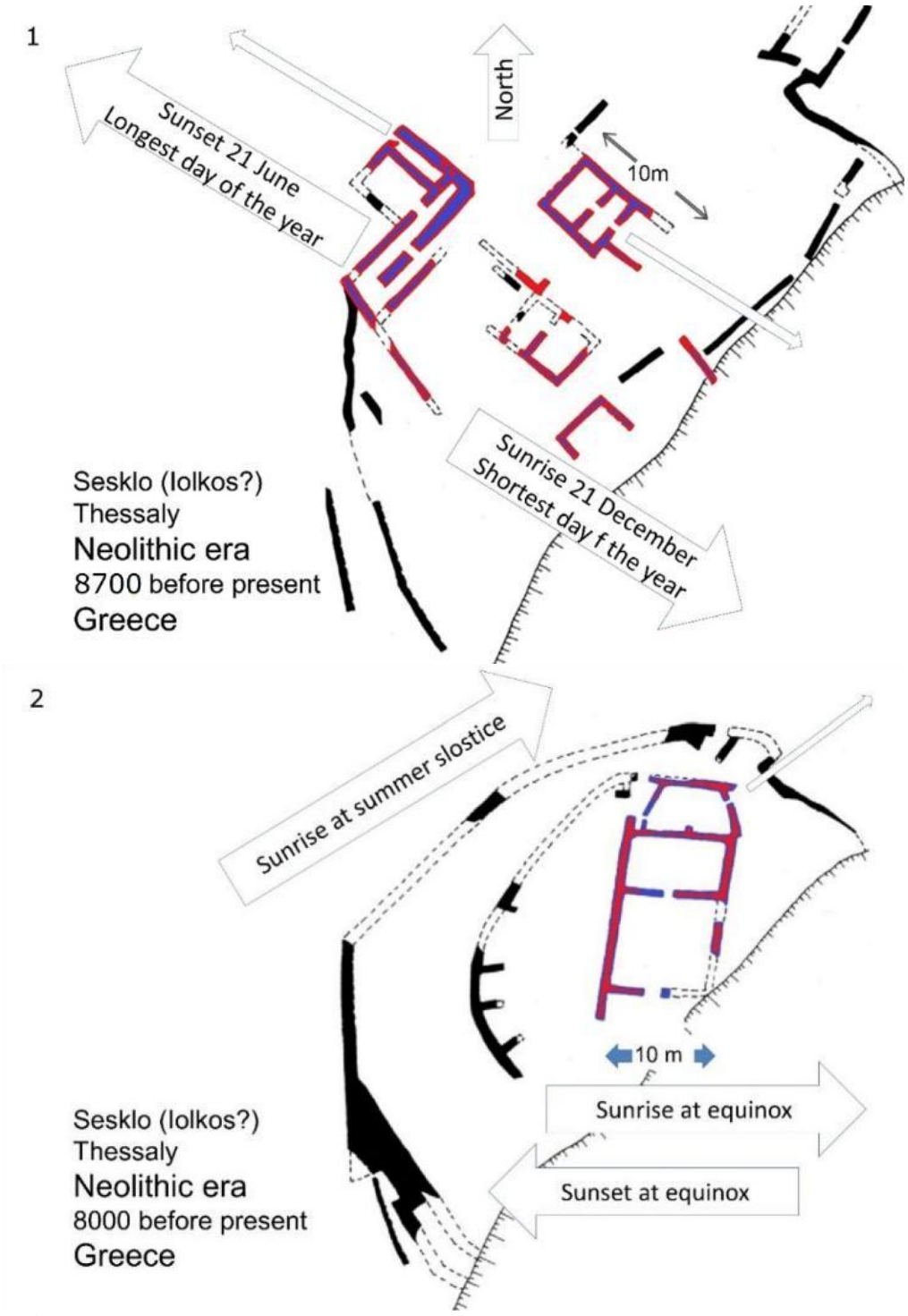


X-ray of the largest section A of the Antikythera Mechanism taken in mid-October 2005 at the National Archaeological Museum with the BladeRunner machine of X - Tek - Systems (now Nikon Metrology). Edit XDM.

Part of the scale of the eclipses can be distinguished concerning an eclipse of the Sun which will take place at 9 o'clock (Θ ωρ) and another of the Moon which (coincidentally) is expected to happen again at 9 o'clock (Θ ωρ). Measurements of eclipses were taken at Syracuse by Archimedes and his students. On the right is the color of the Moon during the eclipses (PYRRON, red).

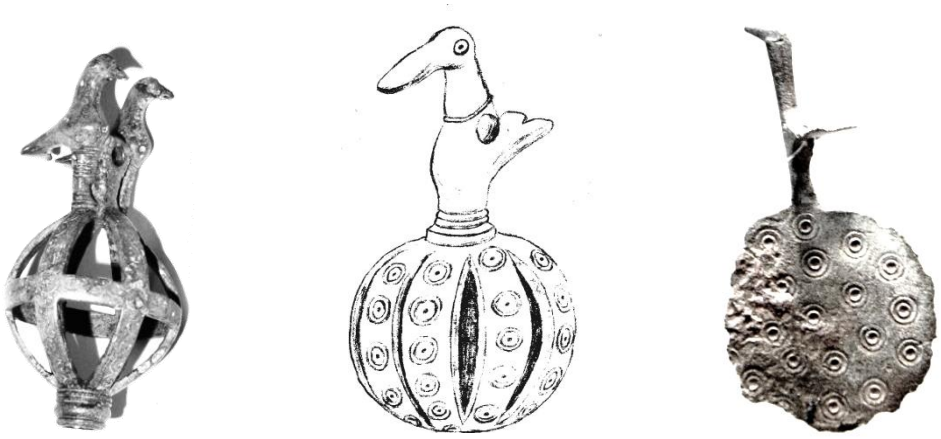


The astronomical orientation of the oldest Greek cities of Sesklo 1) during the first phase (6300 BC) all buildings took towards the sunrise at winter solstice (shortest day of the year), 2) during the second phase the megaroid looks towards the sunrise at the equinoxes. Astronomy begins worldwide and it is established in Greece during the 7th millennium BC.



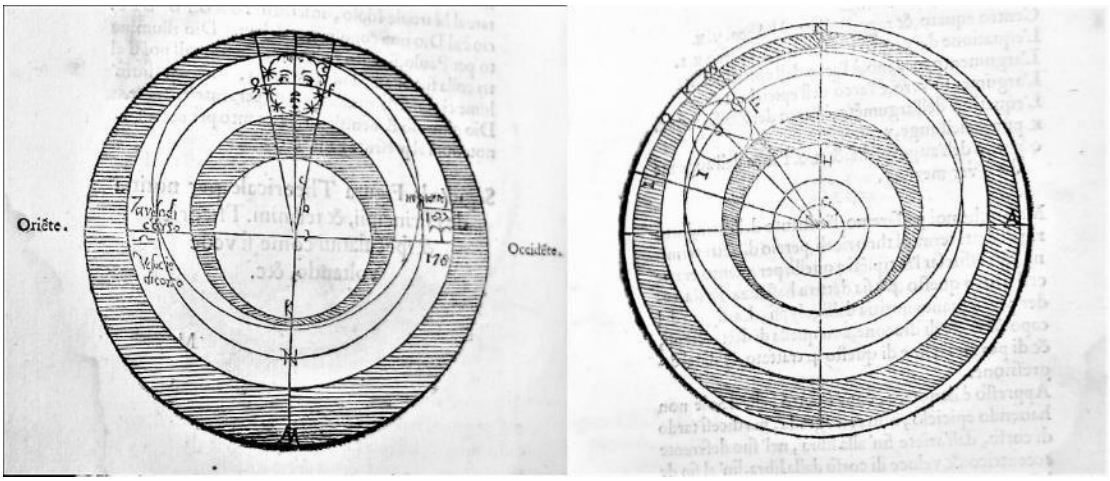
• Sesklo，Iolkos（？ ）。The oldest rectangular buildings in prehistory are oriented towards sunrise and sunset at the summer and winter solstices (1. in the first phase before 8500 years ago) and towards the highest point of the sun at the spring and autumn equinox (2. in the second phase around 8000 years ago), Thessaly, Greece.


Two disconnected statues, on the left the oldest large sculpture in Europe from Thessaly around 5000 BC and on the right a small statuette from one of many Peak Sanctuaries from Crete (2nr millennium BC). They show a continuation of a social tradition of sunrise observation to keep a proper calendar and predict the weather and time for cereal sowing. National Archaeological Museum and Archaeological Museum of Chania



