

Astronomical Function of the 59-Hole Boards in the Lunar-Solar Synchronism

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[A few authors have pointed out scattered evidence of certain astronomical associations in some of the ancient Egyptian game boards. This article studies data to sustain that the ancient Egyptian slab, known as 59-hole board, is not a game, as it has been interpreted, but an astronomical instrument to register solar and lunar cycles. The number and the disposition of the holes, the spiritual-astronomical symbolism of the iconography at the boards, the correspondence of the marks at the orifices with the days of the main Egyptian festivities, the parallelisms between the registering system of the slab and the later Greek and Roman calendars known as *parapegmata*, offer evidences to maintain that the 59-hole board was a calendrical tool for the lunar-solar synchronism. After the Greek and Roman calendars with holes were in use, a different version of the 59-hole original board appeared in Egypt during the sixth century.]

Keywords: 59-hole boards, Ancient Egyptian Calendars.

1. Introduction

Scattered evidence of certain astronomical associations, in some of the ancient Egyptian game boards, has been pointed out by a few authors.¹ As a number of publications have already studied the slab-type Egyptian games and their recreational function,² only a brief allusion to them is necessary here, since the purpose of this study is not to deal with instruments for entertainment, but to maintain that the main function of the so-called 59-hole board was calendrical. The main spiritual, astronomical and astrological

1. Piccione, *The Historical Development of the Game of Senet and its Significance for Egyptian Religion*. Chicago, 1990; Finkel, "La Tablette des Règles du Jeu Royal d'Ur", *Jouer dans L'Antiquité*. (André et al, Ed.) Marseille, 1992, 154-155, p. 154; Griffiths, in Plutarch, *De Iside et Osiride* (J. Gwyn Griffiths trans.), Swansea, 1970, 12, 293; Hornung, "Zeitliches Jenseits", *Eranos Jahrbuch*, 47 (1978) 269-307, p. 271; Kendall, "Règles du Jeu", *Jouer dans L'Antiquité*, (André et al. Ed.) Marseille, 1992, 45, 160; Pieper, "Das Brettspiel der alten Aegypten", *Wissenschaftliche Beilage zum Jahresbericht des Königsstädtischen Realgymnasiums zu Berlin* (1909), 112; "Ein text über das ägyptische brettspiel", *Zeitschrift für ägyptische Sprache und Altertumskunde*, 66 (1931) 15-33, pp. 16, 29-32.

2. Hoerth, *Game boards in the ancient Near East*. Chicago, 1961; Pusch, *Das Senet-brettspiel im alten Ägypten*, vol. I: *Das inschriftliche und archäologische Material*, Munich, Berlin, 1979; Decker, *Sport und Spiel im alten Ägypten*, Munich, 1987; *Sports and Games of Ancient Egypt*, New Haven, 1990, 134-35; Decker & Herb, *Bildatlas zum Sport im alten Aegypten*, Leiden, 1994, 683-86; André et al. (Ed.) *Jouer dans l'antiquité*, Marseille, 1992.

references to some of the board-games are listed here, while the suggestions of the authors on the details of their playful function are excluded.

1.1 *The mehen board*

The *mehen* board is a disc in the form of a coiled serpent, with the head in the centre of a spiral divided in square segments. It was used from the Predynastic Period (c. 5000-3150) until the end of the Old Empire (c. 2700-2200) and during the XXVI Dynasty (c. 672-525). The use of the board has been associated to the after death spiritual resurrection.

1.2 *The 20-square game*

The 20-square game has a 12-square row, flanked by two 4-square rows. Some boards are attested from the middle of the third millennium in Mesopotamia. Egyptian boards of the XVII Dynasty (c.1650-1522) have been found. Jéquier and Kendall have suggested that the board could appear among the representations of two tombs of Beni-Hassan from the XII Dynasty (c. 1991-1785).³

Finkel studied the instructions on how to play a game contained in a Mesopotamian cuneiform inscription, clearly related to astrology with an aim at prediction. Following the author's interpretation, it probably was the 20-square game⁴ and their draughtsmen seem to correspond to five planets moving in the sky to predict the destiny.

1.3 *The senet*

Senet, the most popular of the Egyptian games, was known from the Dynasty I (c. 3050-2995) to the Roman Period (30 B.C. - 395). It has 10-square 3 rows. Usually, only the last five squares have any decoration, but one of the boards that we know has all its squares decorated.⁵

Pieper associated the 30-square board of the *senet* game with the days of the month and with the year.⁶ Petrie had suggested the calendrical use of a board coming from a tomb containing Egyptian materials of the XXII Dynasty, found in Beth Pelet, Palestine.⁷ It has 30 holes arranged, like the *senet* squares, in 3 rows. The interpretation of Seyffarth of the *senet* game inscribed in the Turin Papyrus, n. 1.775 was, however, less serious, since the author was always ready to engage in astrological readings.⁸

Piccione thoroughly studied the recreational and religious functions of the *senet* game, and related it to the spiritual renovation in the afterlife.⁹ According to the author, it is possible that the board developed some astronomical meaning from the New Kingdom (c.1552–1069) onwards, since he notices the following features:

A) The number of squares of the board is 30, like the days of the Egyptian civil month. Some of the squares seem to mention the most important periodical festivities of the year. The allusions to Thoth and Horus, or Re Harakhti, in the first and in the last squares, can be related to the names of the first and of the last months of the Egyptian lunar and civil years. Thoth is the name of the first month of the civil year, as well as of the lunar intercalary month. Horus, or Re Harakhti, is connected to the name of the last month

3. Kendall, *op. cit.* (ref. 1); Newberry, *Beni Hasan. Part II*, London, 1893.

4. Finkel, *op. cit.* (ref. 1) 154.

5. André et al. *op. cit.* (ref. 2) 130-131.

6. Pieper, *op. cit.* (ref. 1) 16 ff.

7. Petrie, *Beth-Pelet (Tell Fara) I*. London, 1930, 13, pl. 36, 40, n. 481.

8. Seyffarth, *Beiträge zur Kenntnis der Literatur, Kunst, Mythologie und Geschichte des alten Ägypter*. Leipzig, 1833, 3, 200-202, pl. 3.

9. Piccione, *op. cit.* (ref. 1) 352-353.

of the civil year, since *mswt ra*, ‘birth of Re’ is a variant of *wp-rnpt*, the twelfth month of the lunar year.¹⁰ The decoration of the *senet* game inscribed in the Turin Papyrus n. 1.775¹¹ seems to relate the square n. 6 to the sixth day lunar festival, *snt*, and the central squares to the feast of the full moon.

B) In opinion of Griffiths, Hornung, Kendall and Piccione, the final 5 squares, usually marked in a special way, alluded to the 5 epagomenal days of the civil year, which were gained by Thoth to Selene by means of a board game, according to the Egyptian myth mentioned by Plutarch.¹²

C) Grenfell and Hunt, followed by Pieper, interpreted the Oxirrinco Papyrus n. 470 as a Greek commentary to the translation of an old Egyptian book, perhaps a manual of astronomy.¹³ The text offers mathematical calculations to make an *orologion*, a type of clock, and indicates the way to use the *pesseuterion*, an instrument related to the calendar. Pieper defends that the *pesseuterion* could be the *senet* and Piccione offers a similar interpretation, for the following reasons:

D) The text makes reference to markers called ‘dogs’, the demotic name of the tokens, sometimes shaped like dogs. The *pesseuterion* has 30 squares, like the *senet* board. The text relates that number to the days between every lunation.

