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A STONE BLOCK FROM OLD SMYRNA: *PENTE GRAMMAI*? ABACUS?

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The study examines, a stone block of unknown provenance preserved in a warehouse in Old Smyrna. On the flat surface of the stone, there are five parallel lines with round holes at the ends of each line, and a half-arc-shaped line on the top of one of the straight lines. The suggestions that stone blocks with different versions of this pattern, including five, seven, and eleven lines, were used for different purposes are controversial. While such stone blocks have been found in sanctuaries and settlements in the Greek mainland and on the islands, this specific Old Smyrna find provides an important contribution to Anatolian history. First researchers who worked on the subject defined these stones as a board for the *Pente Grammai* game, one of the lesser-known ancient games; later researchers described stone blocks with letters as *abaci*. In recent studies, it has been suggested on the basis of archaeological evidence that such stones functioned as a means of teaching mathematics in Greek educational system. The Old Smyrna find with its simple design is interpreted by us to be both a game board (*Pente Grammai*) and a simple calculating tool (*abacus*). The closest parallels to the design of the Old Smyrna example can be found at Stagira and at Eretria.

Keywords: Anatolia, Old Smyrna, *Pente Grammai*, Board Game, Abacus

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КАМЕННЫЙ БЛОК ИЗ СТАРОЙ СМИРНЫ: PENTE GRAMMAI? СЧЕТЫ?

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В данной статье представлены результаты изучения каменного блока неясного происхождения, обнаруженного в Старой Смирне в одном из хранилищ. На плоской поверхности этого камня можно увидеть пять параллельных линий, оканчивающихся круглыми отверстиями, и линию в форме арки над одной из прямых. Вопрос об использовании подобных блоков с различным количеством линий (пять, семь или одиннадцать) остается дискуссионным. До сих пор камни с таким изображением встречались на территории святилищ и поселений на территории материковой Греции и островов, поэтому находка из Старой Смирны представляется особо значимой для истории Анатолии. Первые исследователи, работавшие с подобными находками, определили их как доски для игры pente grammai, «пять линий», которая является одной из наименее исследованных настольных игр античности, но в дальнейшем такие блоки стали интерпретировать как счеты. В последних исследованиях на основе археологических данных было сделано предположение, что такие камни могли использоваться для обучения арифметике. Находка из Старой Смирны, содержащая весьма простой рисунок, по нашему мнению, могла совмещать функции доски для pente grammai и счетов. Ближайшие аналогии подобных многофункциональных блоков с простым рисунком происходят из Стагиры и Эретрии.

Ключевые слова: Анатолия, Старая Смирна, Pente Grammai, настольные игры, счеты

INTRODUCTION

Board games, an important part of ancient game culture, are an educational and informative activity tool played by both children and adults. The board and the playing pieces of the game have survived to the present day in settlement layers, sanctuary areas, and burial contexts in tombs. Many scholars have analysed basic information for ancient board games in ancient literary sources and in archaeological data, which make particularly significant contribution. Hans Lamer, who compiled the archaeological literature and data on ancient games in a meticulous study, provided detailed information about game equipment and rules¹. Among these games is *Pente Grammai* (πέντε γραμμαί / Five Lines), a game whose details are not well known, and

¹Lamer 1927, 1900–2029.

information about which comes mainly through literary texts². For this game, a game board was created on a material such as stone with a flat surface by carving five parallel lines with slightly deepened round holes at their ends. On top of these line blocks, a semi-circular addition in the form of a half-arc was made, whose function is controversial. In the game played by two players facing each other, the basic equipment consisted of five stones (total of ten stones) placed in the holes for each player and a shared die. In recent research, new perspectives have been proposed for objects identified as *Pente Grammai* game boards based on the interpretation of iconographic representations and ancient sources, as well as of excavated game boards. In particular, suggestions have been made that they were used as a calculation tool (abacus) based on written findings carved with five or eleven lines, found in sanctuary areas. This study provides a publication of a limestone block with five parallel lines and an arc carved on it, with opposite holes close to circles at the end of the lines, which is preserved in the excavation depot of Old Smyrna³ but the context of which is unknown⁴, and a new contribution to the wider discussions on the subject⁵ (fig. 1). It adds new evidence for the type of stone blocks with this pattern, already recorded in mainland Greece and the Aegean islands, specifically in Anatolia.