Two prehistoric celestial spheres[1] and sky map from Thessaly, 8th century BC

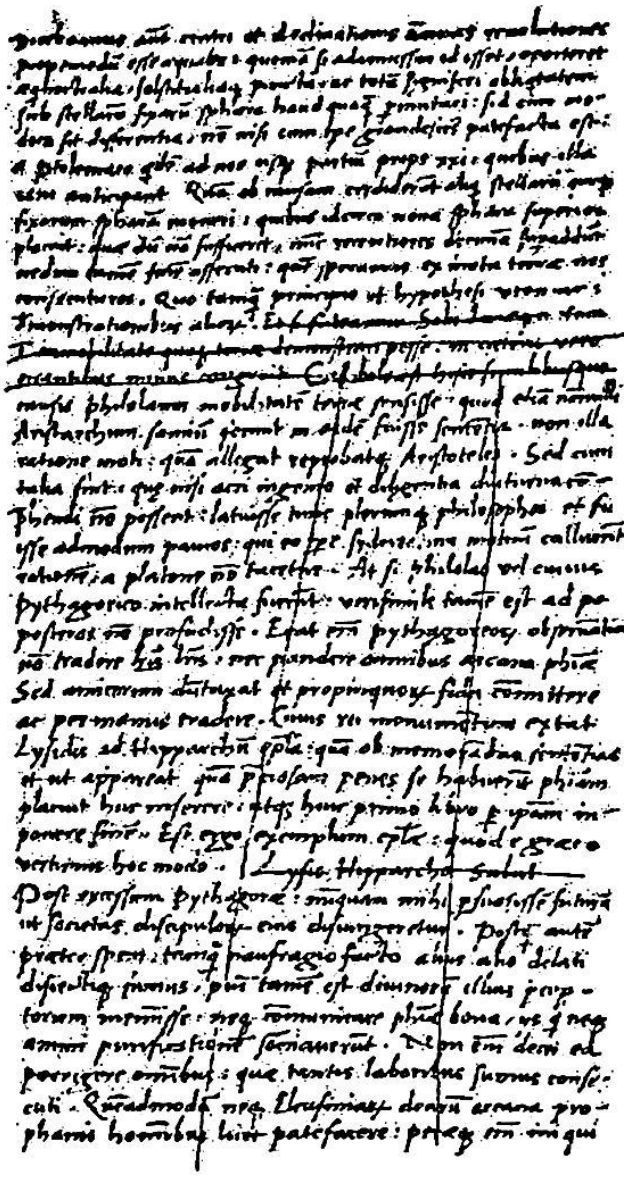
[1] Dimitrakoudis, S., Papaspyrou, P., Petoussis, V., και Moussas, X. 2006. *Archaic artifacts resembling celestial spheres*. Mediterranean Archaeology & Archaeometry, 6, 93-99.



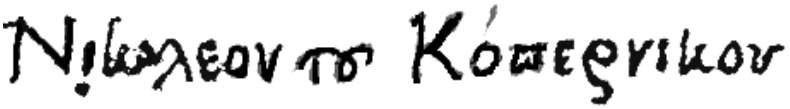
The epicyclical model of two planets described in Sakrobosco's book。 Sphaera Joannis de Sacrobosco, *: typis auctior quam antehac. praemissa Philippi Melanchtonis, praefatione, c.1550*

Photo with two of the gears of the Moon giving variable speed following Kepler's 2nd law

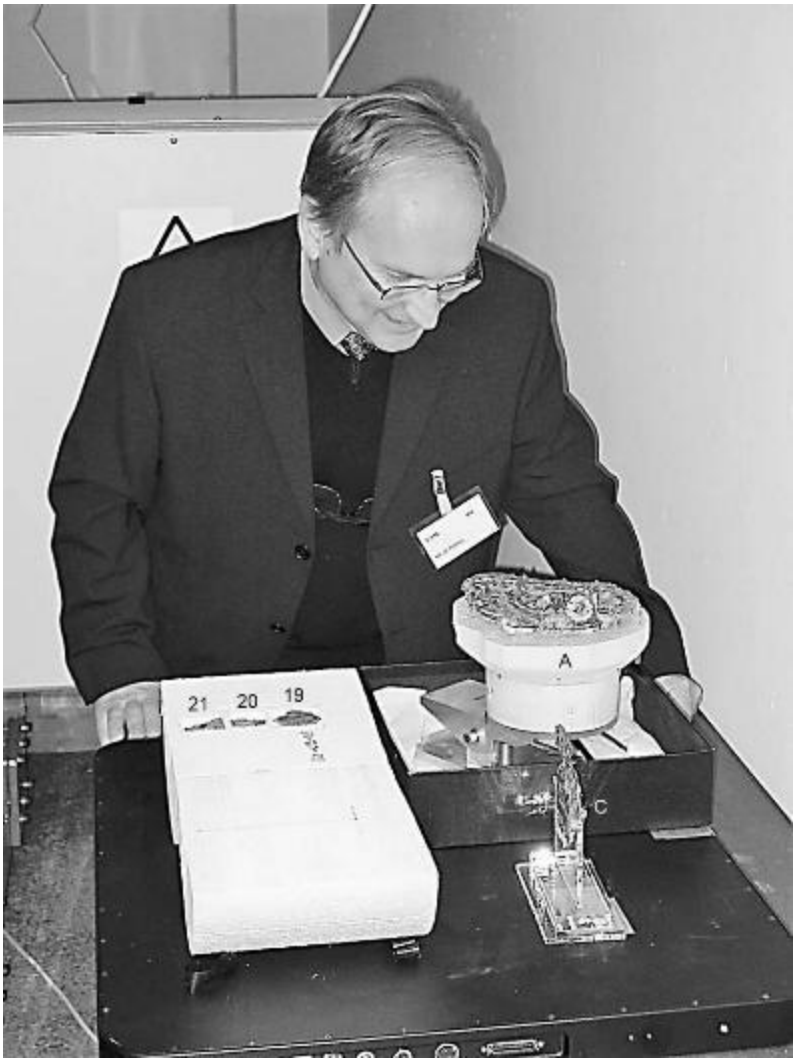
Astronomer Claudius Ptolemy



Copernicus' manuscript on the heliocentric system with references to Philolaus and Aristarchus, who first introduced heliocentric systems, dethroning the Earth. These paragraphs were later deleted, probably by its publisher.

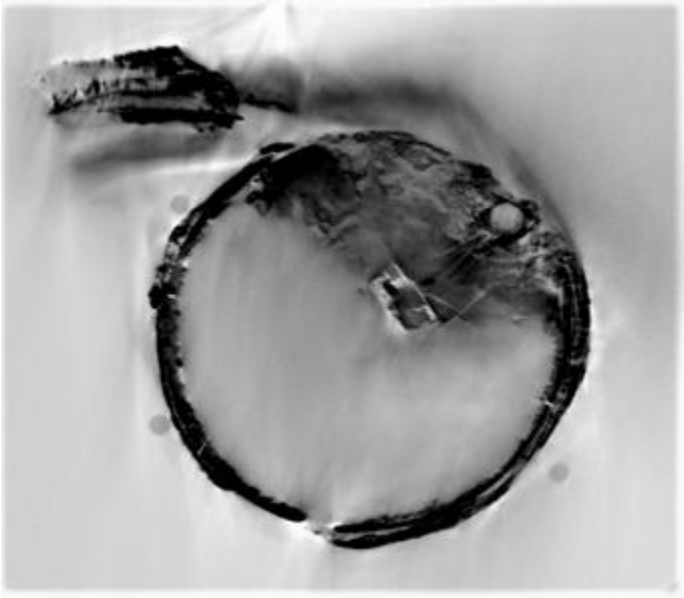


Nicolaus Copernicus' signature in Greek, an indication of the influence of Greek letters in Europe.

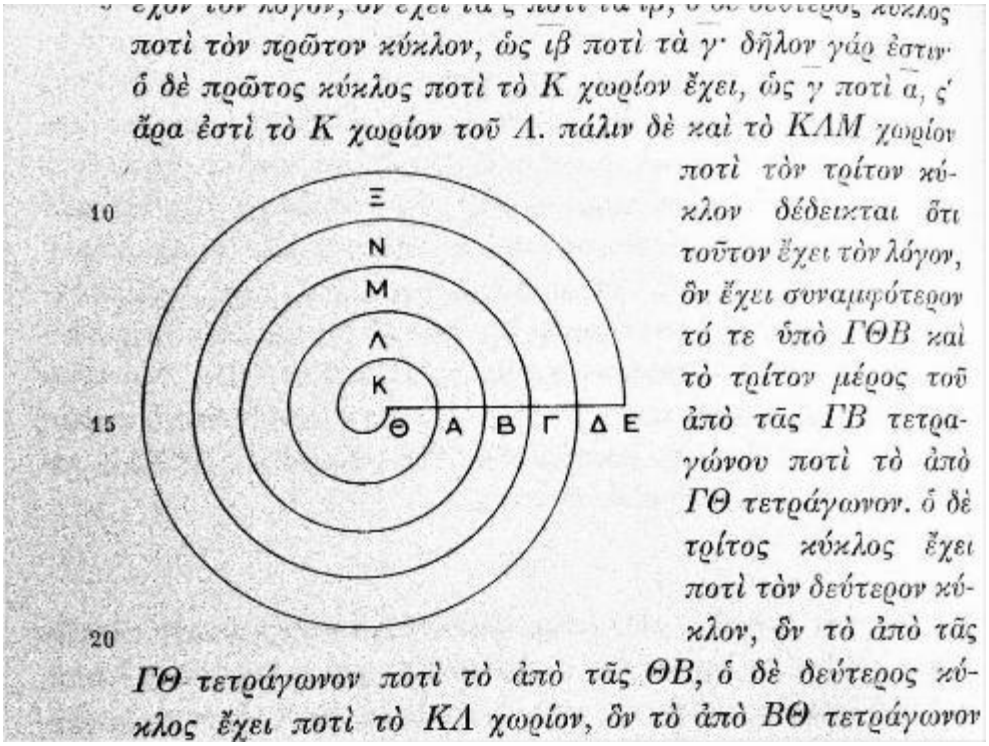


Xenophon Moussas at the National Archaeological Museum October 15, 2005, receiving the CT scans of the Antikythera Mechanism. The large piece A of the Mechanism with the wheel of the Sun can be seen on the round structure made of expanded polystyrene and in the rectangle three parts of the user manual (19, 20, 21), while in the front right part C of the Mechanism with the Moon and parts of the scale of the year and the zodiac sky map with the names of the signs and the ecliptic. Section 19 has the laws of physics that predict the phases of the Moon (cycle of Meton and Callippus) and eclipses of the sun and moon (cycle of Saros).

The two main concentric circular scales of the tropical year (with the Egyptian months written in Greek, then used as today we use Roman months) and the zodiac with the Signs which is a map of the sky. The two indicators, of the Sun, are distinguished, the little golden sphere [ΧΡΥΣΟΥΝ ΣΦΑΙΡΙΟΝ], as we read in the manual of the Mechanism, and of the Moon. Photo of a reconstruction of the Mechanism of the mathematician and maker of ancient instruments Mr. Dionysis Kriaris. The construction is based on the results of our studies.



