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Research

Traditional patterns in Pyrgi of Chios: Mathematics and Community

Abstract. Ethnomathematical research has revealed interesting artifacts in several cultures all around the world. Although the majority of them come from Africa, some interesting ones exist in Western cultures too. *Xysta* of Pyrgi are a designing tradition that concerns the construction of mainly geometrical patterns on building façades by scratching plaster. The history and the culture of the community, the way that this tradition is connected with them, as well as the informal mathematical ideas that are incorporated in this tradition are some of the issues that are explored here.

Η εθνομαθηματική έρευνα έχει φέρει στην επιφάνεια ενδιαφέροντα τεχνουργήματα από όλο τον κόσμο. Παρότι η πλειονότητά τους προέρχεται από την Αφρική ενδιαφέροντα σχέδια υπάρχουν και σε δυτικές κουλτούρες. Τα *ξυστά* στο Πυργί της Χίου αποτελούν μια σχεδιαστική παράδοση που αφορά στην κατασκευή γεωμετρικών, κυρίως, σχεδίων στο σοβά που βρίσκεται στην πρόσοψη των σπιτιών. Σ' αυτή την εργασία εξερευνάται κυρίως η ιστορία και η κουλτούρα της κοινότητας του Πυργιού, η σύνδεσή τους με την παράδοση των *ξυστών* καθώς και οι άτυπες μαθηματικές ιδέες που είναι ενσωματωμένες σ' αυτή την παράδοση.

1 Theoretical points

1.1. Introduction

According to D'Ambrosio, "Mathematics is an intellectual instrument created by the human species to help in resolving situations presented in everyday life and to describe and explain the real world" [2005, 11]. So, every community depending on its special environmental and social conditions—not necessarily practical—selects different ways to answer its own needs.

As Paulus Gerdes notes:

> Many peoples do not appear to have referred to the mathematics history books. This does not mean that these people have not produced mathematical ideas. It means only that their ideas have not (as yet) been recognised, understood or analysed by professional mathematicians and historians of mathematical knowledge. In this respect the role of Ethnomathematics as a research area resides in contributing with studies that permit to begin with the recognition of mathematical ideas of these people and to value their knowledge in diverse ways, including the use of this knowledge as a starting base in mathematics education [2005].

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Ethnomathematical research has shown that all cultures use notions and practices recognizable as mathematical no matter whether or not mathematics exists as a distinguishable category of cognition in these cultures. Different cultures present and develop some common mathematical activities in order to respond to the needs and requirements of the natural as well as the sociocultural environment. That is to say, depending on the needs and demands, mathematical activities tend to be developed in different directions as well as in different degrees in every culture.

According to Bishop [1988] the mathematical activities that are accepted as universal are counting, measuring, locating, designing, playing, and explaining. These six activities are adopted as analytical categories by all researchers and very often research focuses on one of them.

Research regarding the above activities contributes to the acquisition of a deep cognition about mathematical activities and the ways through which people are educated by them in every particular culture. Also, it helps us to realise that all cultures have common characteristics as well as particular ones that distinguish them. Furthermore, the study of these universal activities results in the recognition and acceptance of each culture's contribution to what we today call academic or school mathematics.

1.2. Design activity

The activity of designing concerns "the manufactured objects, artifacts and technology which all cultures create for their home life, for trade, for adornment, for warfare, for games and for religious purposes" [Bishop 1988, 39]. An important part of designing concerns the transformation of some materials, usually from nature, into something that is useful in a given society with particular conditions.

Design activity exists in every culture. The type of designs depends on the people's needs and the available materials. What differs among cultures is what is designed, in what way and for what purpose. That is to say, in every society depending on its own needs—not always material—the expression of this particular activity is differentiated.

Some researchers, as for example Pinxten [1983], write about their own impression of the geometrical and mathematical possibilities of the design forms that appear in several cultures they have studied. In her book *Africa Counts* [1973], Zaslavsky presents the richly geometrical tradition of African societies, part of which is decorative patterns. She also describes the African architecture that is depicted on houses in the form of elaborate drawings.

Gay and Cole [1967] note that the Kpelle have developed a technology for the construction of houses using right angles and circles: "they know that if the opposite sides of a quadrilateral are of equal length and if the diagonals are also of equal length, the resulting figure will be a rectangle" [Bishop: 1988, 41]. The Kpelle, although unable to state this suggestion as a theorem, apply it in their constructions as a culturally acquired cognition.