STONE OBJECT WITH FIVE STRIPES AND HALF AN ARC FROM OLD SMYRNA

The stone block was rediscovered in 2016, during the classification studies carried out in the stone depot of Old Smyrna. It is made of white limestone; no information had been recorded about its find place and context by the original excavators. The find is approximately 52.5 cm tall, 32 cm long, and 12 cm wide, with dimensions close to a rectangle. The stone block has five parallel lines carved horizontally into its surface. The lines are shallow and 0.4 cm wide. The length of the lines varies from 20 cm to 21 cm. The distances between the lines from the first to the fourth are 6 cm in each case, and the distance between the fourth and fifth lines is 5 cm. At the end of these lines, there are shallow holes drilled in a circular shape with a diameter of 1.5 cm, opposite each other

² Becq de Fouquières 1873, 396–405; Lamer 1927, 1973; Austin 1940, 267–271; Murray 1978, 28–29; Kurke 1999, 256.

³ At the Old Smyrna site in the Bayraklı district of İzmir province, settlement is observed from the Early Bronze Age to the beginning of the Hellenistic Period. For the history and chronology of Old Smyrna, see Akurgal 1997; Tanriver 2023, 77–109. On the recent excavations, see also Erdem, Tanriver 2016, 1–9; Tanriver *et al.* 2017, 95–114; 2023, 53–68; Cevizoglu, Tanriver 2023, 73–88.

⁴ The excavations at Old Smyrna have been ongoing since 2014 under the director of Prof. Dr. Cumhur Tanriver. However, the records and documentation of earlier years are incomplete in the excavation depots. This is one of the challenges faced by team members who make arrangements in warehouse studies and researchers working on find groups. The fact that the find that we examine in this study was not recorded constitutes an obstacle in understanding its context. The possibility that this stone block was brought from any point in and around Bayraklı, delivered to the excavation, and placed in the storehouse, should be considered.

⁵ Traces of game culture in Old Smyrna are known in parallel with archaeological findings. For bone astragals, fish vertebrae and a game object used as playing counters unearthed in various areas, see Akar Tanriver, Foça 2022, 138–141, pl. 1–3.