CT scan of the Moon's gear train shown at upper right. The small silver Moon ball rotates around its axis with the help of the cylindrical gear seen in the center and changes phases during the month.

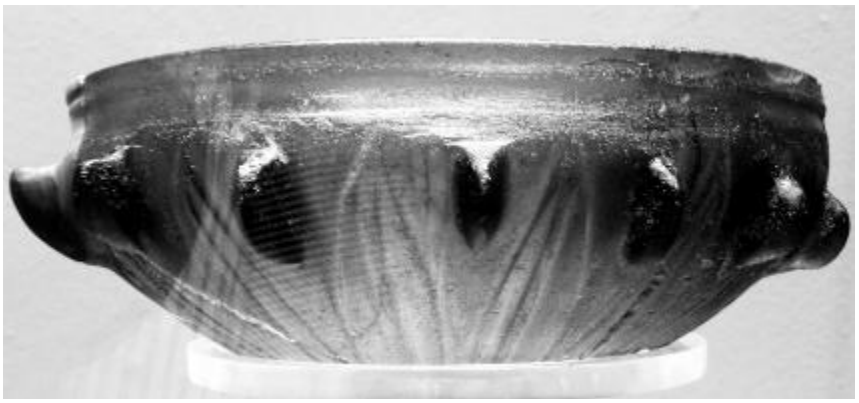


The scales of eclipses and the phases of the Moon are Archimedes' helices, like the one from Archimedes' book, [Archimedes works, Ev. Stamatis, Ed. TEE.]

The clock of Slovakia, exact copy of the original Prague clock.

The clock of Slovakia with the ring of 365 holes.

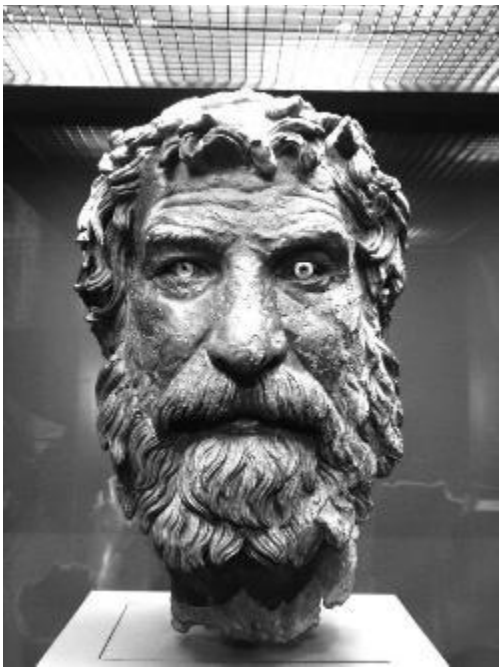

IMAGE OF THE MECHANISM



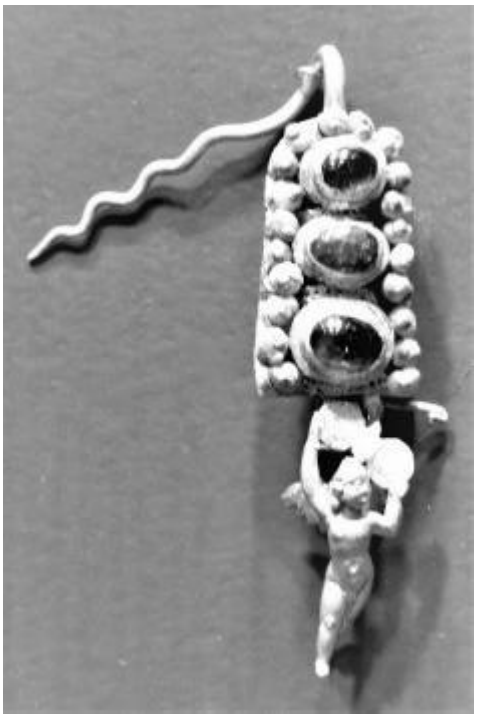
Ornate glass vase, part of the precious cargo of the ancient ship of the 1st century BC, which sank in Antikythera, is characteristic of the wealth carried by the huge shipwreck (National Archaeological Museum).

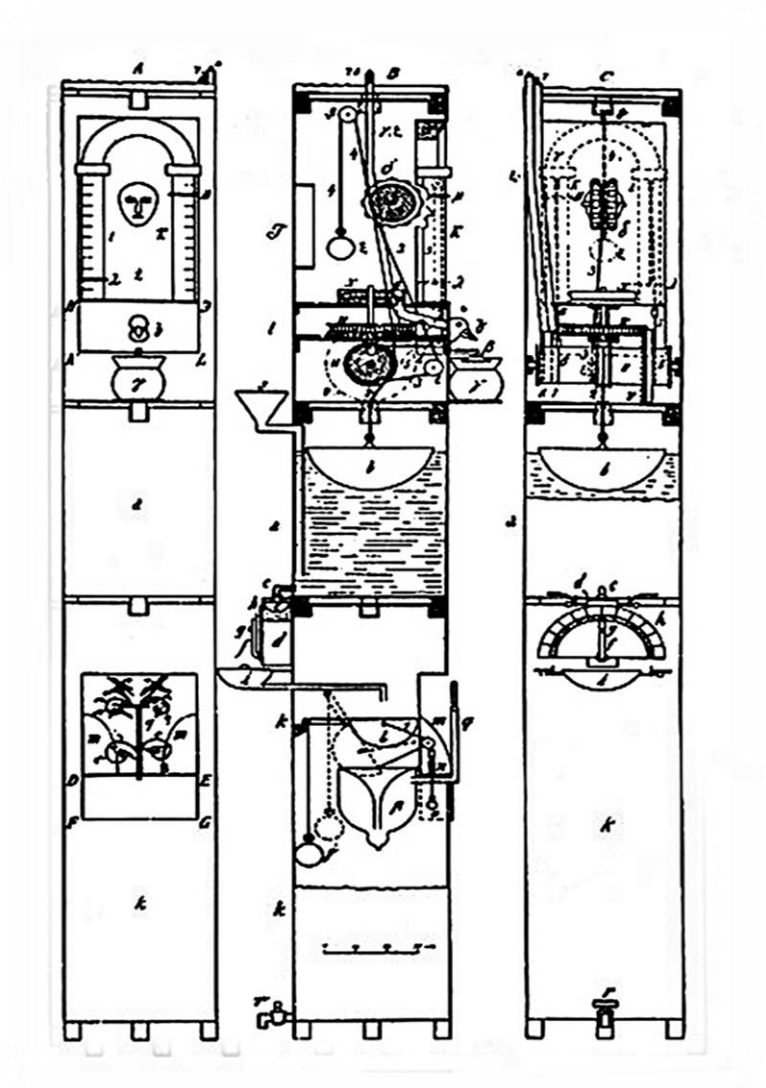
The sponge ship that found the ancient ~~huge~~ shipwreck~~ed~~ in Antikythera~~, which was almost always~~ (a former pirate base).

Officials on the underwater archaeological expedition to Antikythera, 1900.



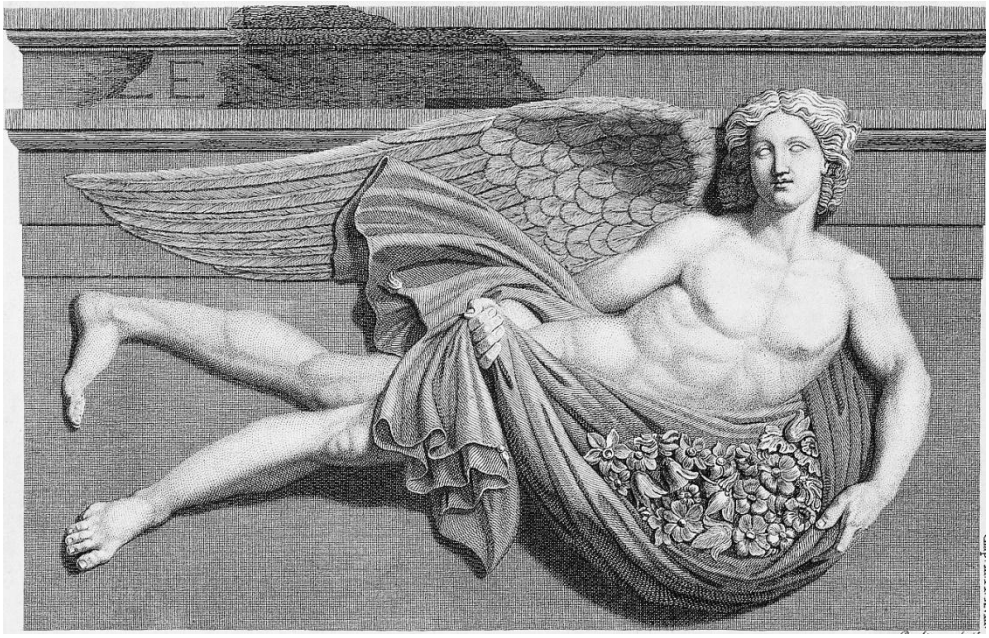
The very expressive and realistic so-called Philosopher of Antikythera (probably made between 250-200 BC). It is estimated that it may depict Bion the Borysthenite (325 BC in Olbia Pontica, Black Sea, Ukraine - 246 BC in Chalkis), who taught in Athens.