Mentions in the text to *fernuḫi* square were related by Pieper to the 26th square of *senet*, that usually contains the *nfr* sign, the reason why it could be denominated ‘house of the beauty’, *pr-nfr*, in Egyptian, possibly *fernouḫi*, in Greek.¹⁴ The square 26 is the first of the 5 last squares, which are related to the epagomenal days of the civil year, dedicated to the celebrations of Osiris, Seth, Isis, Nephthis and Horus feasts, as Griffiths, Hornung, Kendall and Piccione suggested.¹⁵

In my opinion, the astronomical symbolism of the *senet*, make sense in a funerary context, since, following Piccione, the board was utilized to travel in the afterlife. According to the Egyptian conception, the deceased had to cross the body of Nut, in the solar boat, entering by the mouth of the goddess of the sky, in the western horizon, to be born in the eastern horizon, linked to the sunrise. Before his rebirth, he had to know very well the celestial regions, to be able to accomplish his travel. The *Books of the Afterlife* were the topographical guides of the sky for the deceased, including spiritual references to the hours of the night, the decanal constellations and other celestial bodies. The *senet* offered a similar kind of indications, with the same function.

2. Astronomical function of the 59-hole board

The “58-hole”, “59-hole” or “hounds and jackals” game, was used from the end of the First Intermediate Period (c. 2200–2160) and during the Middle Kingdom (c. 2160–1785). From the Middle Kingdom onwards, it appeared in Nubia and, from the New Kingdom (c. 1552–1069) it is attested in the Near East.

The 59-hole board has the form of a violin or an axe leaf with two symmetrical 29-hole rows and a bigger central orifice. One of the few sets of markers linked to the boards we know of has head-shaped

10. Parker, *The Calendars of Ancient Egypt*. Chicago, 1950, 33-34.

11. Seyffarth, *op. cit.* (ref. 8) 3, 200-203, pl. 3; Devéria, “Les jeux de dames en Égypte”, *Bibliothèque Égyptologique* 5 (1897) 83-96; Wiedemann, “Das Brettspiel bei den alten Ägypten”, *Actes du Dixième Congrès Internationale des Orientalistes*, 1894, Leiden, 1896, 35-61, p. 35.

12. Griffiths, in Plutarch, *op. cit.* (ref. 1), 12, 293; Hornung, *op. cit.* (ref. 1), 271; Kendall, *op. cit.* (ref. 1), 45; Piccione, *op. cit.* (ref. 1), 354 ff.

13. Grenfell & Hunt, *Oxyrhynchus Papyri* 3. London, 1903, 141-144; Pieper, *op. cit.* (ref. 1) 16, 29-32 ff.

14. Piccione, *op. cit.* (ref. 1) 346.

15. Griffiths, in Plutarch, *op. cit.* (ref. 1) 293; Hornung, *op. cit.* (ref. 1) 271; Kendall, *op. cit.* (ref. 1) 45.

sticks like hounds and jackals. Petrie, Brunton, Carter, Drioton, May, Kendall, Hoerth¹⁶ and other authors, interpreted the 59-hole board as a game.

2.1 Hypothesis on the function of 59-hole board

Plato¹⁷ tells us of an Egyptian board “marked as though it were a game of draughts... by means of which the Egyptians treat the movements of the sun and of the moon and the eclipses”. My hypothesis relates the 59-hole boards to the instrument Plato mentions, because I think they were astronomical tools to register the cycles of the moon and of the sun, aiming to get a calendrical lunar-solar synchronism. Possibly, the 59-hole slab offered the pattern for the astronomical meaning that Piccione mentions the *senet* board developed from the New Kingdom (c. 1552-1069) onwards.¹⁸ My hypothesis is based on the following observations:

A) The number and disposition of the 59 holes allow the register of lunar and solar cycles, like the board Plato mentions.

B) All the decoration of the boards can be explained in terms of astronomical symbolism.

C) Most of the marks in the holes correspond to the holydays of the lunar and of the civil Egyptian calendars. Some of the marks are signs *nfr*, and also appear in the Egyptian written calendars, to indicate propitious days for certain activities,¹⁹ a tradition that Rome also adopted, following the Egyptian pattern, to point out the character of some days denominated *dies aegyptiaci*.²⁰

D) The registering system of the 59-hole board appears in a type of Greek calendar with holes, called *parapegma*,²¹ some of whose versions were possibly made in Egypt,²² as well as in a kind of Roman pocket almanac with orifices and pins.²³

E) After the Greek and Roman calendars with holes were in use, a different version of the 59-hole original board appeared in Egypt during the sixth century.²⁴

Although I offer data to support that the 59-hole slab was designed as an astronomical instrument, perhaps some board could have been, later on, used like a game,²⁵ deliberately or ignoring their main

16. Petrie & Brunton, *Sedment, I*, London, 1924; Petrie, *Objects of daily use*. London, 1927, 55 ; Carnavon & Carter, *Five Years' Explorations at Thebes*, Oxford, 1912, 58; Drioton, « Un Ancien Jeu Copte », *Bulletin de la Société d'Archéologie Copte*, VI (1940) 177-206; May, “Le Jeu de 58 Trous”, en André et. al. (Ed.) *Jouer dans L'Antiquité*. Marsella, 1992, 156-159, 162-163, p. 156 ff; Kendall, *op. cit.* (ref. 1) 160 ff; Hoerth, *op. cit.* (ref. 2).

17. Quoted by Eustathius of Thessalonica, *Comentarii ad Homeri Iliadem et Odysseam ad fidem exempli Romani*. (ed. G. Stallbaum) 7 vols., Leipzig, 1825-1830, p. 1397; Griffiths, in Plutarch, *op. cit.* (ref. 1) 293; Grenfell & Hunt, *op. cit.* (ref. 13) 141.

18. Previously commented, Piccione, *op. cit.* (ref. 1) 352 ff.

19. Möller, *Hieratische palaeographie*. Leipzig, 1909-1911; Bakir, *The Cairo Calendar No. 86637*, Cairo, 1996.

20. Salzman, *On Roman time: the codex-calendar of 354 and the rhythms of urban life in late antiquity*, Berkeley, 1990, 242; Degrassi, *Inscriptiones Italiae*, vol. 13, *Fasti et elogia*. Fasc. II, *Fasti anni Numani et Iuliani*, 1963, 263.

21. Neugebauer, *A History of Ancient Mathematical Astronomy*, Berlín, Heidelberg, New York, 1975, pp. 587-588; Diels-Rehm, “Parapegmenfragmente aus Milet”, *Sitzungsber. d. Königl. Preuss. Akad. d. Wissensch, philos.-histor.*, 23 (1904) 92-111; Degrassi, *op. cit.* (ref. 20) 13, II.

22. On Eudoxus *parapegma*, Tannery, *Mémoires scientifiques*. Paris, 1912-1950, vol. II: 236; Eudoxus residence in Egypt and commentary on the sources, Van der Waerden, *Science Awakening II. The Birth of Astronomy*. Leiden, 1974, 39 ff; Diodorus of Sicily, *The Library of History* (C.H. Oldfather trans. Loeb Classical Library), London, 1961, 1. I, 96, 2; Strabo, *Geography* (H.L. Jones trans. Loeb Classical Library), London, 1949, XVII, 1.29.

23. Salzman, *op. cit.* (ref. 20) 9; Degrassi, *op. cit.* (ref. 20) 308-309; Manicoli, “Un calendario astrologico al Museo della Civiltà Romana”, *Bollettino dei Musei Comunali di Roma* (1981-1983) 28-30, pp. 18-22.

24. Drioton, *op. cit.* (ref. 16) 177 ff.

25. Petrie & Brunton, *op. cit.* (ref. 16) 7; Petrie, *op. cit.* (ref. 16) 55; Carnavon & Carter, *op. cit.* (ref. 16) 58; Drioton, *op. cit.* (ref. 16) 177-206; May, *op. cit.* (ref. 16) 156 ff; Kendall, *op. cit.* (ref. 1) 160; Hoerth, *op. cit.* (ref. 2).

function. Any user, who could have handled 59-hole boards from funerary stealing, for instance, may have conceived a new use for such instruments, considering their similarity to the board games. As Vernus²⁶ details, the funerary robberies were very frequent in the ancient Egypt.