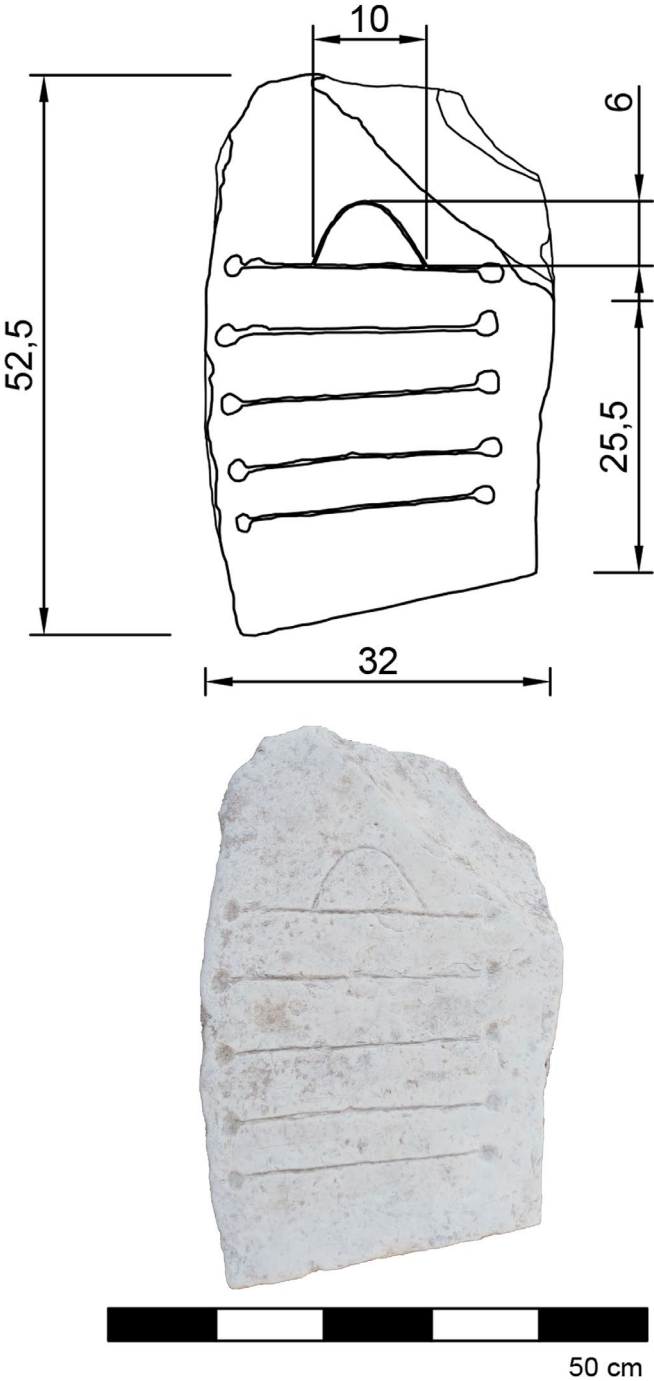


Fig. 1. A stone block from Old Smyrna © The authors

at both ends. An arc-shaped form with a width of 10 cm and a height of 6 cm is carved shallowly from the middle of the first line on top of it. There are some cracks alongside the margins of the stone block.

THE *PENTE GRAMMAI* GAME

Pente Grammai, in its basic description, can be defined as a game in which two players, each with five pieces, took turns rolling dice to move their pieces on a game board and assemble their pieces on the middle line. The first player to reach this line and assemble all of their pieces on their side would win⁶. Information obtained from the descriptions in ancient sources helps to make inferences about how the game is played and its rules. Based on the lost work of Suetonius, the second-century AD lexicographer Pollux, identifies three board games⁷. The first of these is the *Ludus Latrunculorum*⁸, the second is the *Diagrammismos*⁹, and the third is a game that was left unnamed by the ancient author but labelled by modern scientists as the Pente Grammai (Five Lines)¹⁰. In describing the setup of the game, Pollux states that each player had a total of five pieces on five lines; the middle line of the five was called the sacred¹¹ or holy line¹². Based on Suetonius's lost book, the Byzantine writer Eustathios of Thessalonica provided descriptions of Greek games, including the Pente Grammai¹³.

Another source of information about the Pente Grammai game is its representations on archaeological finds. One of the earliest examples of it is a small terracotta game board found in a tomb in Anagyros (Vari), Attica, dated to the mid-seventh century BC¹⁴. Five lines are made on this board with hollows on both sides of the lines. The dice that belong to the board are decorated with geometric shapes, a horse, and a female figure¹⁵. On all four sides of the board, there are figures of women mourning with their hands on their heads. Another miniature game board made of terracotta was found in Kerameikos, the cemetery area of Athens¹⁶. The surface of the board is not preserved, and it was found with a pierced die. The board, dating to the beginning of the sixth century BC, has figures of women mourning with their hands on their heads, as in the Anagyros find. The verses of the poet Pindar, who lived in the fifth century BC, are a noteworthy source about the burial of board games, especially those composed of mourning women. The poet mentions that in the afterlife, everyone will spend time with different activities,

⁶ For suggestions about the gameplay and rules of the game, see Schädler 2009, 195–196.

⁷ Poll. *Onom.* IX. 97.

⁸ For detailed information about the *ludus latrunculorum*, a strategy game, see Ersoy, Erdin 2015, 143–147.

⁹ For details about the game, see Selvi Bener 2013, 19–20.

¹⁰ Schädler 2009, 174. Pollux considers this game to be among the games of chance: Poll. *Onom.* VII. 206.

¹¹ For details about the sacred line, see Kidd 2017, 86–96.