Geometrical figures such as the right angle and the orthogonal triangle appear frequently in all cultures around the world. Circles also play an important role among symbolic representations, such as in mandalas. Several geometrical figures played important role in helping people to imagine relations between phenomena.

Paulus Gerdes [1996, 1999] gives various examples concerning mathematical ideas incorporated in the design processes of artists in Mozambique as well as in other places in Africa. Furthermore he emphasizes the necessity of incorporating this cognition into the curriculum. He maintains that if the hidden mathematics of Mozambique, which he characterizes as "frozen" mathematics, were "defrosted", the culture would be revealed and make it clear that Mozambique's people, like other people, have produced mathematics.

Among other interesting design traditions connected with mathematical ideas is that of the *quipu* of the Incas, studied by Marcia and Robert Asher [1981]. A quipu is an assemblage of coloured and knotted cotton cords. The colours of the cords, the way they are connected together, their relative placement, the spaces between them, the types of knots on the individual cords, and the relative placement of the knots are all part of a logical-numerical recording. In the tradition of the quipu exist important mathematical ideas, mostly of graph theory, which the Incas developed much earlier than did the West. Also, it is important to mention the fact that the representation of the numbers developed in a way that took into consideration the place value and the representation of zero.

Another interesting expression of design activity is found in the tradition of *sona*, the name given by the Tchokwe people of northeast Angola to their standardized drawings in sand. These were used as mnemonic aids in the narration of proverbs, fables, riddles, etc. Thus the patterns of *sona* played an important role in the community's transmission of collective memories. The *sona* patterns depended on the kind of ritual they were used in. This tradition is also of interest because of the mathematical ideas that are incorporated in it. Arithmetical relationships, progressions, symmetry, Euler graphs, and the (geometrical) determination of the greatest common divisor of two natural numbers are some of the mathematical ideas hidden in *sona* patterns.

Obviously, each of the design traditions mentioned above is incorporated into its respective culture and responds to its particular reality.

2 The tradition of Xysta

Xysta (singular *xysto* ; plural *xysta*) are a kind of graffiti that appears at the village of Pyrgi, one of the medieval villages of Chios. Although there are also a few houses in some other villages with *xysta*—mostly geometrical patterns constructed by traditional craftsmen on house façades—those in Pyrgi are considered a particular tradition (fig. 1).

The procedure for their construction is the following. First the craftsman plasters the façade of the house in one or two layers: the first makes the surface flat, while the second is the base for *xysta.*[1] While the material is fresh a layer of whitewash is added. The craftsmen subdivides the wet surface into zones, and in every zone appropriate patterns are designed. The pattern is then scratched with a fork into the whitewashed surfaces. The patterns that appear are the result of the contrast between the scratched whitewash and the plaster (fig. 2).

Fig. 1

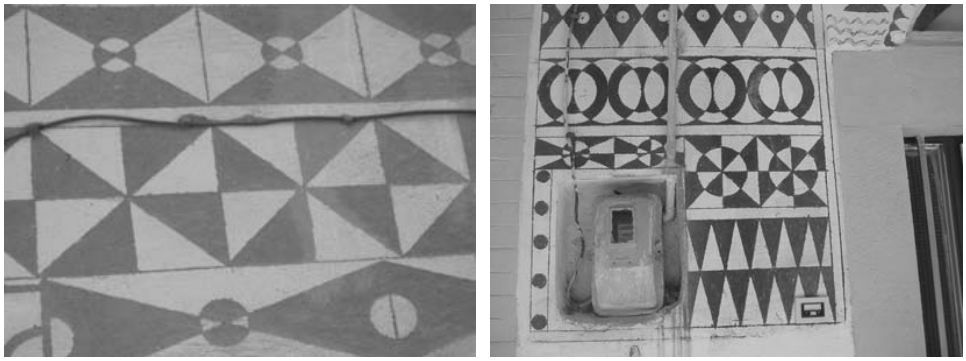


Fig. 2

The main materials that are used for this procedure—depending on the time period—are different kinds of sand, mortar, whitewash and cement. The instruments that the traditional craftsmen use are only a lath, dividers with two points, and a fork. The lath serves two purposes: for the separation of the wall's surface in zones and for the construction of straight lines. The dividers are used for the construction of circular figures, while the fork is used for scratching some areas of the figures in a way the one area is dark (the scratched one) and the next white and so on.

As will be discussed below, this tradition is very important for the inhabitants' community and sense of identity. The fact that this is both a cultural practice as well as the application of interesting mathematical ideas in a traditional art form make *xysta* an interesting example of Ethnomathematics.