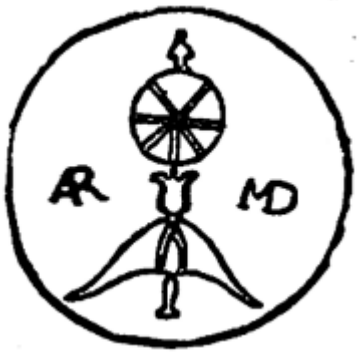


The mechanical clock with automations of Archimedes. It illustrates how it works with weights and counterweights, and hydraulic time regulator. From the book E. Stamatis, Ed. TEE.

The octagonal tower of the Athenian Clock of Andronicus. Archives of the Foundation Aikaterini Laskaridis. Stuart, James and Revett, Nicholas. The Antiquities of Athens measured and delineated by James Stuart FRS and FSA and Nicholas Revett painters and architects, volume I, London, John Haberkorn, 1762.



Zephyr, Archives of the Foundation Aikaterini Laskaridis. Stuart, James και Revett, Nicholas. The Antiquities of Athens measured and delineated by James Stuart F.R.S. and F.S.A. and Nicholas Revett painters and architects, I, John Haberkorn, 1762.



Portrait of Archimedes and one of his celestial mechanical spheres from the Syracuse mint

The Minoan Astronomical Computer (1800 BC) is a mold to construct metallic objects believed to be a portable calendar machine and eclipse calculator. In the image the main circular part of the mechanism and a smaller part. The Minoan astronomical calculator. It determines the phases of the Moon, the beginning of each month, and predicts eclipses. Archaeological Museum of Heraklion. (Tsikritsis et al. 2013, MAA). Archaeological Museum of Heraklion.

Cricoid sphere of Plato. Credit: Astronomy: Ptolemy and Euclid with an armillary sphere between them. Engraving. Wellcome Collection

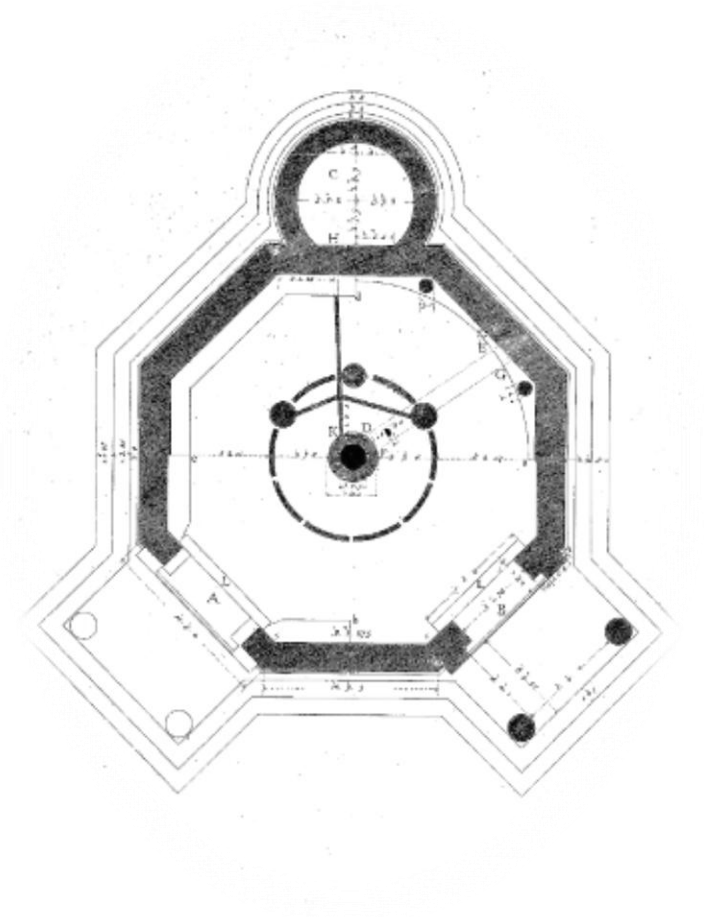
Hipparchus in a Roman time coin of Necaea (Hipparchus of Nicaea; c. 190–c. 120 BC), Greek astronomer, geographer and mathematician, founder of trigonometry and discoverer of the precession of the equinoxes. Hipparchus is depicted in the back facet of a coin whose front facet shows the Roman emperor Severus Alexander (: Marcus Aurelius Alexandros Augustus) (image source: Visconti, 1817).

The Lips, southwest wind, propels a ship whose stern it holds. From the Winds to the Clock of Andronikos, Aikaterini Laskaridis Foundation Archive.. Stuart, James και Revett, Nicholas. The Antiquities of Athens measured and delineated by James Stuart F.R.S. and F.S.A. and Nicholas Revett painters and architects, I, John Haberkorn, 1762.

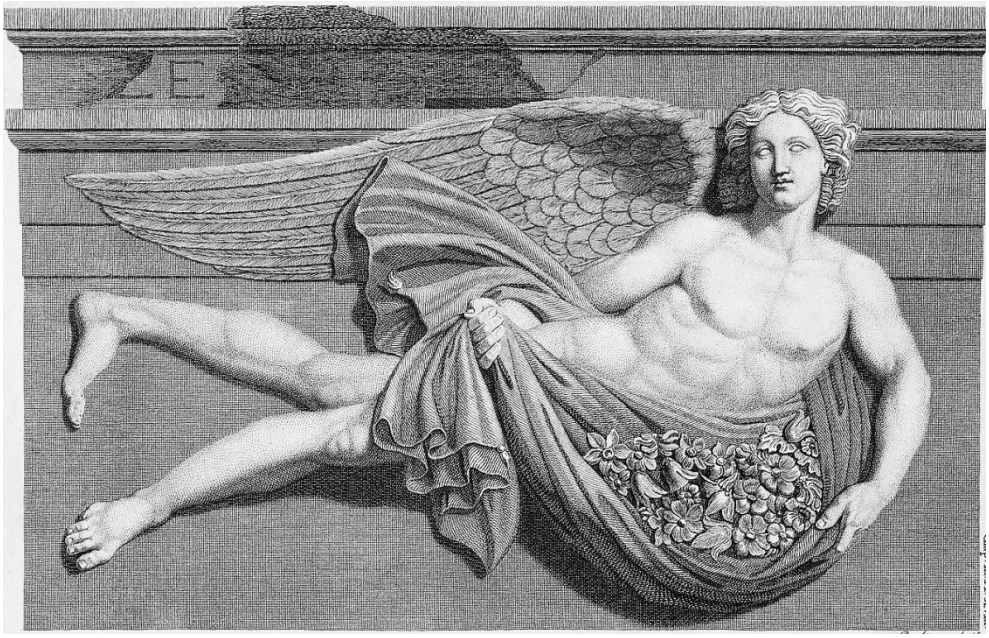
The eastern wind Apiliotis from the clock of Andronicus, c. 100 BC, Athens. Aikaterini Laskaridis Foundation Archive.. S*tuart, James και* R*evett*, Nicholas. The Antiquities of Athens measured and delineated by James Stuart F.R.S. and F.S.A. and Nicholas Revett painters and architects, I, John Haberkorn, 1762.

Skiron is the north-west wind in the Clock of Andronicus. Credit: Image of Foundation Aikatrini Laskaridis. From the book of Stuart, James and Revett, Nicholas. The Antiquities of Athens measured and delineated by James Stuart FRS and FSA and Nicholas Revett painters and architects, vol. I, London, John Haberkorn, 1762.

Boreas, The North Wind of the Winds or Clock of Andronicus. Aikaterini Laskaridis Foundation Archive.. Stuart, James και Revett, Nicholas. The Antiquities of Athens measured and delineated by James Stuart F.R.S. and F.S.A. and Nicholas Revett painters and architects, I, John Haberkorn, 1762.

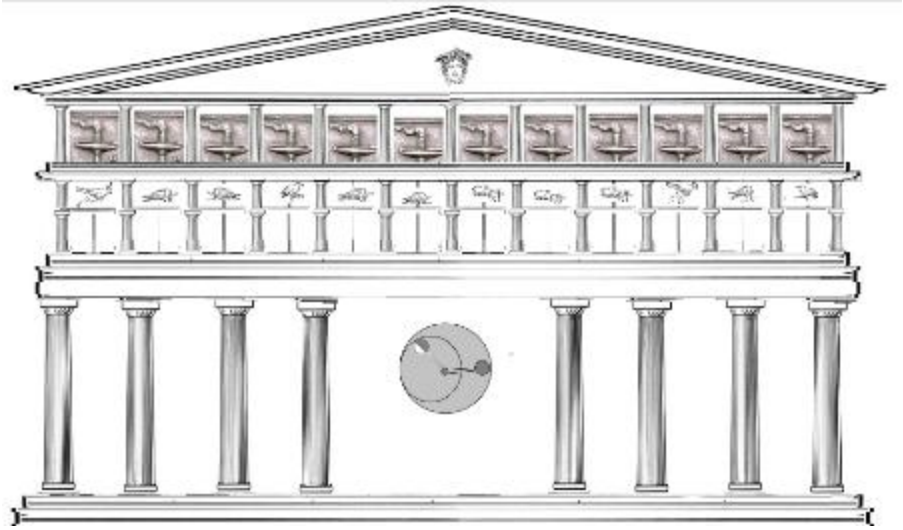


The Clock of Andronicus. The system with the grooves can be seen on the floor. Image credit: Foundation Aik. Laskaridis. From the book Stuart, James and Revett, Nicholas. The Antiquities of Athens measured and delineated by James Stuart FRS and FSA and Nicholas Revett painters and architects, vol. I,