¹² Poll. *Onom.* IX. 97; Becq de Fouquières 1873, 395.

¹³ The author mentions that the game is played with a dice. For details, see Schädler 2009, 173–174.

¹⁴ Kallipolitis 1963, 123–124, pl. 53–55.

¹⁵ U. Schädler says that this female figure could be Athena. Schädler 2009, 175.

¹⁶ Kübler 1970, 394–395, 512, floor no. 129, pl. 102.

and among these activities, he lists playing games¹⁷. In this context, game boards left as tomb gifts are provided to the deceased individuals to play games in the afterlife¹⁸. In addition, Attica-found miniature terracotta game boards associated with funeral traditions have been recorded in museum inventories¹⁹.

The most important iconographic source for the representation of board games in ceramic groups is the game played by Aias and Achilles²⁰. These two warriors depicted playing a board game on an amphora painted by Exekias, one of the representatives of Attic black-figure vase painting, dated to ca. 540 BC, bear their names²¹. This composition, which forms the main scene of the amphora, depicts Aias and Achilles standing opposite each other at the heads of a game board, wearing cloaks and weapons, during the Trojan War, during a break in the fighting. The striking detail on the amphora is that the numbers 4 (tesara) and 3 are written next to the mouths of Achilles and Aias, respectively²². No details are shown about what game is being played on the table²³. A crucial piece of evidence pertaining to the game played by two Homeric figures is depicted on a kyathos housed in the Royal Museums of Fine Arts and History in Brussels, Belgium²⁴. On the vessel dated to the early fifth century BC, Aias and Achilles are depicted playing a game opposite each other, with the figure of Athena in the middle. The depiction of the board used for the game is shown from above in detail. On the board, five parallel lines are depicted, with gaming pieces in the form of astragal at the ends of the lines²⁵.

In addition to ceramics, images of the game are also known on other materials. The first of these is a scene on an Etruscan mirror dated to the fourth century BC, depicting two warrior figures (possibly Achilles and Aias)²⁶. What makes this representation different is the presence of seven parallel lines and two dice on the board.

¹⁷ Pind. *Fr.* 129.

¹⁸ For views on the symbolic interpretation of games for death and life based on game boards found in burial contexts, see Kurtz, Boardman 1971, 77 etc.; Vermeule 1979, 77–82; Garland 1985, 70; Whittaker 2004, 279–297.

¹⁹ Chidiroglou *et al.* 2022, fig. 4–16.

²⁰ H.G. Bucholz has listed the 168 vases in which this scene is depicted (Bucholz 1987, 126–184).

²¹ Boardman 2003, fig. 100.

²² For some ceramic vessels showing Aias and Achilles pronouncing numbers, see 2 and 4, a lekkythos in the Boston Museum. The number 2 on one of the two container fragments painted by Epictetus, and 4 on the other (Woodford 1982, 182–184).

²³ In games played with astragals, the number system is in the form of 1, 3, 4, 6, and there is no equivalent for the numbers 2 and 5 (Aktaş 2018, 3). The number 2 is written on the scene of Aias-Achilleus on an olpe preserved in the Oxford Ashmolean Museum. Based on this, researchers suggest that the game was played with a single die rather than an astragal (Woodford 1982, 185).

²⁴ Brommer 1974, 84; Dasen 2015, 85, fig. 3.

²⁵ The game played in this scene is suggested to be the Pente Grammai (Schädler 1999, 41).

²⁶ Gerhard 1884, 144–146, pl. 109.

ABACUS?