In this paper the following questions are discussed:

- How is the cultural context connected with this design tradition?
- What are the main mathematical ideas that we can see in these patterns?
- How is the construction of these patterns a result of informal cognition that craftsmen acquire through partnership?
- How could this be used for teaching some mathematical notions or practices?

3 Methodological issues: the method of the research

As Ethnomathematics lies in the confluence of mathematics and social (cultural) anthropology, the main methodology adopted comes from anthropology, namely ethnography. A commonplace of the researchers who explore cultural parameters is that "the place of emergence of cultural cognition is ethnography". It is argued that ethnographical research constitutes a particular characteristic of modern anthropology that differentiates it from the other social disciplines [Madianou 1999, 215].

A basic element in ethnography is research on site, with the main characteristic being participant observation. Participant observation combines participation in peoples' lives with a scientific distance that allows the precise observation and reporting of data. Also, participant observation is a kind of baptism in a culture.

In the framework of an ethnographic work, the researcher remains in the field as long as necessary in order to acquire access to aspects of life that could not otherwise be easily be approached in order to select data. In this type of research data can appear *a posteriori* as the result of meanings that are attributed in particular contexts and which researcher can see and interpret after he has been incorporated into the indigenous culture.

Participant observation is considered by some researchers as a method and by others as a research strategy or technique. Independently of the way we define participant observation, the majority of researchers consider it the most important as well as the most laborious method of anthropological research [Madianou 1999, 242]. The reason is that participation requires the involvement of the anthropologist in everyday activities and community life. Furthermore, communication through the local language is required. In fieldwork he has to observe and analyze the incidents in light of their everyday cultural relevance.

The procedure of interviewing is another important element. Open interviews are the most common type. Although they seem casual, because they have an implicit agenda—in comparison with the structured interview with its explicit agenda—these kind of interviews are useful for ethnographic research because they help the researcher understand the way people think and to compare the opinions of different people.

Another important aspect regarding fieldwork is entrance in the community. Since the ethnographer doesn't usually come from the community that he studies, how he or she approaches the members of the community is a significant issue.

The method that was selected for the present research was one with ethnographical characteristics. Although the time of my residence during the fieldwork was less than the usual, the tools of the research were very close to those of ethnography. Residence in the field, participant observation, and the informal interviews are some of the elements that determine the research presented here.

4 The fieldwork

Having visited Pyrgi a few times between 1993 and 2005, I had the sense that the geometrical patterns that the inhabitants create on the façades of their houses were of mathematical interest. The summer of 2005 I decided to stay in Pyrgi in order to study not only the kind of patterns but also the reasons why this tradition began and developed here. Thus most of the material in the present paper was the product of research on site.

4.1 The place and the people: past and present

Pyrgi, also known as the "painted village," is located in the north of Chios, one of the Aegean islands. Chios is well-known as the native land of the epic poet Homer. Today it is famous thanks to mastic, a product of the mastic tree. The inhabitants of Chios, especially those who come from the south, feel proud of their place because of the fact that while these trees also exist in other places around the world they don't produce mastic. Pyrgi is a mastic village.

Furthermore, Pyrgi is one of the medieval villages of Chios. What differentiates it from other medieval villages is the fact that it is substantially the same as it was six to seven centuries ago. Although there is an expansion of buildings, the main part of the settlement continues to be the same as it was in the past.

There is no sure information about the exact date of the settlement's construction. Among other writers, Konstantinos Sgouros [1937] asserts that the village existed before the possession of Genoa (1346-1566). Another historian, George Zolotas [1928], also believes that the main core of Pyrgi existed before the possession of Genoa. He also maintains that the inhabitants of Pyrgi and the nearby settlements were unified for safety purposes.

The architect-researcher Maria Xyda reports that the conquerors unified the settlements in order to fortify and organize the ex-Byzantine settlements that produced mastic into a single settlement [2000, 37]. Xyda estimates that the design of the village happened in another place. She notes that buildings such as churches were not included in the original design of the village, and thus claims that the design happened at Genoa. To support this argument she notes that the medieval villages of Chios were designed in the same way as Liguria's villages. The similarities between Chios's medieval villages and those of Liguria concern not only the urban layout but the constructive and morphological details of the houses as well as the use of similar stones [Xyda 2000, 38].

The German sojourner Hohann Michael Wansleben, who visited Chios in 1674, noted "Pyrgi is very well fortified and it has been built in the Italian way".