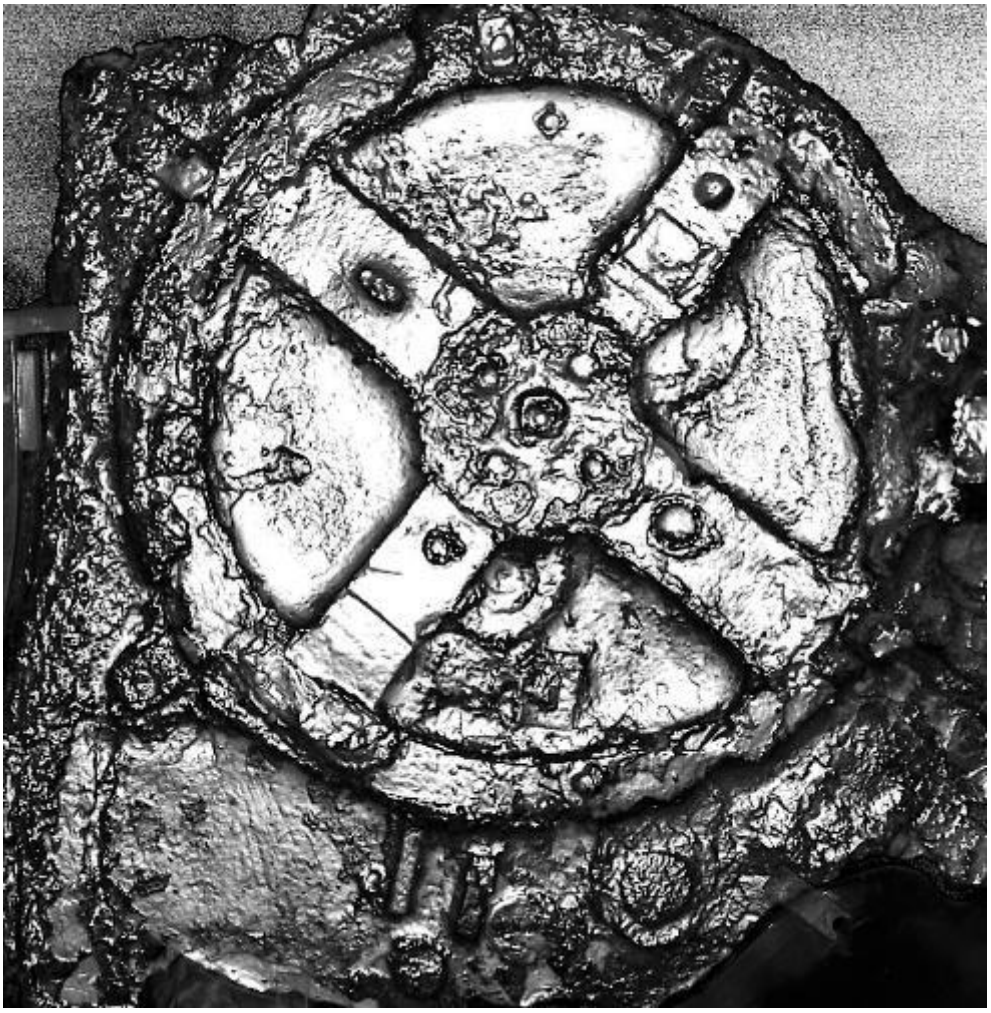
Zephyr, west wind from the Towerof Winds, the Clock of Andronicus. Aikaterini Laskaridi Foundation Archive. Stuart, James και Revett, Nicholas. The Antiquities of Athens measured and delineated by James Stuart F.R.S. and F.S.A. and Nicholas Revett painters and architects, τ. Ι, Λονδίνο, John Haberkorn, 1762.

Stonehenge, a prehistoric astronomical observatory used for weather prediction based on a solar calendar.

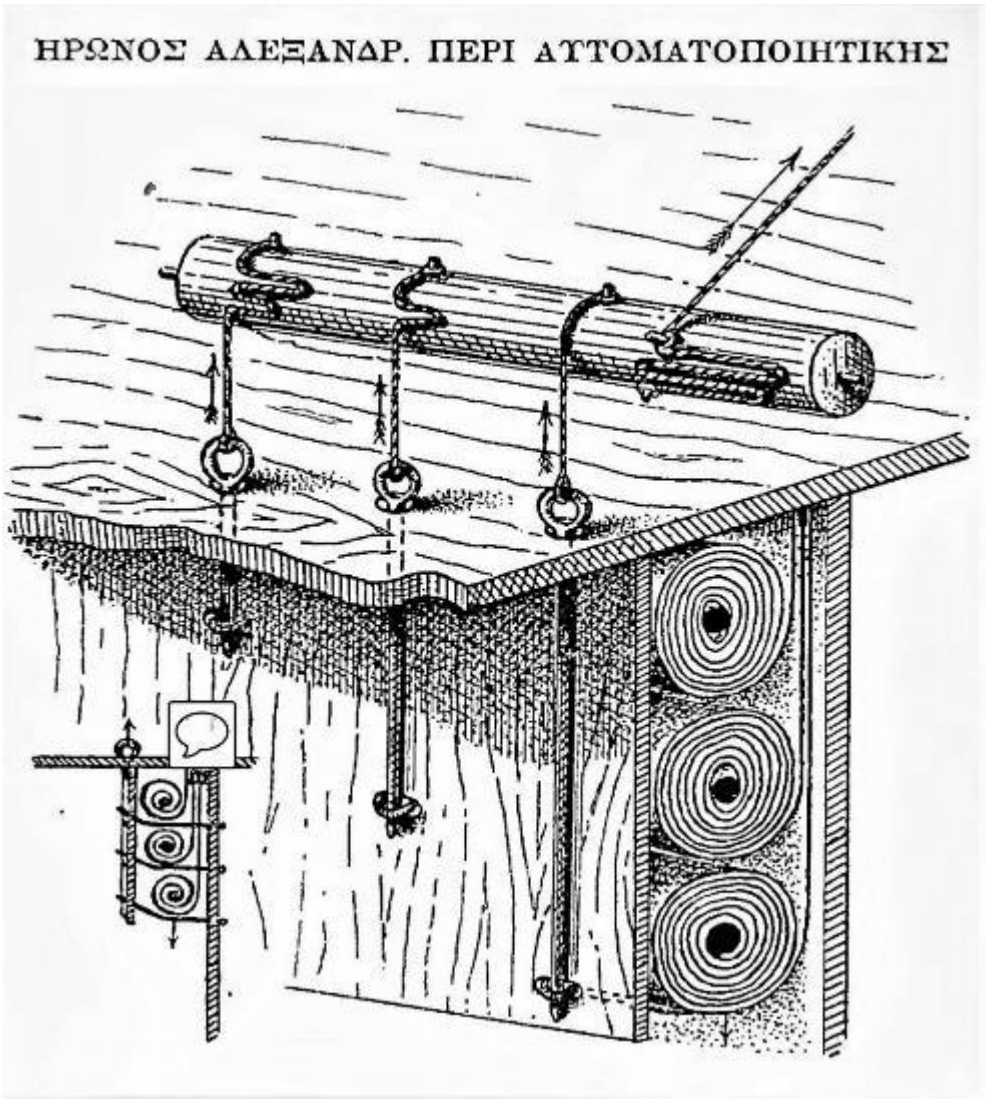


The Gaza Clock. It was probably made by the philosopher, physicist, mathematician, and architect of Hagia Sophia Anthemius of Tralles around 520 AD.

The author presenting a lecture at a college in England.

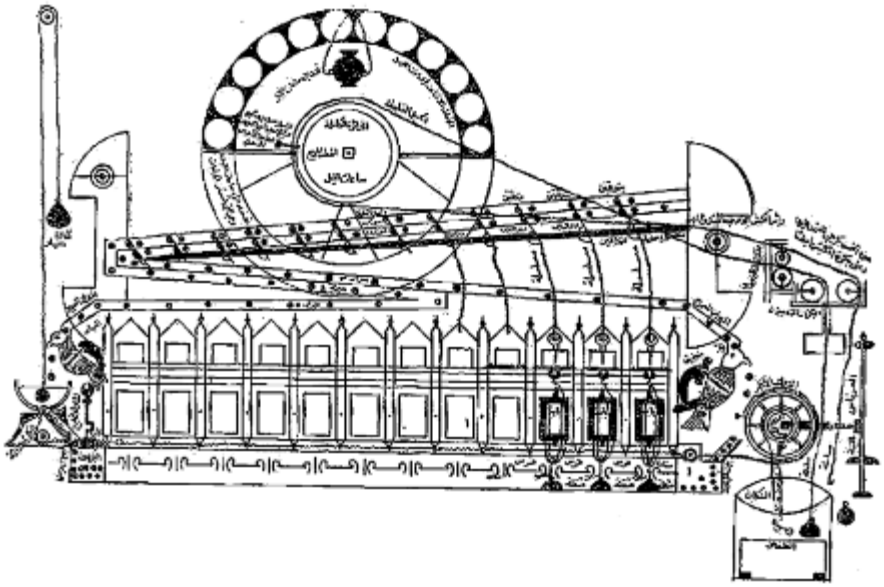


The wheel of the Sun, the largest cog of the Antikythera Mechanism



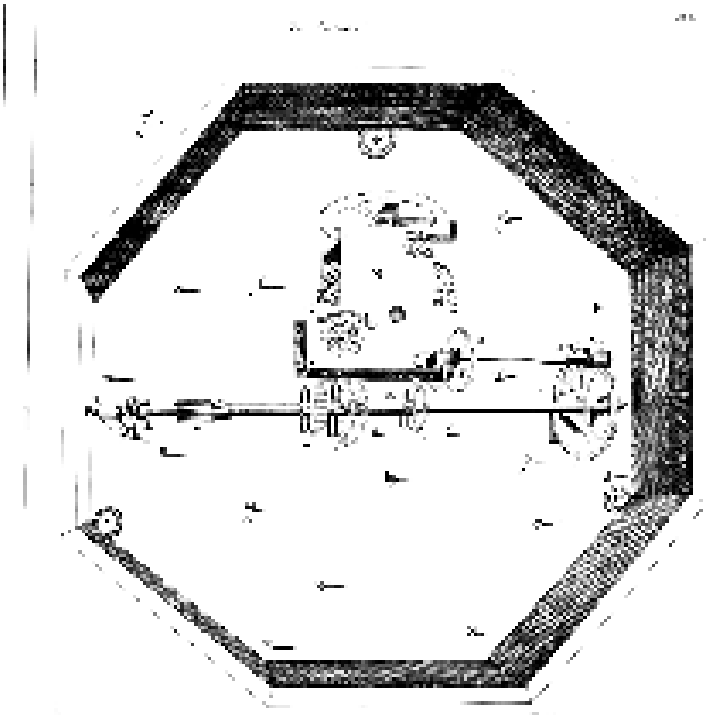
System of automated change of scenery in an automatic theater designed by Hero. Using ropes wrapped around a cylinder rotating at given times, causing the scenery to change as the play progresses. A similar system was used by the clock of Gaza to make Hercules act and the doors open at the hour, the Yazid clock of the clockmaker Muhammad al-Saati of the Umayyad Mosque in Damascus, and the Al-Jazaari clock.