Inscribed boards with parallel lines have been identified by twentieth-century researchers as equipment used in games. For instance, W.K. Pritchett evaluated thirteen findings as game boards after comprehensive examination²⁷. However, A. Schärli, in his study in which he catalogues twenty-nine findings, including new data, suggests that stone blocks with this type of parallel lines are a calculating tool/abacus²⁸. In his study of the Pente Grammai game based on archaeological evidence and ancient sources, U. Schädler partially addressed the debate over whether these were abaci or game boards²⁹. V. Dasen and J. Gavin's study, 'Game Board or Abacus? Greek Counter Culture Revisited', provides a detailed overview of this topic and presents noteworthy hypotheses³⁰. The composition carved on the marble altar found in the Krannon Necropolis in Northern Greece, dated to the end of the fifth century BC, that we examine in this study, provides new data for parallel-line stone blocks³¹. A bearded male figure on the right of the scene is seated in a chair, with his right hand on a square block carved with five lines and a semicircle. On the left is a child depicted standing behind the stone with his left hand in the air, and a dog trying to grab something from his hand. Based on this scene on the altar, V. Dasen and J. Gavin say that the adult man is an arithmetician and the child is a student, and that it is a representation of the new calculating system that changed in the fifth century BC³². This interpretation is important because it shows that five-line game boards were used for a different purpose as an educational tool³³.

The basic criterion for distinguishing whether stone blocks carved with parallel lines were used as a game board or a calculation tool is the letter systems applied on the sides or tops of the lines, as seen in the written examples that we will present below³⁴. In Ancient Greece, the Greeks used two different numeral systems, alphabetical and acrophonic, from the Archaic period onwards³⁵. The alphabetic numeral system used a total of 27 signs with 3 different symbols in addition to the 24 letters in the Greek alphabet³⁶. The acrophonic system is a calculation index that is arranged in a decimal system with a base of 5. It is a system that is preferred for the value of money, weight,

²⁷ Pritchett 1968.

²⁸ Schärli 2001.

²⁹ Schädler 2009.

³⁰ Dasen, Gavin 2022.

³¹ Dasen, Gavin 2022, 254, fig. 1.

³² Dasen, Gavin 2022, 266.

³³ The Krannon gravestone stands as a groundbreaking new piece of evidence for the teaching of basic arithmetic, specifically showcasing the utilization of a half-arched parallel five-line abacus.

³⁴ Dasen, Gavin 2022, 266.

³⁵ Blok 2021, 21.

³⁶ The monograms Ϝ (digamma) for 6, ϙ (qoppa) for 90 and ϗ (Phoenician sampi) for 900 were used. The recalculation of four-digit numbers with the number thousand begins with alpha combined with the acritic sign.

and measurement units³⁷. In ancient Greece, calculation on the board and taking notes of calculation were used simultaneously³⁸. Small stones, seashells, and pieces made of glass were tools used in the calculation process³⁹.

It is quite difficult to determine the purpose of five, seven, or eleven-lined tablets without numerical values. The functions of these objects are mostly associated with games and calculation tools. The words *abax* and *abakion*, which terminologically define counting/calculation, also refer to gambling games⁴⁰. Pollux defines the term *abax* as a board, one of the objects used by gamblers⁴¹. In addition to these, there is evidence that game boards were used as divination tools⁴².

ARCHAEOLOGICAL FINDS DESIGNED WITH PARALLEL LINES

In line with textual and visual representations discussed above, many pieces of archaeological evidence, with or without inscriptions, have been recorded on stones and roof tiles in the Aegean region. The stone find, which is the first of three examples found in the Epidaurus Asklepios Sanctuary, is dated to the fourth century BC⁴³. On the top, there are four parallel lines carved on one side and five on the other side, while votive inscriptions are seen in the middle of the two blocks of lines and on the side of the stone board⁴⁴. The letters M X H-O I are engraved on each of the five lines⁴⁵. The other stone board, which was found right next to the first find, has two different sets of five lines⁴⁶. The third find was recorded with five parallel lines with hollows and three indistinct lines next to them⁴⁷.

On the other hand, the six stone finds from the Amphiareion at Oropos provide important data on the subject⁴⁸. One of the stones that were found in many pieces and reassembled has eleven lines, and the top of the first line is carved in the form of a half-arc⁴⁹. At the bottom is an eleven-letter X Ϝ H Ϝ Δ Γ Ι C T X inscription of monograms.

³⁷ It goes Γ, πέντε for 5, Δ, δέκα for 10, H, ἑκατόν for 100, X, χίλιοι for 1000, M, μυριοί for 10000.