The shape of the settlement originally was a quadrangle. A small tower was built on each of the four apexes. The houses had neither windows nor doors on the external side, so they had a view only of the internal side of the settlement. The way those houses were built formed a wall around the settlement [Proiou 1992, 48]. Two main gates, in the north and the south, permitted access to the settlement. The houses were arranged like rings. At the boundaries of every ring the streets were made. These rings were linked by arcs [Xyda 2000, 41]. This form of the village was maintained until the beginning of the twentieth century, when it started to expand. As a result, today the boundaries are not distinguishable.

The houses of the old part of the village are very similar as far as the design and the material of construction are concerned. Usually the houses are constituted of three or four floors.

The type and the arrangement of the place dictate corresponding practises. First of all, because the inhabitants by definition live very close to each other, they have direct everyday contact with their neighbours, voluntary or not. What is of great importance for the present research is the fact that since the houses were narrow and dark, the inhabitants had to

spend a lot of time outside. In other words, the whole social life of the population happens in the central square as well as in the streets around the square. The women meet their friends and their neighbours and do the household duties outside their homes, for example on the sidewalks in front of their houses, because there are no yards. At the time I was there I saw women preparing fresh beans, threading tomatoes—in order to dry them—and undertaking any other kind of activity they could do outside (figs 3-6).

Fig. 3-6. Social life in Pyrgi

The fact that they spent so much time outside their houses doing their everyday duties seems to have affected the way they realized the exteriors of them. The inhabitants initially constructed their houses with plain stones. As over time they improved their financial situation, they were able to plaster their houses in order to protect the walls from the weather. Later they started to add patterns to the facades of their houses for decoration purposes. So the practice of plastering, which was initially used simply for protection against the elements, developed into a way of decorating.

According to some sources, the patterns that they are used are derived from the carpets that Genovese people—the conquerors—used to put on the outsides of their houses for decorative purposes. After the Genovese left Pyrgi, the practice of decorating the façades with carpets was replaced by decorating façades with the patterns on plaster. Others consider the patterns of Capodocia in Turkey to be the inspiration (see [Xyda 2000]). The geographical location of Chios, and the Aegean islands in general, appears to explain the influences of both East and West.

4.2 The evolution of the style of *xysta*

As already mentioned, there is no sure information concerning either the date or the origin of the tradition of *xysta*. It is supposed that a constructive technique developed into a decorative one. When I asked Maria Xyda if there was an era at which the *xysta* were connected with a high status, she answered that the people who had the ability to plaster their houses and create *xysta,* in its earliest stages, were the wealthier people of the community.[2]

Although little is known about the date this tradition began, the techniques used from the beginnings up to the present is well known. Maria Xyda has classified the technique, the material, the patterns and the style, in general, into five categories [2000: 64-68].

- *Xysta* of the first period. At this time the patterns were only geometrical themes—limited types—and the plaster was made of river sand, lime and straw. The size of the patterns was similar to the size of the stones used as structural units (fig. 7).

Fig. 7

- *Xysta* with influences from the East. The *xysta* of this period were influenced from the Near East so there was a rich diversity in patterns. Another characteristic of this period was the tassels they had at the bottom, which represented carpets. Although the patterns are different from the first period the material used was the same (fig. 8).

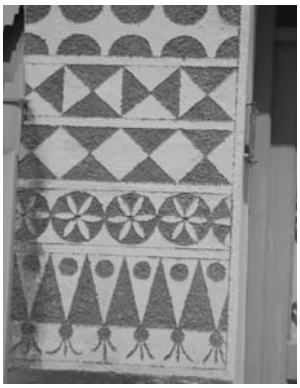


Fig. 8

- *Xysta* of 1930-1940. The *xysta* at this time reflect all the previous influences. The material is not always the same since sea sand and cement were added (fig. 9).

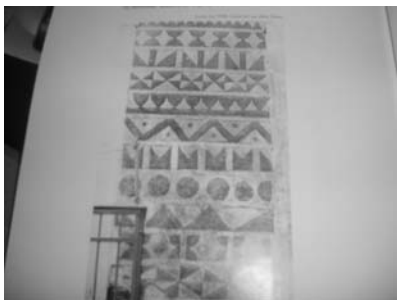


Fig. 9

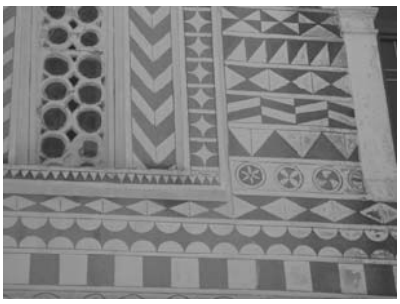


Fig. 10

- *Xysta* after the Second World War. The patterns become increasingly complicated, while at the same time they abandoned the use of colours. The material is the same except for the sand, which is now only from the sea, which is very close to the village (fig. 10).
- Contemporary x*ysta*. The patterns are black and white. They aren't organized in units, but are more complicated and, in contrast with the previous periods, they extend over the entire surface of the facades. Furthermore the patterns are borrowed from some other traditions of craftsmanship, such as carpentry and blacksmithing. The patterns of this period cover the entire façade without taking into consideration the doors and windows. The materials that are now used are cement, a different type of sand that they can buy from the market, lime, and cinder (fig. 11).