2.2 Hypothesis on the 59-hole board use

The Egyptian civil year had 30-day 12 months, to which 5 epagomenal days were added. The lunar month had either 29 or 30 days. The difference in the number of days had to be established based on practical observations of the real synodical cycle. The length of the synodical month varies between 29.26 and 29.80 days, due to 3 factors: 1) the anomaly of the moon (oscillation of its distance from the earth); 2) the obliquity of the ecliptic (oscillation of its angle with the celestial equator); and 3) the latitude of the moon (oscillation of its distance north or south of the ecliptic).²⁷

As there was a difference of 11 days between the 354-day lunar cycle and the 365-day civil year, a month had to be added to the lunar calendar, in every certain number of years, to reach their correlation. Parker²⁸ proposes: ‘all intercalation would then be based upon a very simple rule... whenever the first day of lunar Thoth would fall before the first day of civil Thoth, the month is intercalary’. The 59-hole board offers good possibilities to indicate when the intercalary month had to be added.

One of its two 29-hole rows, A, could be used to register the days of every lunar month of the 354-day years, by means of a stick advancing within the orifices. Once the computation of 29 or 30-day 12 lunar months was finish, the marker at the symmetrical row, B, would start to move, to accumulate each 11-day period of difference between the lunar and the civil 365-day year. When the marker reached the 29th hole of row B, the next would be an intercalary month, to be registered in row A. The bigger central hole could be used to register the 30th day of some lunar months.

In addition to the bigger central orifice, some boards have two 30-hole rows, instead of two 29-hole rows.²⁹ On 30-hole slabs, lunar 29 or 30-day months could be marked in row A, and the accumulated 11-day periods in row B, while a stick at the central orifice could serve to remind the intercalary nature of the 13th month registered in A. Or else, the bigger central hole could be used to hold every stick that had completed the route of a month, or a year, aiming to retain the amount of cycles.

Otherwise, a single board could have been used to register lunar cycles in row A and civil cycles in row B. Or else, a pair of 30-hole and 29-hole boards could simultaneously register 30-day civil months and 29, 30-day lunar months, respectively. Relating to this possibility, no 29-hole, but only 30-hole boards, have the inner upper orifice specially decorated with a circle around it, forming the Egyptian sign of the sun, whose cycle was connected to the civil year.

Observing the hieroglyphs of some holes, the markers seem to start from the inner upper orifice and move across the board from the inside to the outside rows. Descending towards the opposite end of the board and then ascending on the next line, the lunar month was completed at the outer upper hole of the row, the 29th day, or at the bigger central orifice, the 30th day, in 29-hole slabs. At 30-hole boards, 30-day civil months could be registered, as well as lunar cycles, using the inner upper orifice, specially decorated with a circle around, during 30-day months, and eluding it during 29-day months.

26. Vernus, *Affaires et scandales sous les Ramsès*. Paris, 1993, 19.

27. Parker, *op. cit.* (ref. 10) 3 ff.

28. Parker, *op. cit.* (ref. 10) 26.

29. Figs. 1, 2.

One of the few sets of markers we know for the boards has head-shaped sticks like hounds and jackals.³⁰ Other markers are topped off with different kind of caps, but there is no evidence to indicate that these represent pieces related to the 59-hole boards.

Sets of sticks with distinctive colours, or topped with two different types of heads could have been used to mark solar and lunar cycles, respectively. Or else, 3 different kinds of heads, or colours, could indicate the 3 seasons of the Egyptian calendar. The sticks collected at the bigger central hole, after registering every cycle, could offer quick information about the amount of months or seasons of every year already counted, while any current day could be easily indicated by the position of the marker moving at the holes.

As we will see, the slabs of the Roman calendars with holes also offered simultaneous information on the day, the week and the month. The Egyptian observations, gathered by means of boards, could have been integrated in written versions. In the same way, later on, the observations of the Greek *parapegmata* on slabs with holes also appeared in written versions.

3. *Spiritual and astronomical symbolism in the 59-hole boards*

3.1 The *Snw* sign, corresponding to ‘the complete region crossed by the sun’³¹ appears surrounding the central hole of a board.³² The myth of Re’s birth talks about the passage of the sun through Nut’s body, being swallowed in the western horizon by the goddess, every night, to appear again in the eastern horizon every day. But it is possible that the legend also describes the annual solar cycle, that is to say the sun’s periodical roundtrip in Egypt between the most northern and southern sunrises, during summer and winter solstices, respectively, according to an interesting suggestion of Wells.³³ Daily and annual trip of Re is related to the *Snw* sign, and it makes sense on a board that, according to my interpretation, is an instrument to reach synchronism between the lunar year and the solar cycle of the civil year.

3.2 *The palm tree symbolism*

A Palm tree decorates the centre of the same board. Certain paragraphs of Horapollo³⁴ say that, as the Egyptians believed that a new branch grew every month in the palm tree, it could serve to reckoning of time. A branch of palm, stripped of leaves and notched, was the symbol of the year and of the season, used as determinative in words related to time, such as *rnpt* “year” *tr* “season”.³⁵

30. Fig. 4, set of the board; Carnavon & Carter, *op. cit.* (ref. 16) 56 ff; Drioton, *op. cit.* (ref. 16) plate IV; May, *op. cit.* (ref. 16) fig. 148.

31. Gardiner, *Egyptian Grammar*, 3rd ed., Oxford, 1988, 522: V9.

32. Fig. 4; Carnavon & Carter, *op. cit.* (ref. 16) 56 ff; Drioton, *op. cit.* (ref. 16) plate IV; May, *op. cit.* (ref. 16) fig. 148.

33. Wells, “Re and the Calendars”, *Revolutions in time*. (Spalinger ed.), San Antonio, Texas, 1994, 1-38, pp. 4 ff, observes that the Milky Way has the classical form of the goddess Nut’s depictions, with her bend body resting on her hands and feet, touching the western and eastern horizons, respectively. Following the author, during the night of the spring equinox, the visible part of the Milky Way looks like Nut’s head with her open mouth next to the place of the sunset. Then, 272 days later, in the morning of the winter solstice, the sun seems to come out of Nut’s belly from the part of the Milky Way that resembles her legs, the day the Egyptians called *mswt* Re, ‘Re’s birthday’. According to Wells, probably the Egyptians become aware of the fact that 272 days correspond both to the time between the spring equinox and the winter solstice as well as to the period of woman pregnancy.

34. Sbordone Ed. *Hieroglyphica - Hori Apollinis*. Naples, 1940, 8 ff.

35. Gardiner, *op. cit.* (ref. 31) 479: M4, M5, M6).

A palm was one of the attributes of Thoth, who was the “Lord of Time”, “Reckoner of Years”.³⁶ Due to Seshat’s relationship with Thoth, the goddess held a notched palm branch in her hand to record the royal jubilees.³⁷ Eight gods Heh, who held the sky, are normally shown with a palm-rib in their hands or over their heads. They were the personification of infinity and represented the wish for millions of years of life.³⁸ Sothis, the goddess “Opener of the Year”, was associated to the palm leaf, from the first dynasty.³⁹

The 17 branches of this board could correspond to 12 months and 5 epagomenal days. According to several authors, references to elements of two different kinds of cycles are also mixed in the 30 squares of some *senet* boards, to designate both the days of the month and the 5 epagomenal days of the year.⁴⁰ Equally, Parker’s interpretation on 59 divinities that are represented in the temples of Dendera, Edfu and Esna, offers mixed references to 4 parts of the 12 months and to the 11-day difference between the 354-day lunar cycle and the 365-day civil year.⁴¹