Byzantine period ancient sundial calendar mechanism (around 500 AD) worked by gears. Programmed to work for various latitudes and cities (Alexandria, Antioch, Rhodes, Athens, Sicily, Thessaly, Rome, Dalmatia, Caesarea). Reconstruction of Dionysis Kriaris. The original is at the Science Museum London.

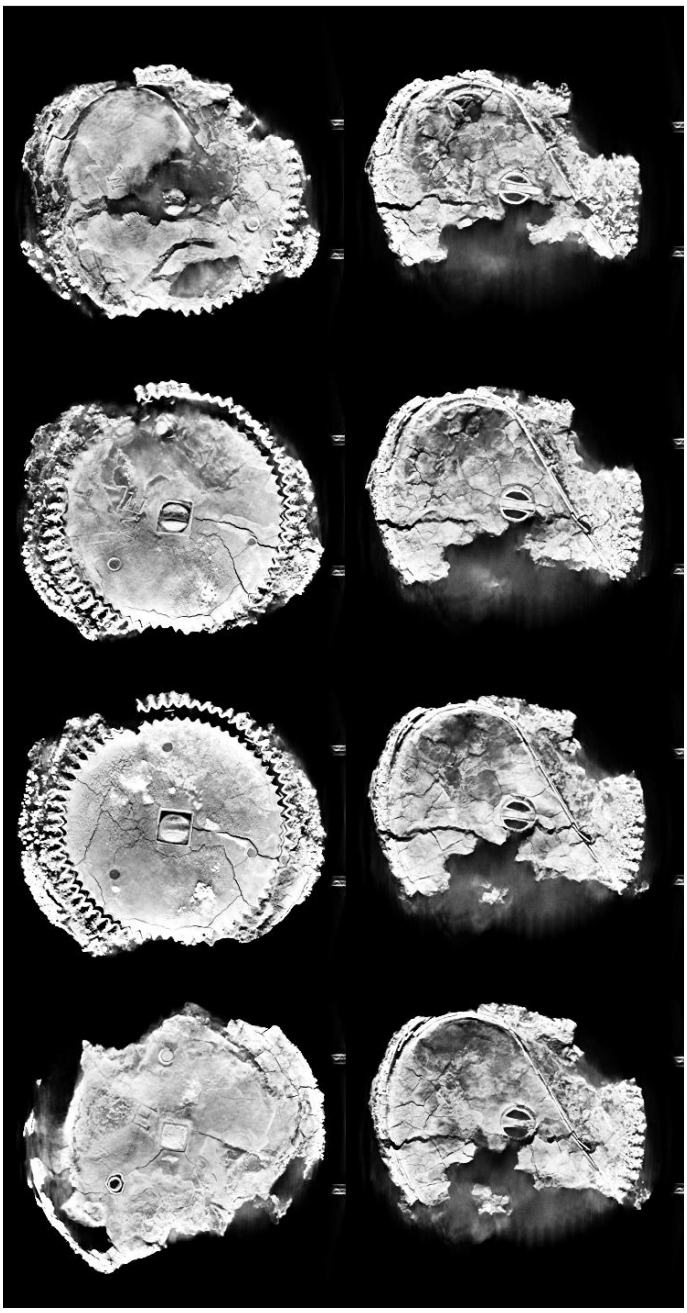


The famous clock of Ridhwan al-Saati, described in 1203 like the clock of Al-Jazari based on the clock of Archimedes and Gaza. The movement is regulated by changing the position of a float in a water tank with a weight and counterweight system tied to a rope wrapped around a cylinder that powers the clock. Automations such as opening a door every hour are similarly driven by twelve ropes of varying lengths wound around a cylinder rotating at a constant rate.
https://en.wikipedia.org/wiki/File:Ridhwan_al-Saati_clock.jpg

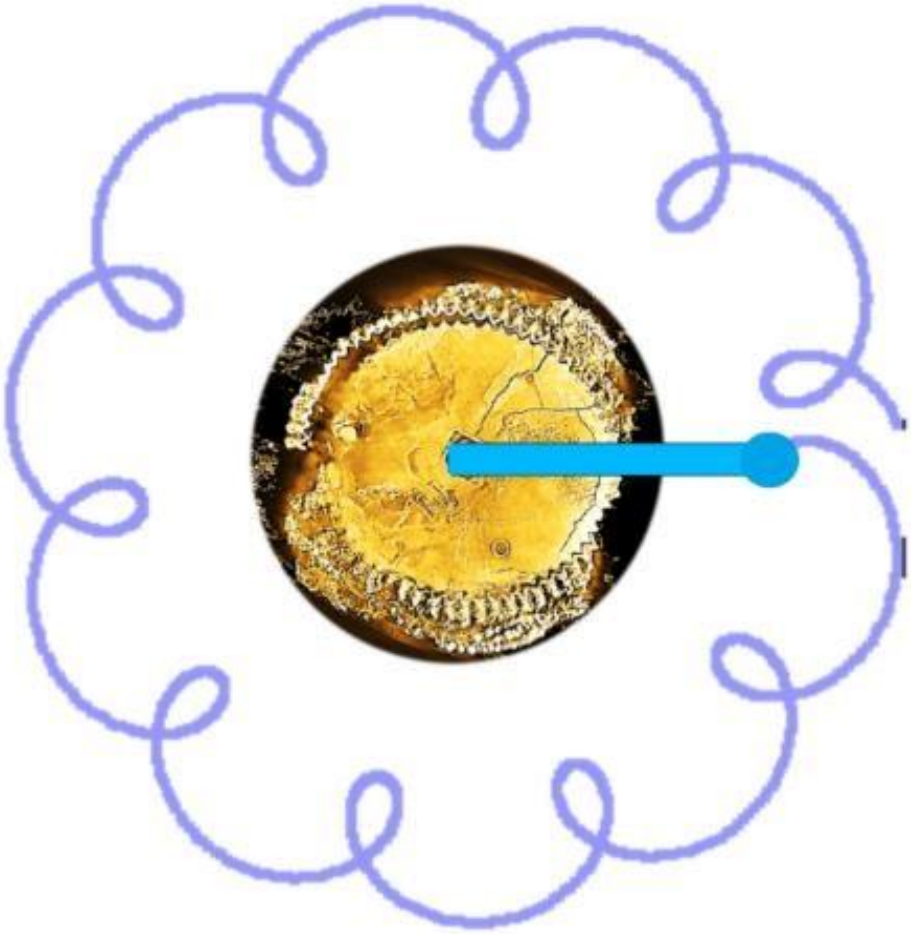
The clock Al-Jazzari or the elephant clock. A water clock constructed by theIsmail Al-Jazari (1136–1206). from The Book of Knowledge of Ingenious Mechanical Devices. Image from Wikipedia [Al-jazari_elephant_clock.png (1013×1587) (wikimedia.org)]



Huygens planetarium 1703 (from his book “Descriptio Automati Planetarii,” in Opuscula Posthuma, digitized by Goolge).

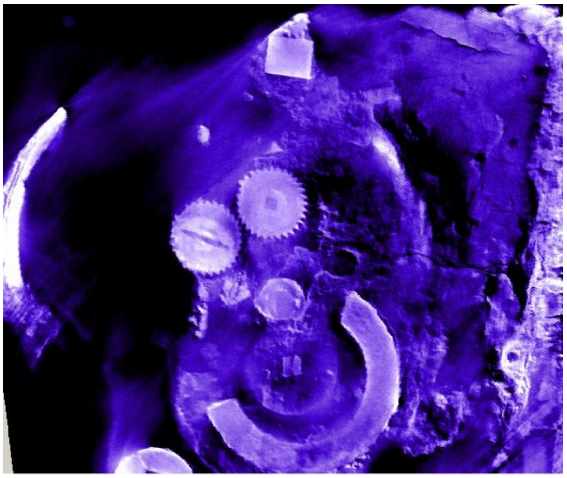


Sequential cuts (CTs) of the fragment D of the mechanism. The complex axis of rotation is visible in several sections. The nails that connect the inner gear with the lid of the almost cylindrical outer box. The nails are hollow, that is, made of a copper tube. On the right below is also the ellipsoid object and the laminate surrounding the ellipsoid.

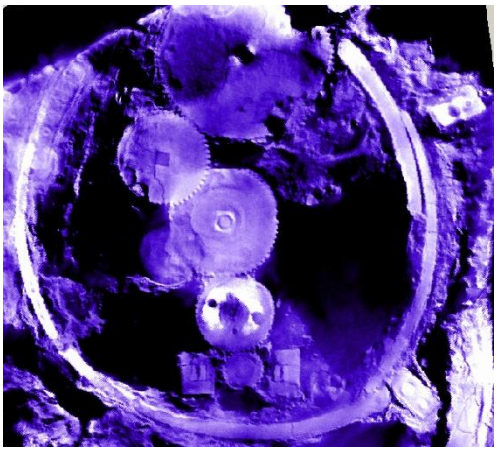


Jupiter's orbital motion can be reproduced with epicycles by fragment . In this schematic diagram the orbit is exaggerated forclarity.