³⁸ One of the pieces of archaeological evidence for this practice is the scene seen on a ring stone dated to the third quarter of the fourth century BC. A male figure seated in a chair is extending his left hand towards three stones placed on a tripod table. With his other hand, he is holding a plate with numbers carved on it, checking the calculations (Dasen, Gavin 2022, 269, fig. 12; Zazoff 1968, 193, no. 1199).

³⁹ Herodotus states that pebbles were used for writing and counting: Hdt. II. 36. 4.

⁴⁰ Dasen, Gavin 2022, 277.

⁴¹ Poll. *Onom.* X.150.

⁴² Dasen, Gavin 2022, 282.

⁴³ Pritchett 1968, 189.

⁴⁴ Blinkenberg 1898, 2, fig. 1–2.

⁴⁵ M corresponds to 10,000 drachmas; X to 1000 drachmas; H to 100 drachmas; O to 1 drachma; and I to 1 obol.

⁴⁶ Blinkenberg 1898, 3–4, fig. 3–4.

⁴⁷ A stone block with a votive inscription is dated to the fourth century BC. For the image, see Blinkenberg 1898, 4, fig. 5–6.

⁴⁸ Leonardos 1925–1926, 44–45; Lang 1957, 275–276; Pritchett 1968, 191–193; Schärli 2001, 67–68.

⁴⁹ Dasen, Gavin 2022, 267, fig. 11; Schärli 2001, 67–68, fig. 3.3.

The upper part of the stone is made up of a second block with five lines and an arch carving. The other stone block is preserved with four parallel carved lines, while the half-bow on it is barely visible, and a nine-letter inscription of ΜΤΦΧΦΗΦΔΓ is located in the place of these lines⁵⁰. These numbers correspond to drachma, obol and half obol⁵¹. In addition to these two sacred areas, another stone block found in a well in the Corinth South Stoa has been identified as the Pente Grammai game with five parallel lines carved into it⁵². In this context, the letters Δ, T, X, H, and A carved in different places have been interpreted as elements related to the game that are helpful to the players⁵³. At the bottom left of the stone, there's the inscription ιός Βουλέος, and on the bottom right Δαμ is written with ην underneath it. These expressions are associated with the cult of Zeus Bouleus, Demeter, and Kore⁵⁴. The surface of a stone block found in Salamis is made up of two different groups of lines⁵⁵. On one of the short sides, there are five parallel lines and a half-arc. The other side has the same half-circular arc but there are eleven larger lines instead⁵⁶. The long sides of the stone bear number marks on both sides, ranging from 1000 drachmas to 1/8 of an obolus. In addition, there are numbers representing 5000 drachmas and 1 talent (6000 drachmas)⁵⁷. A stone recorded in Delos was found in a theater with eleven parallel lines like those in Salamis, had the third, sixth, and ninth lines marked with an X⁵⁸. Two other stones carved with this pattern were recorded at Abdera⁵⁹ and Eretria⁶⁰. The stone block found in the Temple of Apollo at Delphi is also carved with parallel lines, and there's the votive inscription Η - - Ν Υ Ι Ο / Σ - - located at the bottom⁶¹. As a secondary use, it is suggested that it was used as an abacus⁶². This stone block found in pieces has five parallel lines with triangular-shaped ends and half-arc-shaped carvings. Right next to these five lines are two lines, one of which is indistinct, and an arc⁶³. Based on the preserved lines, V. Mathé suggested

⁵⁰ Pritchett 1968, pl. 3.1.

⁵¹ Pritchett 1968, 192.

⁵² Broneer 1933, 563, fig. 8; 1954, 64, pl. 15.1; Kent 1966, 13–14, no. 42, pl. 6.42.

⁵³ Kent 1966, 13.

⁵⁴ J.H. Kent argues that the use of stone as a game object came several centuries after the writings dating back to the 2nd century BC. He cites the crudeness of the lines and the individual letters associated with the stone as evidence (Kent 1966, 13–14). Pritchett, on the other hand, disagrees with this view (Pritchett 1968, 193, n. 8).