3.3 *The Hippopotamus symbolism*

The Hippopotamus shape of a Louvre Museum board⁴² could be related to the fertility goddess, Tueris,⁴³ whose former name was Ipet, Apet, Epet or Opet.⁴⁴ A text at Opet sanctuary in Karnak attributes the patronage of the months to different representations of the goddess Shepset’s hippopotami.⁴⁵ The character of the 12 female hippopotami that patronise the months of the civil year was explained by Quaegebeur, relating to the 12 goddesses protecting Edfu temple.⁴⁶ Other name of the hippopotamus goddess, Meskhenet, appears in a text at the Opet sanctuary: “Providence that decide the existence, bearer of wealth without limit, she increases the time of life to those who serve her, she counts the years to those your loved ones”.⁴⁷ Four Meskhenet goddesses are, very often, represented in late temples, like Dendera, identified with Nut, Tefut, Isis and Nephtys. A Roman text from Esna says: “They are counters of the life time, masters of the destiny and of the providence”.⁴⁸ At Philae temple, the hippopotamus is linked to the year.⁴⁹ At the Ptolemaic sanctuary of Hatshepsut temple, the hippopotamus is related to the celestial goddess Ipet-Nut, directing the terrestrial affairs through the decanal stars.⁵⁰

36. Wilkinson, *Todos los Dioses del Antiguo Egipto*. Madrid, 2003, 215 ff; Hart, *A Dictionary of Egyptian Gods and Goddesses*. New York, 2004, 214; Lanzone, *Dizionario di Mitologia Egizia*. Amsterdam, 1974, plate 36 ff.

37. Wilkinson, *op. cit.* (ref. 36) 167; Hart, *op. cit.* (ref. 36) 193; Lanzone, *op. cit.* (ref. 36) plate 340

38. Wilkinson, *op. cit.* (ref. 36) 109-110; Hart, *op. cit.* (ref. 36) 83; Gardiner, *op. cit.* (ref. 31) 449, C 11.

39. Parker, *op. cit.* (ref. 10) 34.

40. Griffiths, in Plutarch, *op. cit.* (ref. 1) 293; Hornung, *op. cit.* (ref. 1) 271; Kendall, *op. cit.* (ref. 1) 45; Piccione, *op. cit.* (ref. 1) 333, 346, 354, 356.

41. Parker, *op. cit.* (ref. 10) 54-56.

42. Fig. 10; Petrie & Brunton, *op. cit.* (ref. 16) 7, plate XXII, 25; May, *op. cit.* (ref. 16) fig. 156; André et al, *op. cit.* (ref. 2) fig. 156.

43. Tony-Révillon, « À propos d’une statuette d’hippopotame récemment entrée au Musée de Boston », *Annales du Service des Antiquités de l’Égypte*, 50 (1950) 47-63, p. 53.

44. De Wit, *Les inscriptions du temple d’Opet à Karnak*. I-III, Brussels, 1958-196, 7.

45. De Wit, *op. cit.* (ref. 44) I: VII, 185; III: 102.

46. Marquis de Rochemonteix & Chassinat, *Le Temple d’Edfou*. Cairo, 1897-1960) I, plates 53, 66; IX, plates 16-17; Quaegebeur, *Le dieu égyptien Shai dans la religion et l’onomastique*. Louvain, 1975, 154.

47. Sauneron, « Remarques de philologie et d’étymologie », *Bulletin de l’Institut Français d’Archéologie Orientale* (1964) 36-45, p. 27.

48. Sauneron, *op. cit.* (ref. 47) 27.

49. Junker & Winter, *Das Geburtshaus des Tempels der Isis in Philä*. II, Vienna, 1965, 241.

50. Laskowska-Kusztal, *Deir El-Bahari III. Le Sanctuaire Ptolémaïque de Deir el-Bahari*. Warszawa, 1984, 77 ff.

3.4 *The eyes of Re symbolism*

The solar and lunar eyes of Re decorate a board at the Cairo Museum.⁵¹ It is not necessary to narrate here the popular well-known myth that links Re's eyes to the iconography of the sun and of the moon,⁵² so representative of the proposed function of the boards, as instruments to reach synchronism between solar and lunar cycles.

Thoth obtained lunar-solar synchronism while giving back to Horus the eye uprooted by Seth⁵³ and, in another myth, when winning to the moon, with a board game, the five epagomenal days to complete the Egyptian civil year.⁵⁴ In a different story, Thoth obtained lunar-solar synchronism by convincing to the eye of Re, Hathor, to stop her destruction, when humankind rebelled against the sun. When Hathor returned to Re, the union of the two eyes, sun and moon, took place. An Egyptian hymn to the moon say on her synchronism with the sun: 'the left eye has been united to the right eye and the moon comes in the fixed time (variant: in its place), without irregularity with the celebration of each of its phases (variant: without irregularity with the festival of the sun, Re)'.⁵⁵

3.5 *The Dog and Jackal heads symbolism*

Dog and jackal heads, topping the sticks of a board,⁵⁶ are connected to the sun and moon symbolism, and could have been used to differentiate the register of solar and lunar cycles, respectively.

The canine nature of gods such as Anubis and Wepwawet, usually identified as a jackal and a wolf, respectively, is still disputed. Gardiner offers the Greek interpretation of Anubis as a "recumbent dog".⁵⁷ Gaillard showed that the skulls found at Asyut were either those of wild dogs (*canis familiaris*) or crosses of this with the small Egyptian jackal (*canis lupaster*).⁵⁸ This hybrid was called *canis lupaster domesticus* by Hilzheimer, arguing that the description of Wepwawet as a wolf is wrong.⁵⁹

Witkowski suggests that Anubis is a "syncretic creation of the human imagination". He accepts the term canine proposed by Kees and comments the theological duality of Anubis, due to the solar and lunar aspects of the god.⁶⁰ The Egyptian nome XVII, called "Black dog", had a god whose name, "two brothers", also evokes a double nature, according to Montet.⁶¹ Some authors explain the canine duality as represented by two different gods, Anubis "Mighty One in the Sky" and Wepwawet "Mighty One in the Two Lands".⁶²

The duality of Anubis and his canine nature were alluded to by Plutarch: "Nephthys is what is below the earth and invisible, while Isis is what is above the earth and manifest; and the circle which touches

51. Fig. 5; Petrie & Brunton *op. cit.* (ref. 16) XXII, 12; Drioton, *op. cit.* (ref. 16) 190, fig. 7.

52. Wilkinson, *op. cit.* (ref. 36) 200-206; Hart, *op. cit.* (ref. 36) 87 ff. 179 ff.

53. Hart, *op. cit.* (ref. 36) 87.

54. Plutarch, *op. cit.* (ref. 1) 12.

55. Herbin, "Un Hymne à la Lune Croissante", *Bulletin de l'Institut Français d'Archéologie Orientale*, 82 (1982) 237-282, p. 259.

56. Fig. 4, set of the board; Carnavon & Carter, *op. cit.* (ref. 16) 56 ff; Drioton, *op. cit.* (ref. 16) plate IV; May, *op. cit.* (ref. 16) fig. 148.

57. Gardiner, *op. cit.* (ref. 31) 459, E15.

58. Gaillard, "Les Animaux Consacrés à la Divinité de L'Ancienne Lycopolis", *Annales du Service des Antiquités de l'Égypte*, 27 (1927) 33-42, p. 33.

59. Gardiner, *op. cit.* (ref. 31) 460, E18.

60. Witkowski, "Quelques Remarques Sur le Nom d'Anubis. Graphie et Étymologie", *Études et Travaux*, XII (1983) 38-52, p. 40.