Icelandic Antikythera Mechanisms. wooden calendar mechanisms c.1780. credit: the National Archaeological Museum of Iceland.

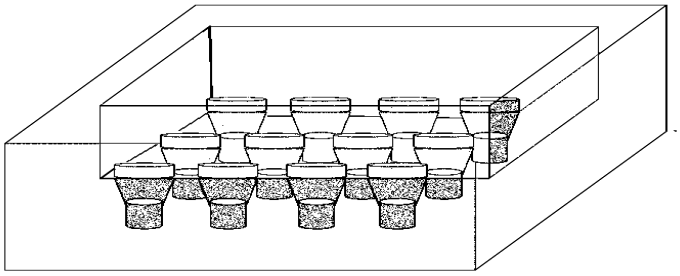


Section of the mechanism showing many gears, and two types of washers, one about semicircular that is at the bottom between two gears so that they do not touch each other. Similarly to the left is an uneven thickness bronze bow (safety or maintenance plate), often used in pocket watches made in the 17th and 18th centuries. Illustrated with the X-Tek Systems BladeRunner CT scanner made especially for our study by Dr. Roger Hadland and his colleagues.



Another section of the Mechanism that shows many cogs. We can clearly distinguish a horseshoe washer that looks light in the middle bottom, placed between two gears so that they do not touch each other. Similarly left, right, below are shown three uneven thick bronze arches, which are fuses or maintenance plates, often used

Golden chapel with Dionysus and satyr of the Antikythera Mechanism. Most likely, the Mechanism, which, as we learn, cost many times its weight in gold, had externally the form of such a chapel.



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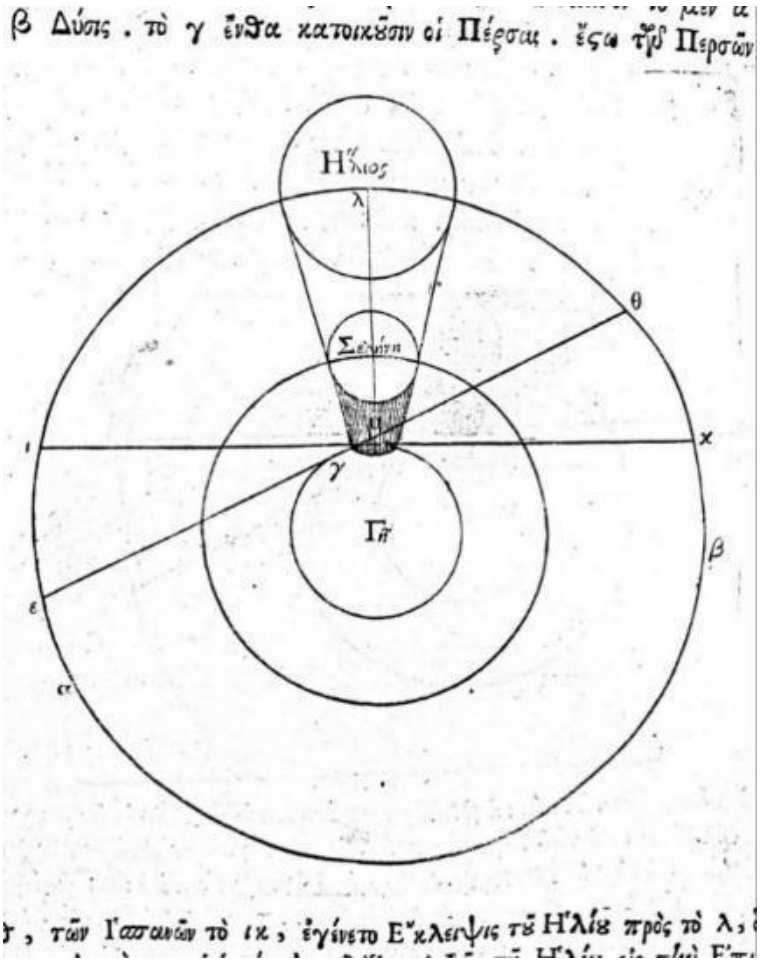
Possible automation system with 12 valves. A rectangular carved stone object measuring about 28×20×5 cm, with a hollow rectangle of 15×9×3 cm carved in the middle of the longest side, which has at its bottom 12 parallel conical holes aligned in three rows. Each conical hole has the form of a truncated cone. The large diameter inside the hollow of the stone is around two centimeters and the small one, which ends in a narrow opening at the base of the stone, has a diameter of about 10 to 13 millimeters.



Philosophers recognize that during solar eclipses, it is the Moon that stands between the Sun and the Earth and that the earth is spherical, as its shadow is a circle and that the nature of the moon is similar to the nature of the earth (Thales).

Ancient observers, "astronomers" observing the sunrise from a mountain peak. Archaeological Museum of Chania, Greece.

Ancient "astronomers" may have observed the rising sun in the cave of Dascalio on the Greek island of Kalymnos in the Aegean Archipelago.

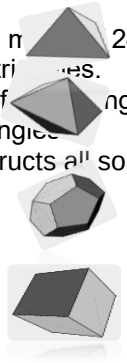
Pythagoras was writing one of his theorems, while Theano recorded on her tablet the sound of harmony and the universe (detail of the Academy of Athens), painted by Raphael, frescoes, Signature Hall, Vatican, Papal Palace, 1509.

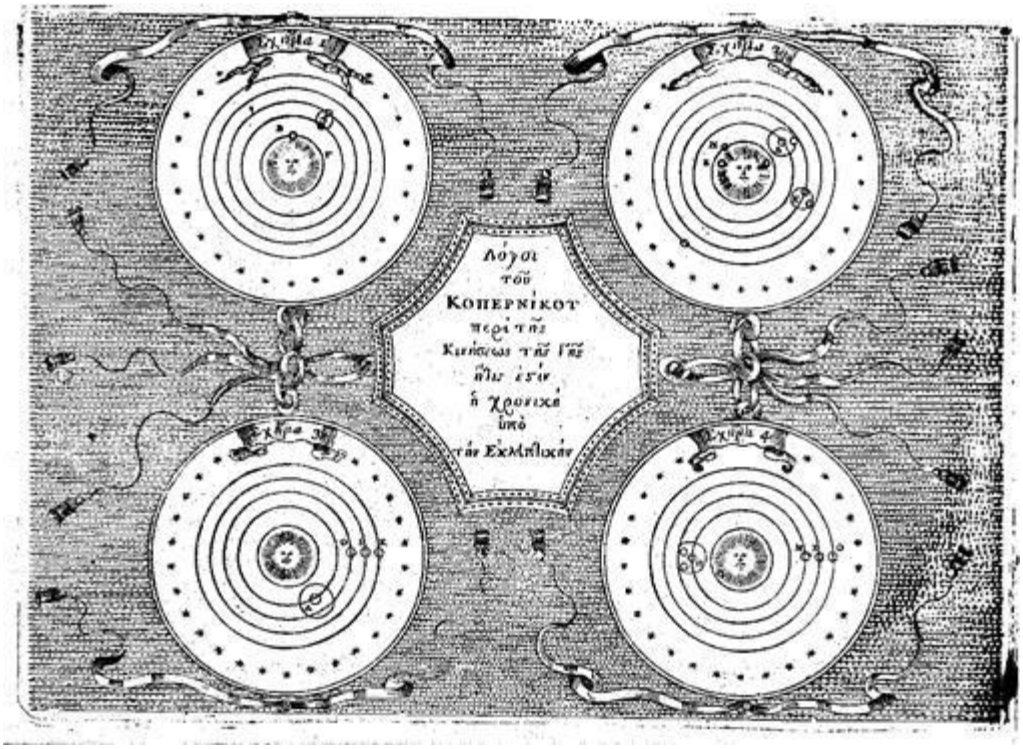
Plato's chemical elements and quarks

Let's look at his chemical elements or Plato's atoms:

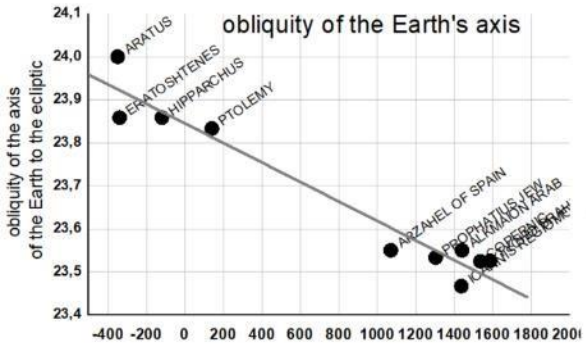
1. The tetrahedron or pyramid, which is the "chemical element fire", is m[illegible] 24 triangles.
2. The octahedron, which is its "chemical element air", is made of 48 tri[illegible]es.
3. The icosahedron, which is the "chemical element water", is made of [illegible]ngles.
4. The cube, which is the "chemical element earth", is made of 24 triangle[illegible]

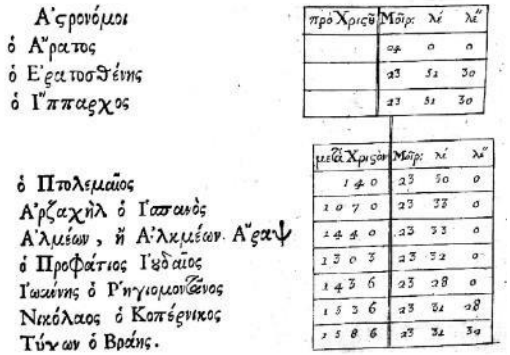
The two right triangles with which Plato constructs all solids (let's call them "chemical elements") are Plato's "quarks".