⁵⁵ Pritchett 1968, 193–195, no. 11, pl. 4.1; Schärli 2001, 66–67, fig. 1.

⁵⁶ The single vertical line equally divides these horizontal lines, while the third, sixth, and ninth horizontal lines are marked with an X.

⁵⁷ Pritchett 1968, 195. For another stone find in Salamis, divided into two by eleven horizontal lines and a single vertical line, see Chavane 1975, 197, no. 576, pl. 53.

⁵⁸ Déonna 1938, 336, pl. XCV, 831.

⁵⁹ Ignatiadou 2019, 146, fig. 1.

⁶⁰ For the find with only two pieces preserved along with a proposition for reconstruction, see Knoepfler 2001, 79, fig. 11–12.

⁶¹ A proposal has been made that the first use of the block was as a pedestal for a statue dedicated as an offering in the Archaic period (Mathé 2009, 173).

⁶² Mathé 2009, 175.

⁶³ Mathé 2009, 174, fig. 6–7.

that there may be nine more lines in the continuation of the existing lines, and, as in the examples of Salamis and Oropos, there are eleven parallel lines in total⁶⁴.

In addition to stone-carved game boards, there is also archaeological evidence of game boards carved on terracotta roof tiles. Two roof tiles found in Pydna, Macedonia, are thought to be game boards for Pente Grammai⁶⁵. Another notable find identified as the Pente Grammai game is the game set found in a tomb context in Corinth/Derveni⁶⁶. The wooden set that has gaming pieces with iron-reinforced edges found alongside it in its context, has been evaluated as a foldable Pente Grammai game board⁶⁷.

In addition to the examples mentioned above, the findings in Stageira⁶⁸ in the North Aegean and Eretria⁶⁹ on the island of Euboea are the closest matches to the stone block we examined in this study.

EVALUATION

Blocks and plates carved with parallel lines are often associated with the Pente Grammai game and are defined as game boards, one of the basic tools of this game. Archaeological data from mainland Greece and the Aegean islands have led recent researchers to identify stone blocks with five, seven, and eleven parallel lines on the same surface as abacus. These blocks are characterized by monograms on their sides that correspond to numerical values. Given that sacred areas in ancient Greece served as financial centres, it is likely that these types of inscribed artifacts found especially in sacred areas were used for large-scale calculations⁷⁰. It's hard to say whether the five-line examples with no numerical values are a calculating tool or a game board for the Pente Grammai game. In this context, the Old Smyrna stone block we are examining corresponds to the simple and plain designs found in Stageira and Eretria. The iconographic narrative on the Krannon grave stele provides new data on the use of simple-designed boards as an abacus. This finding contributes to the view that board games were used as teaching tools in the Greek education system⁷¹. Due to the lack of recorded information about the context of the Old Smyrna find that we have introduced in this study, no hypotheses about the intended use of the find will lead to an accurate identification. We can generally state that the example we examined was used as a multi-purpose object that included both an abacus and the Pente Grammai game. The Old Smyrna find we examined in this study provides important new evidence for research

⁶⁴ Mathé 2009, 174, fig. 8.

⁶⁵ One of these examples is a Corinthian-style roof tile with six lines on it dated to the first half of the fourth century BC, which was found in a settlement area. Another Lakonian-style roof tile, on the other hand, has nine lines with a triangular motif carved over one of the lines. For details, see Ignatiadou 2019, 151, fig. 9–10.

⁶⁶ Ignatiadou 2016, 111–112, fig. 13.

⁶⁷ Ignatiadou 2019, 151. For foldable digital animation of the game table, see Kotoula, Ignatiadou 2019, 91, fig. 5–6.

⁶⁸ Ignatiadou 2019, 150, fig. 7.

⁶⁹ Knoepfler 2001, 81, fig. 13.

⁷⁰ In ancient times, sanctuary areas took on a banking role by collecting taxes, protecting the treasury, and exchanging money values (Immerwahr 1986, 199).

⁷¹ Netz 2002, 342.

on this topic, particularly in Anatolia, and on the Graeco-Roman game culture in the Smyrna region.

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