61. Montet, *Géographie de l'Égypte Ancienne. Deuxième Partie*. Paris, 1961, 170.

62. Bonnet, *Reallexikon der Ägyptischen Religionsgeschichte*. Berlin, 1952, 42-43.

both of these and is called horizon, being common to both, has been given the name Anubis, and in form is represented like a dog; for a dog sees equally well by night and day”,⁶³ “... Anubis, who is sometimes called Hermanubis as well, since he belongs partly to the world above and partly to the underworld. Therefore, they sacrifice to him now a white cockerel and now a saffron-coloured one, believing that the world above is pure and clear, while that below is adulterated and variable”.⁶⁴

Diodorus of Sicily comments,⁶⁵ “Now Osiris was accompanied on his campaign as the Egyptian account goes, by his two sons Anubis and Macedon, who were distinguished for their valour. Both of them carried the most notable accoutrements of war, taken from certain animals whose character was not unlike the boldness of the men, Anubis wearing a dog’s skin and Macedon the fore-parts of a wolf; and it is for this reason that these animals are held in honour among the Egyptians”.

In the same way, Apuleius describes the procession of Isis “... immediately after these came the deities, condescending to walk upon human feet, the foremost among them rearing terrifically on high his dog’s head and neck that messenger between heaven and hell displaying alternately a face black as night, and golden as the day”.⁶⁶

The solar and lunar aspects of Anubis, who was the son of Osiris, but also the son of Re,⁶⁷ offer good possibilities to interpret a supposed use of dog and jackal-shaped sticks as markers to differentiate solar and lunar cycles.

3.6 *The marks in the orifices of the boards*

The marks in the orifices of the boards coming from Egypt invariably appear at the 29-hole slabs in the 6th, 8th, 10th, 15th, 20th and 25th holes.⁶⁸ A line in the form of “s” unites the 6th and the 20th holes together. A semicircle links the 8th and 10th holes. The *nfr* sign appears in the 15th and 25th holes. At 30-hole slabs, the first orifice is bigger or surrounded by a circle. Ignoring this hole, the marks keep the already described position.

Counting the greater central orifice in 29-hole boards and ignoring it in 30-hole slabs, the marks offer a division in three 10-hole groups, at each row, comparable to the three 10-square lines of the *senet*. This grouping could allude to the three 10-day weeks of the 12-month Egyptian civil year, that is to say, to the 36 annual decans.

3.6.1 *The five epagomenal days*

The five epagomenal days probably are evoked at the last five orifices of the 59-hole boards by means of the *nfr* sign, which is usually represented at the first one of them, that is to say, at the 25th orifice in 29-hole slabs and at the 26th in 30-hole slabs. In the same way, according to Piccione, Griffiths, Hornung and Kendall, the last five squares of the *senet* boards correspond to the five epagomenal days and they are frequently decorated, including the *nfr* sign at the first one of them.⁶⁹ It is interesting to repeat that, according to Plutarch’s⁷⁰ version of an Egyptian myth, the instrument that Thoth used to gain five

63. Plutarch, *op. cit.* (ref. 1) 44.

64. Plutarch, *op. cit.* (ref. 1) 61.

65. Diodorus of Sicily, *op. cit.* (ref. 22) I, 18.

66. Apuleius, *The Golden Ass: or Metamorphoses* (E. J. Kenney trans. Penguin Classics), London, 1999, XI

67. Hart, *op. cit.* (ref. 36) 21 ff.; Wilkinson, *op. cit.* (ref. 36) 186 ff.; Lanzone, *op. cit.* (ref. 36) 65.

68. Plates I, II.

69. Piccione, *op. cit.* (ref. 1) 243, Griffiths, in Plutarch, *op. cit.* (ref. 1) 293; Hornung, *op. cit.* (ref. 1) 271; Kendall, *op. cit.* (ref. 1) 45.

70. Plutarch, *op. cit.* (ref. 1) 293.

epagomenal days to the moon was precisely a board game. That board could allude to the 29-hole astronomical slab, or to some game linked to it, such as the *senet*.

The *nfr* sign, “beautiful”, “fair”, “happy”, “good”, at the first of the last five holes, probably symbolizes the beauty of the five days dedicated to Osiris, Isis, Seth, Nephtys and Horus festivities, as well as the favourable character of the period. In the same way, the signs *nfr* indicated the lucky days in the Egyptian calendars,⁷¹ which were the origin of the Roman tradition to allude to the “Egyptian days” in many almanacs.⁷²

3.6.2 *The Full Moon and first quarter feasts*

The Full Moon and first quarter feasts could be indicated at the 15th and 6th holes.⁷³ The 15th hole usually has the *nfr* sign. The 6th hole is linked to the 20th by means of a line shaped in “s”. On the 15th of every month, the festival of the full moon evoked the mythological episode ‘the eye filling’ of Horus. On 6th of every month, the celebration of the first quarter commemorated ‘fill the eye’ of Horus. Also the 15th and 6th squares of some *senet* boards seem to contain mention to both lunar festivities, according to several authors.⁷⁴

Both dates allude to the mythological episode of Horus’s eye pulled out by Seth, during the struggle of the gods, as well as to the role the lunar god Thoth played in reconstructing and returning the eye to the deity. The sixth lunar day was celebrated with great ceremonies and seems to be related to the beginning of the eye reconstruction that culminated during the full moon day. The first quarter day was favourable to begin the construction of religious buildings⁷⁵ and, according to the Cairo Calendar,⁷⁶ it evoked ‘the arrival of the great ones of the house of Re rejoicing in that day, when they receive the *udyat* eye’.

All the fragments of the eye had been reunited and Horus’s eye was complete during the full moon day. His father, Osiris, played an important role at the celebrations. Ptolemaic texts indicate that Osiris enters into the eye during the Mid-month festivity.⁷⁷ The paragraph links two different mythological episodes, by comparing the collection of the pieces of Osiris’s body that Seth had split at the Nile with the assembling of the fragments of Horus’s eye, pulled out by Seth. In other texts, Osiris is also connected to the 6th day of the moon.⁷⁸

3.6.3 *Other marks*

No obvious interpretation, in astronomical terms, is possible to offer to explain the connection between the 6th and 20th holes, by means of a line shaped in ‘s’. In any case, the line divides the number of orifices in two equal 15-hole parts,⁷⁹ and the days thus linked correspond to comparable and opposed phases of the

71. Möller, *op. cit.* (ref. 19); Bakir, *op. cit.* (ref. 19).

72. Plemius Silvius says that he avoided the traditional indication of bad fortune on the “*dies aegyptiaci*, as the pagans foolishly called those days”, in the introduction to the Christian calendar that he wrote between the years 448 and 449, in Salzman, *op. cit.* (ref. 20) 242; Degrossi, *op. cit.* (ref. 20) 263.

73. Plates I, II.

74. Seyffarth, *op. cit.* (ref. 8) 3, 200-203, plate 3; Devéria, *op. cit.* (ref. 11) 83-96; Wiedemann, *op. cit.* (ref. 11) 35-61; Piccione, *op. cit.* (ref. 1) 343-364.

75. Parker, *op. cit.* (ref. 10) 21.

76. Bakir, *op. cit.* (ref. 19) 41.

77. Brugsch, *Thesaurus Inscriptionum Aegyptiacarum*. Leipzig, 1883-1891, 54; Boylan, *Thot, the Hermes of Egypt*. London, 1922, 69.

78. Lichtheim, *Ancient Egyptian Literature*, vol. III: *Late Period*, Berkeley, Los Angeles, London, 1980, 118.

79. Plate I.

moon, at certain moment of the first and the last quarters. That possibility was also observed by Parker, relating to several correspondences between the names of the days of the lunar month, in which 7 and 23, during the first and last quarters, are both designated *dnit*.⁸⁰

Neither is possible to offer a definitive interpretation, for the union, by means of a semicircle, of the 8th and 10th holes, unless they could be understood like the 9th and 11th positions, counting the 30-day months from the first orifice of the row, usually slightly bigger or specially marked at the 30-hole boards, and from the greater central hole at the 29-hole boards. In that way, the first, specially marked hole of the row, in the 30-hole boards, or either the greater central orifice, in the 29-hole boards, could correspond to the first day of the 30-day cycles, when the festival of *psDntyw*⁸¹ was celebrated, while the 9th and 11th holes could indicate the monthly feasts, celebrated at least 12 times a year, alluded to by Parker.⁸²

Taking into account that unequal 29 and 30-day cycles require at least one fluctuation day for the festivities attached to the lunar phases, full moon would fall during days 15 or 16, and a similar variation would affect the rest of the celebrations.