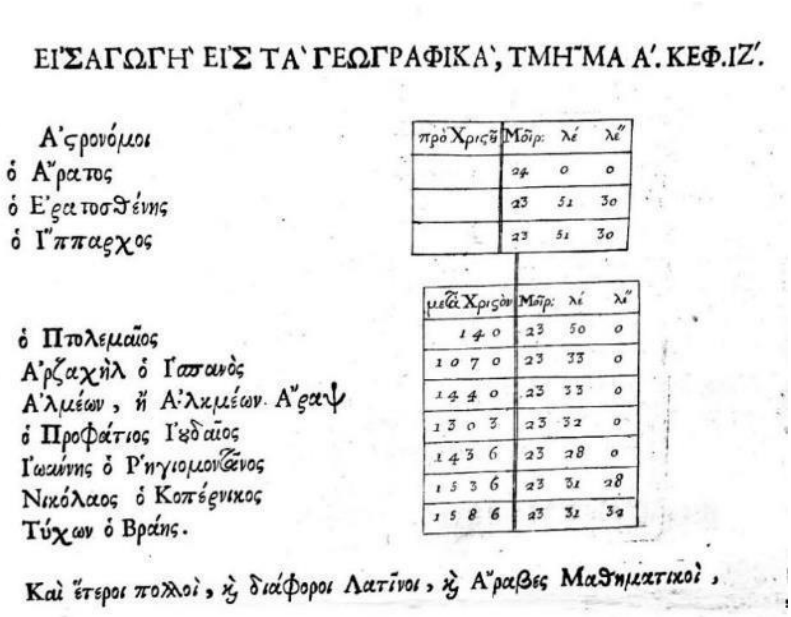


Four images show why heliocentrism is the best description of the solar system. Quoted from the book of Chryssanthos Notaras, circa 1700 AD.





The inclination of the Earth's axis to the plane of orbit that revolves around the Sun, varies with time. Table with observations from various philosophers over time.



ΕΙΣΑΓΩΓΗ ΕΙΣ ΤΑ ΓΕΩΓΡΑΦΙΚΑ, ΤΜΗΜΑ Α'. ΚΕΦ.ΙΖ'.

Α'στρονόμοι
ὁ Α'ρατος
ὁ Ε'ρατοσθένης
ὁ Γ''ππαρχος

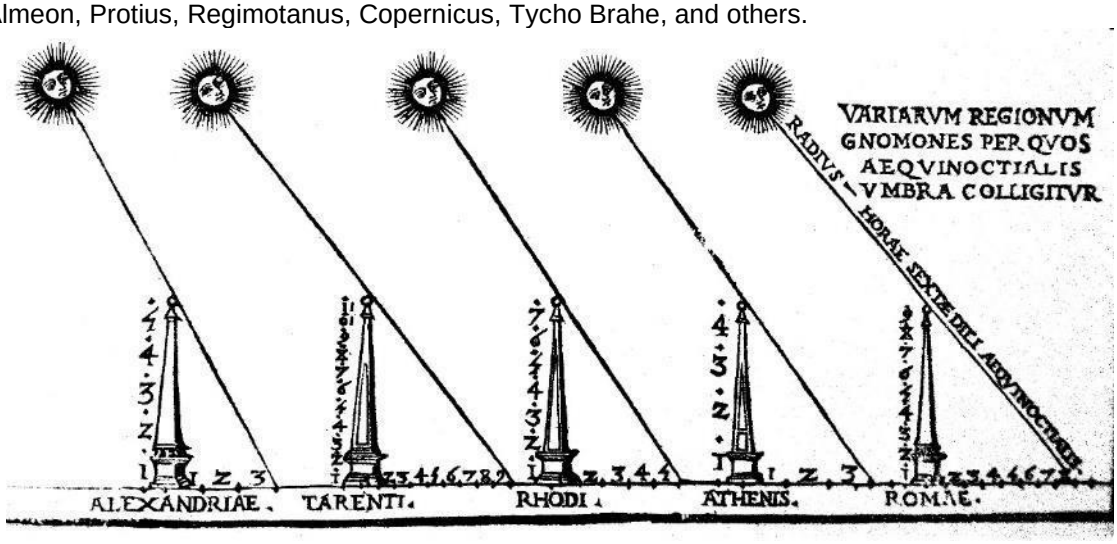
ὁ Πτολεμαῖος
Α'ρζαχὴλ ὁ Γαττανὸς
Α'λμεών, ἢ Α'λκμέων. Α''ραψ
ὁ Προφάτιος Γεδδαῖος
Γωώννης ὁ Ρ'ηγιομοντάνος
Νικόλαος ὁ Κοπέρνικος
Τύχων ὁ Βράης.

Καὶ ἕτεροι πολλοὶ, καὶ διάφοροι Λατῖνοι, καὶ Α''ραβες Μαθηματικοὶ,

πρὸ Χριστοῦ	Μοῖρ:	λέ	λε''
	24	0	0
	23	51	30
	23	51	30

μετὰ Χριστὸν	Μοῖρ:	λέ	λε''
140	23	50	0
1070	23	33	0
1440	23	33	0
1303	23	32	0
1436	23	28	0
1536	23	31	28
1586	23	31	31

Greek astronomers and many later generations measured changes in the angle of inclination of the Earth's axis relative to the ecliptic. The table shows observations from Eratosthenes, Arratus, Hippax, Ptolemy, Ajascher, Almeon, Protius, Regimotanus, Copernicus, Tycho Brahe, and others.

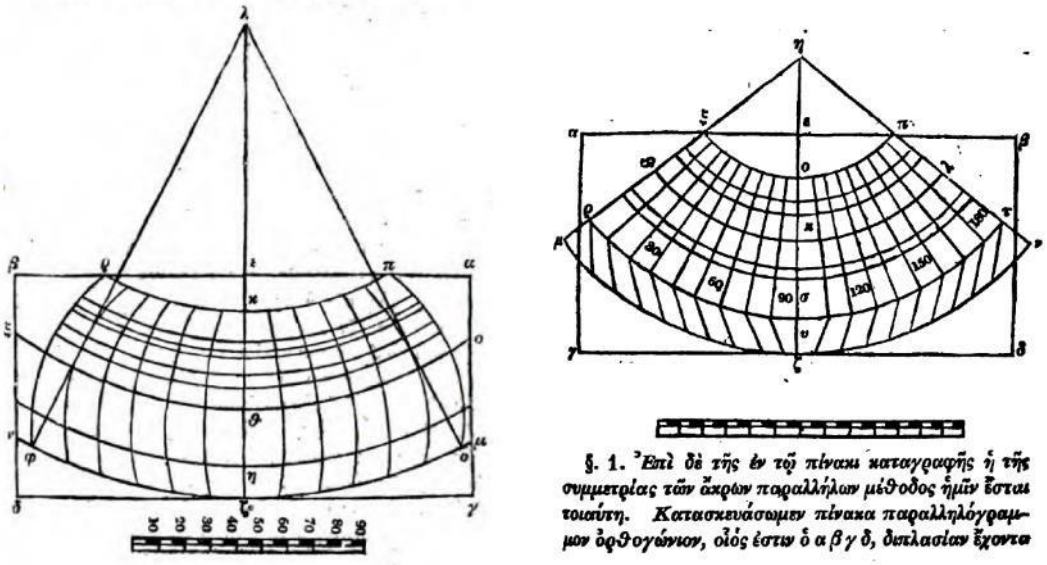


In the Northern Hemisphere, the inclination of the sun's rays increases if it moves north. Latitude is measured by triangulation.

, Greek astronomers and many later generations measured changes in the angle of inclination of the Earth's axis relative to the ecliptic. The table shows the names of Elotosthenes, Aratu, Hippax, Ptolemy, Ajascher, Almeon, Plotius, Regimotanus, Copernicus, and TychoValues observed by Brahe et al.

ά.	ἡ Περίμετρος τῆς Γῆς περιέχει ὡς; λέγει	
ὁ Ἀριστοτέλης	Στάδια Μίλια	4 0 0 0 0 0 0 5 0 0 0 0
ὁ Ἵππαρχος	Στάδια Μίλια	2 7 7 0 0 0 0 3 4 6 2 5
ὁ Ἐρατοσθένης	Στάδια Μίλια	2 5 2 0 0 0 0 3 1 5 0 0
ὁ Πτολεμαῖος	Στάδια Μίλια	1 8 0 0 0 0 0 2 2 5 0 0
ὁ Ἀλφραγᾶνος	Στάδια Μίλια	1 6 3 2 0 0 0 2 0 4 0 0
ὁ Φερνέλιος	Στάδια Μίλια	1 9 6 1 1 4 $\frac{8}{25}$ 0 2 4 5 1 4 $\frac{20}{100}$
οἱ Νεώτεροι	Στάδια Μίλια	1 5 2 6 4 0 0 1 9 0 8 0

Many philosophers have measured the circumference of a spherical earth by various methods.



§. 1. Ἐπὶ δὲ τῆς ἐν τῷ πίνακι καταγραφῆς ἡ τῆς συμμετρίας τῶν ἄκρων παραλλήλων μέθοδος ἡμῖν ἔστω τοιαύτη. Κατασκευάσωμεν πίνακα παραλληλόγραμμον ὀρθογώνιον, οἷός ἐστιν ὁ α β γ δ, διπλασίαν ἔχοντα

Using Hipparchus' method, Ptolemy developed good maps projecting the sphere of the Earth onto the planar surface of a map using two cones (on the right).

The Asian part of the map of Greece, based on the ancient geographer Dionysus. 1700