3.7 Marks at the boards found outside Egypt

As the hieroglyph *nfr* only makes sense in the Egyptian language, the sign is missing from the boards found outside the country. In any case, the slabs conserve other types of marks at the same positions that the Egyptian boards, except for the 6th hole, which appears in some Mesopotamian pieces at the 5th hole, ignoring the initial encircled orifice. In a similar way, we have ignored the initial orifice, surrounded by a circle, at the Egyptian 30-hole boards to calculate the position of the 6th day festivity of the moon.⁸³

Every board we know has the mark in the first of the last five holes that I have related to the five epagomenal days.

The mark at the 5th hole, in the left superior fragment of figure 6,⁸⁴ has been made aligning the hole with what seems to be the beginning of an additional intermediate row, which is impossible to analyze, due to the proximity of a fracture. The fragment is not big enough to appreciate if only the mark at the 6th hole has been moved to the 5th position, or else all the Egyptian sequence of marks in 6th, 8th, 10th, 15th and 20th holes has been advanced to the 5th, 7th, 9th, 14th, 19th. The board at figure 7 has both 5th and 6th positions marked,⁸⁵ conserving the Egyptian sequence, with the innovation of a new union between 10th with 15th holes and 5th with 25th holes, respectively.

In a 30-hole board of Ur,⁸⁶ the specially marked orifice is the second, not the first one. Ignoring the marked orifice, since so we did to count at the Egyptian boards, its first signal appears in the 5th position. A second board from Ur has the first of 29 orifices marked, whereas only at 30-hole Egyptian boards the first position is surrounded by a line.⁸⁷

80. Parker, *op. cit.* (ref. 10) 36.

81. Spalinger, "Thoth and the Calendars; Under the Moon of Earth", in *Revolutions in Time* (Spalinger ed.), San Antonio, Texas, 1994, 45-62, pp. 62 ff.

82. Parker, *op. cit.* (ref. 10) 36.

83. Fig. 7; May, *op. cit.* (ref. 16) fig. 157; upper left fragment of fig. 6, following May, *op. cit.* (ref. 16) fig. 152. The mark of position 6 is a mistake in Drioton, *op. cit.* (ref. 16) fig. 8.

84. De Morgan, *Délégation en Perse, Mémoires, VII*, (Paris, 1905) 104, 105, figs. 345-351.

85. May, *op. cit.* (ref. 16) fig. 157.

86. Drioton, *op. cit.* (ref. 16) 192, plate V B.

87. May, *op. cit.* (ref. 16) fig. 151.

It is not possible to study the pieces of boards from Susa, of figure 6, because they are much fragmented, but in the drawing Drioton offered,⁸⁸ any indication seem absent at the 5th or 6th holes. The lower left fragment of the same figure 6 offers the Egyptian marks in the 8th and 10th holes, but the usual one at the 15th appears at 17th.

In the Mesopotamian boards, the advance to the 5th position of the Egyptian mark in the 6th hole makes sense in an astronomical context. Both marks are related to the same lunar phase, considering the difference between the Egyptian and Mesopotamian lunar-solar calendars.

The Egyptian months began with the moon absence day, whereas Mesopotamian months began later, on the day of the first quarter visibility. According to the Egyptian calendar, if the last quarter was still perceptible during the night 29, the month would be 30-day. According to the Mesopotamian calendar, the earliest presence of the first quarter would indicate the beginning of the month and the moon absence the end.⁸⁹

On the other hand, the Egyptian days were counted from the dawn and the Mesopotamian from the dusk. During total moon absence at dawn, a new Egyptian month started. During the earlier first quarter visibility at dusk, a new Mesopotamian month started.⁹⁰ As Spalinger says, the Egyptian day preceded the Babylonian, Macedonian and Athenian day roughly 1 ½ days.⁹¹ According to the author, a Babylonian, Macedonian and Athenian day 'n' would be the Egyptian 'n + 1'. Parker says⁹² on the Persian-Babylonian calendar of Egypt during the Achaemenid Period, 'if a papyrus were written in the evening, the Babylonian date would be a day later than the Egyptian'.

The advance of the Egyptian mark of the 6th position to the 5th hole, as well as the alterations of both Ur boards, could be explained as an attempt to adapt the original models to the Mesopotamian month. That kind of boards could have been made by the Egyptians themselves, to export, or by local craftsmen.

Both Egyptian and Mesopotamian calendars had a lunar-solar 12-month year with an irregularly intercalated 13th month.⁹³ As the most important festivities corresponded to the main lunar phases, the coincidences between the Egyptian and Mesopotamian marks of the boards are not surprising, since we know they shared the full moon festivity and several other celebrations.⁹⁴

In spite of the superiority of Mesopotamian mathematical astronomy, the Egyptian 360-day civil calendar, with five epagomenal days, was better than other contemporary systems, in order to get synchronism between the lunar and solar cycles, according to Neugebauer.⁹⁵

Probably, some Egyptian boards, or local copies, were used in Syria, since Egypt always tried to maintain with the Semitic neighbours the narrowest economical and political relationship, to assure the defence of the frontier and to import cedar wood and other products. The magnitude of the Egyptian

88. Drioton, *op. cit.* (ref. 16) 191.

89. Van der Waerden, "Greek Astronomical Calendars and their Relation to the Athenian Civil Calendar", *Journal of Hellenic Studies*, 80 (1960) 168-80, pp. 168-72.

90. Spalinger, *op. cit.* (ref. 81) 61 ff.

91. Spalinger, *op. cit.* (ref. 81) 67.

92. Parker, "Persian and Egyptian chronology", *American Journal of Semitic Languages and Literatures*, 58 (1941) 285-301 289; Bickerman, "The 'Zoroastrian' Calendar", *Archiv Orientalni*, 35 (1967), 197-207, p. 25; Neugebauer & Van Hoesen, *Greek Horoscopes*. Philadelphia, 1959, 166-70.

93. Neugebauer, *op. cit.* (ref. 21) 353 ff; Spalinger, *op. cit.* (ref. 81) 61 ff.

94. Parker, *op. cit.* (ref. 10) 12; Spalinger., *op. cit.* (ref. 81) 52.

95. Neugebauer, *op. cit.* (ref. 21) 353 ff. 559; Griffiths, in Plutarch, *op. cit.* (ref. 1) 294.

influence that the Phoenician traders spread in the Mediterranean countries, during the first millennium B.C., demonstrate the prevalence of the civilization of Egypt at the Syrian cities.⁹⁶

A board coming from Palestine (fig. 8),⁹⁷ closely reproduces the Egyptian marks in the 8th, 10th, 15th, 20th and 25th holes, but the 5th and the 6th holes are too deteriorated to see any sign on them. This slab, as well as a very similar Palestinian piece⁹⁸ that keeps the marks at the 6th hole, have the bigger central orifice surrounded by a new series of holes, inside a circular appendix at the upper side. The number of the new series of holes is 8, and also 8 petals have the flowers that mark the board. For this innovation, which also appears in a very similar Egyptian model at the Cairo Museum,⁹⁹ commentaries are offered at the next paragraphs, 4.1 and 4.3.2, relating to the *oktaeteris* that Eudoxus elaborated, probably in Egypt.

No type of influence is possible to deduce from the boards of figure 9, without marks, coming from Palestine.¹⁰⁰ One of them seems to be an object that perhaps never was used, since not all the holes were perforated. It has an additional unfinished 8-hole sequence. In the fragment of the other, there is no mark in the 25th position. It is not big enough to observe marks in the rest of the holes, apart from a slight signal in the first orifice.

4. Greek and Roman *parapegmata* and 59-hole boards from the sixth century

No Egyptian game survived in Greece or Rome,¹⁰¹ but the system of the 59-hole registers was used in certain Greek slabs with orifices and sticks that the astronomers handled to indicate phenomena related to the calendar. The cyclical information thus obtained was named *parapegma*.¹⁰² Later on, the Romans used a similar system in a kind of pocket calendars, also called *parapegma*.¹⁰³ Afterwards, a variant of the original 59-hole board survived in Egypt during the sixth century.¹⁰⁴

4.1 Greek *parapegmata*.

According to Neugebauer,¹⁰⁵ due to the irregularities of the lunar cycles, certain data on stellar phases were indicated at the Greek civil calendar by means of the marking sticks that were introduced in the holes of a slab, next to some inscription corresponding to every day. The original meaning of the Greek term *parapegma* was 'to fix alongside (or close)'. This *parapegma* was also called calendar, but it was different from the Greek civil calendar. The written versions of *parapegmata* were formerly known, but only at the beginning of the twentieth century, two slabs of stone, from the second and the first centuries B.C., were excavated in Miletus.¹⁰⁶ Later on, smaller fragments were found in Athens and Pozzuoli.¹⁰⁷

96. Padró i Parcerisa, *Egyptian-Type Documents from the Mediterranean Littoral of the Iberian Peninsula before the Roman Conquest*. Leiden, vol. I, 1980, vol. II, 1983, vol. III, 1985; *New Egyptian-type Documents from the Mediterranean Littoral of the Iberian Peninsula before the Roman Conquest*. Montpellier, 1995; García Martínez, *Documentos Prerromanos de Tipo Egipcio de la Vertiente Atlántica Hispano-Mauritana*. Montpellier, 2001.

97. Loud, *Megiddo II*. Chicago, 1984, plate 268; May, *op. cit.* (ref. 16) fig. 150.

98. Loud, *op. cit.* (ref. 97) lám. 268.

99. Drioton, *op. cit.* (ref. 16) 193.

100. Drioton, *op. cit.* (ref. 16) 196; Petrie, *Gerar*, London, 1928, 22, plate XXXIX; Petrie & Brunton, *op. cit.* (ref. 16) plate XXII, 15; Dussaud, *Les civilisations préhelléniques dans le bassin de la Mer Egée*. Paris, 1914, 300, fig. 217.

101. May, *op. cit.* (ref. 16) 202.

102. Neugebauer, *op. cit.* (ref. 21) 587-588.

103. Salzman, *op. cit.* (ref. 20) 8 ff.

104. Drioton, *op. cit.* (ref. 16) 177 ff.

105. Neugebauer, *op. cit.* (ref. 21) 587-588.

106. Diels-Rehm, *op. cit.* (ref. 21).

Possibly, the slab-type *parapegma* was initially used in the fifth century B.C. by Meton and Euctemon.¹⁰⁸ Perhaps, both astronomers already knew the Egyptian 59-hole register in some exported model, or while travelling in Egypt, as Eudoxus later did, living there during the fourth century B.C.¹⁰⁹ Following Diogenes Laertius, Eudoxus composed a *parapegma* in Egypt, with lunar and stellar phases corresponding to eight years.¹¹⁰

The oldest written *parapegma* we know was made by Geminus, during the first century B.C.¹¹¹ It seems to gather a previous elaboration of the third century B.C. Geminus and Ptolemy mention six and nine authorities, respectively, that must have developed the same type of *parapegma*. In all the sources, Eudoxus's name is outstanding.¹¹² The second century *parapegmata* from Mileto mentioned Eudoxo and the denominated "Egyptian" astronomers, as sources.¹¹³

4.2 Roman *parapegmata*

Salzman¹¹⁴ mentions certain Roman calendars for individual use, alluding to Petronius description '... two calendars had been fixed to each leaf of the door... painted with the course of the moon and the figures of seven stars. The favourable and unfavourable days were also indicated with marking pins'. The author comments on another type of small Roman calendars, made in wood or clay slabs with holes and markers, which were called *parapegma*.¹¹⁵

A Roman calendar, published by Manicoli,¹¹⁶ has a pair of 15-hole rows, marked with numbers I to XV and XVI to XXX, respectively. At the centre, a 12-segment circle contains the zodiac signs and 24 perforations, one of them at the centre of each horoscope and another one at the limit with the following division. In my opinion, the double number of holes could serve to simultaneously register every month as well as the current zodiacal sign. An upper horizontal row has seven perforations under seven busts of gods, corresponding to Saturn, Sun, Moon, Mars, Mercury, Jupiter and Venus, that Manicoli relates to the days of the week. Following the author, the Greek lunar 29 or 30-day calendar survived in this Roman piece, since any allusion to *calendas*, *nonas* and *idus* is absent on it.

4.3 Versions of the original 59-hole board at the sixth century

Four surviving versions of the original 59-hole board appear in Egypt at the sixth century, without any decoration and two 29-hole rows, as well as a bigger central orifice. Only one of them was found in an archaeological context of the sixth century.¹¹⁷ They are rectangular boxes with 3-body levels. Two of the

107. Degrassi, *op. cit.* (ref. 20) 13, II.

108. Neugebauer, *op. cit.* (ref. 21) 588.

109. Diodorus of Sicily, *op. cit.* (ref. 22) I, 96, 2; Strabo, *op. cit.* (ref. 22) 17.1.29 mentions the houses where Plato and Eudoxus resided in Heliopolis.

110. On the *parapegma* of Eudoxus, Tannery, *op. cit.* (ref. 22) 236; Van der Waerden, *op. cit.* (ref. 22) 39, ff, offers observations on the residence of Eudoxus in Egypt.

111. Neugebauer, *op. cit.* (ref. 21) 580.

112. Neugebauer, *op. cit.* (ref. 21) 587.

113. Neugebauer, *op. cit.* (ref. 21) 588.

114. Salzman, *op. cit.* (ref. 20) 8 ff.

115. Petronio, *Satiricon*. (Alfred Ernout, trans. Les Belles Lettres) Paris, 1962, 30; Salzman, *op. cit.* (ref. 20) 9; Degrassi, *op. cit.* (ref. 20) 308-309; Manicoli, *op. cit.* (ref. 23) 18-22.

116. Manicoli, *op. cit.* (ref. 23) 18-22.

117. Drioton, *op. cit.* (ref. 16) 178-205.

boards have a cavity with a cover in their upper dorsal half, whereas the sliding drawers of the other two are missing today.

Sets of tokens associated to two of the boxes could perhaps suggest some adaptation from the original function of the slab to a new playful utility. But, in my opinion, this version of the 59-hole board was a calendrical tool as well, since the circumstances to attach the accessories to the instruments are more than doubtful.

The only board found in the archaeological context had no token.¹¹⁸ One of the two boxes with tokens was bought by Bénédite, according to Drioton,¹¹⁹ who comments on the crazy combination of different formats in the set of five pieces, with only two of them identical in size and thickness.¹²⁰ The author says the spherical element superposed in the central hole of the board certainly belongs to another different set, probably manipulated by the trader.

Perhaps we are allowed to suspect some strategic supplement of tokens coming from the set of a different piece, with the intention to improve the sale of a supposed game device, in the Egyptian antiquities market.

The second board with tokens was mixed with a lot of archaeological pieces coming from Drah Abu el Naga, and it was attributed, just as many of them, to the dynasty XVII, according to Drioton. That is the reason why the author says that the sixth-century slab was exposed with some pieces from 1663-1570 B.C. Considering that the tokens are flat and round, like the type never linked to 59-hole boards, but generally attached to 20-square games,¹²¹ we cannot omit the circumstance that at least two 20-square slabs were found in Drah Abu el Naga, the Cairo Museum pieces D.085 and D.086.¹²² The tokens could belong to some of the other sets coming from Drah Abu el Naga.

If the tokens were really associated to the 59-hole boxes, they had to be used as casting implements to throw, to obtain a number, but not like draughtsmen to move over the board, since they are much bigger than the holes. For a progressive movement using the holes, the lots had sticks, also supposedly associated to the boards. It seems that the flat and rounded draughtsmen were used as tokens in Mesopotamian 20-square boards, since dices appear linked to them as implements to throw.¹²³ On the other hand, from a cuneiform tablet containing instructions to use the 20-square boards, we know that tokens were used to mark the positions on the board, while astragali were utilized as dices to obtain a number.¹²⁴ The use of astragali with the Egyptian games is very well documented in Egypt.¹²⁵ Considering the high risk of a wrong association of tokens to two boards, perhaps we have to trust the absence of accessories linked to the board that, with certainty, was found in an intact tomb.

4.3.1 *Astronomical function*

From an astronomical point of view, some of the new groups of orifices in these boards, in addition to the classical double 29-hole pattern, could be connected to the *parapegmata*. The Christian church accepted the Julian calendar, but tied it to the lunar cycle that was the base of the ecclesiastic calendar, in

118. Fig. 13; Drioton, *op. cit.* (ref. 16) 182; Gayet, *Antinoë et les sépultures de Thaïs et de Sérapion*. Paris, 1902, 47-48.

119. Drioton, *op. cit.* (ref. 16) 179.

120. Drioton, *op. cit.* (ref. 16) 177-182.

121. Finkel, *op. cit.* (ref. 1) fig. 146; Wooley, *Ur Excavations*, Vol. II, London, 1934, 158, 221, 274, fig. 95-98.

122. Drioton, *op. cit.* (ref. 16) 177-182.

123. Wooley, *op. cit.* (ref. 121) 158, 221, 274, fig. 95-98.

124. Finkel, *op. cit.* (ref. 1) 154.

125. Piccione, *op. cit.* (ref. 1) 24.

order to establish the religious celebrations. As previously commented, the first written *parapegma* we know was made by Geminus¹²⁶ during the first century B.C. and it seems to gather earlier information from the third century B.C. But it was thought that the *parapegmata* with holes, which were used to register and observe the cycles of the written versions, were invented by Meton and Euctemon,¹²⁷ in the fifth century B.C.

Eudoxus offered the study of an 8-year cycle, with three intercalary lunar months, in order to obtain a lunar-solar synchronism and, according to Diogenes Laertius, he prepared the *oktaeteris* in Egypt.¹²⁸ Geminus adopted the same 8-year cycle, which later was also used in Rome.¹²⁹ The 8-year cycle was the origin of a Coptic calculation attributed to Aba Demetrius (third century) that still appeared at the XVIII century in an Arabic text on the Christian calendars.¹³⁰

With such a long tradition, the *oktaeteris* could have been the cycle observed by means of boards, like the one of figure 11 that has an additional 8-hole group. Former 8-hole additions already existed in three boards from Egypt and Palestine, previously commented,¹³¹ which could perhaps suggest that some Egyptian *oktaeteris* was observed and registered, prior to the one Eudoxus prepared in Egypt.

The 9-hole group on the board of figure 14 could have been related to another *parapegma*, or perhaps to the 9 lunar 13-month 'great years' of an Egyptian 25-year cycle with 9.125 days, mentioned in the Papyrus Carlsberg 9, in the second century. It corresponds to 309 lunar months, divided into sixteen 12-month years and nine 13-month "great years".¹³²

The 12-hole group on the board of figure 13 could have been used to register another *parapegma*, or 12-month years, while the 13th lunar month could have been indicated in the bigger central hole. The 4-hole group of three boards, perhaps two 2-hole addition to every 29-hole row,¹³³ could serve to register days 30 and 31 of the Julian calendar, used from the 45 B.C. onwards.

The boards of the sixth century conserve the Egyptian three 10-hole groups of the original 29-hole slabs. The last decade could be completed in the bigger central hole, only during 30-day months. The circles drawn up, with discontinuous lines, in figures 11, 12, 13 and 14, are decorative, since they are not perforated.

126. Neugebauer, *op. cit.* (ref. 21) 580.

127. Neugebauer, *op. cit.* (ref. 21) 588.

128. On Eudoxus *parapegma*, Tannery, *op. cit.* (ref. 22) 236; Eudoxus residence in Egypt and commentary on the sources, Van der Waerden, *op. cit.* (ref. 22) 39 ff; Diodorus of Sicily, *op. cit.* (ref. 22) I, 96, 2; Strabo, *op. cit.* (ref. 22) 17.1.29.

129. Neugebauer, *op. cit.* (ref. 21) 620.

130. Neugebauer, *op. cit.* (ref. 21) 568.

131. Fig. 8.

132. Parker, *op. cit.* (ref. 10) 13 f.

133. Figs. 12, 13 and 14.

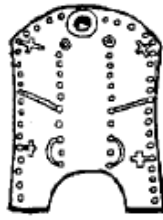


Fig. 1

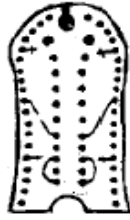


Fig. 2



Fig. 3



Fig. 4



Fig. 5

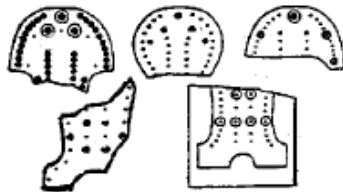


Fig. 6



Fig. 7

Plate I: Boards numbers 1 (2130-1991), 2 (Metropolitan Museum, 2160-1991), 3 (1991-1785), 4 (Metropolitan Museum, 1800-1792) and 5 (Cairo Museum, 1674-1320) were found in Egypt;¹³⁴ number 6 (Louvre Museum, XII B. C.) comes from Susa¹³⁵ and number 7 (Louvre Museum, first millennium B. C.) comes from Iran.¹³⁶

134. Drioton, *op. cit.* (ref. 16).

135. Drioton, *op. cit.* (ref. 16) Drioton, *op. cit.* (ref. 16).

136. May, *op. cit.* (ref. 16).



Fig. 8



Fig. 9

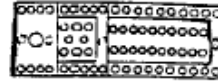


Fig. 11

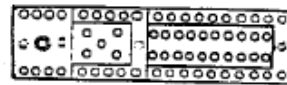


Fig. 12

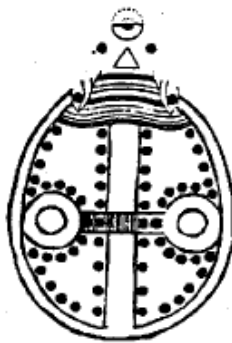


Fig. 10

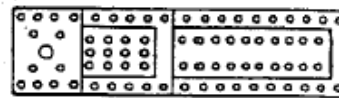


Fig. 13

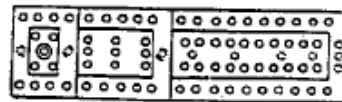


Fig. 14

Plate II: Boards numbers 8 (Oriental Institute Museum, University of Chicago, XIII B. C.)¹³⁷ and 9 (Cairo Museum, 1567-1320) come from Palestine;¹³⁸ numbers 10 (Louvre Museum, 1200-715), 11 (Cincuentenario Museum, sixth century), 12 (Cairo Museum, sixth century), 13 (Guimet Museum, sixth century) and 14 (Louvre Museum, sixth century) were found in Egypt.¹³⁹

137. May, *op. cit.* (ref. 16).

138. Drioton, *op. cit.* (ref. 16).

139. Drioton, *op. cit.* (ref. 16).