Fig. 11

4.3 The entrance in the community

After visiting Pyrgi a couple of times as a tourist, I decided that studying *xysta* could be of great interest in the context of the connections between culture and mathematics. This special tradition of *xysta* was important not only from the side of the construction and designing but also from the side of culture and mathematics. The majority of the patterns were geometrical constructions that were made by two simple instruments.

The first day I visited Pyrgi as a researcher, in the summer of 2005, I attempted my entrance in the community through a café located in the central square of the village in order to meet members of the community (*cafeneio* = Greek café). As mentioned above the social life of people takes place in the centre of the village. After this informal discussion with the inhabitants my informer Elias led me to observe some interesting patterns and also facilitated my contact with one of traditional craftsmen.

4.4 Material and data selection

The interviews with the inhabitants were informal and semi-structured. Through them I attempted mostly to understand elements about their identity as inhabitants of Pyrgi and the connection with the *xysta*. In contrast, the interviews with the craftsmen and the architects were more structured because more concrete answers concerning *xysta* were expected.

At Pyrgi, I had the chance to meet some very kind and helpful inhabitants who did their best to facilitate my research. Since the community is a small one, in a very short time, everybody had been informed that someone was interested in *xysta*. As a result, while I was walking down the streets or taking photos some inhabitants approached me and gave me any information about *xysta*.

In these discussions I heard several versions of the story of their origin as well as the date or period when this tradition started. Some of them consider the tradition to have come from the East (Turkey) and some others from the West (Italy). The location of Chios and, more generally, the area of Aegean Sea (indeed, the whole of Greece), allowed it to be influenced by both East and West.

Written documents selected from the local library supplemented the material of the research on site. In the library I found material concerning the tradition of *xysta* as well as the place and the people. Another very important resource for my research was my personal communication with the architect Maria Xyda. She comes from the island Chios and had conducted research about *xysta* in the framework of a European project. This resulted in her book, *The* Xysta *at Pygri of Chios*. In addition to personal communication, this book was of special interest for my research.

The ethnographical equipment used in the fieldwork were a camera to take some photos of the many designs of *xysta*, and paper and pencil in order to take notes during the fieldwork and to try some original analysis and thoughts. I used a tape recorder for the interviews.

4.5 Identity of Pyrgi's inhabitants and *xysta*

The majority of the inhabitants maintain that the main elements that distinguish their community from the 'others'—in the island and generally—are the *xysta* and their traditional dance, called *pyrgousiko*. Some added the traditional clothing, *pyrgoysiki*, as a distinguishing factor. The connection of the traditional clothing with the other two cultural peculiarities is noteworthy: according to their explanations, the designs on the sleeves of this clothing come from the *xysta*, although, as I noticed in the folklore museum, only a part of them had patterns similar to *xysta*. In any case, the fact that they speak this way, connecting these traditional elements and their identity, is itself of some importance.

Figs. 12-14

The following discussion with an 80-year old man is characteristic of the importance of *xysta* for the members of community:

> "Why do you like to have *xysta* at your house?"
>
> "Because I'm *Pyrgouis* (=habitant of Pyrgi). Jesus Christ was born in the manger and the manger is what he remembers."

Many others answered the question about their interest in *xysta* in a similar way, saying that they like *xysta* because "these are our tradition". In some other cases it was tourist purposes that were emphasized: "The *xysta* is a means of promotion for Pyrgi, the place is famous because of its *xysta*".

The sign and the design on the t-shirt in figs. 12 and 13 are indicative of the connection of *xysta* with what is expected from tourism. Also, it was observed that some modern buildings, such as hotels, were decorated with *xysta*. In fig. 14 the interior of a modern hotel is shown. This hotel was located in the village closest to Pyrgi, which is its seaport. The majority of this village's habitants—including the owner of the hotel—came from Pyrgi. By using the *xysta* in an alternative way to decorate part of the hotel's interior he was declaring the continuity of the tradition.

5 Patterns and mathematical ideas

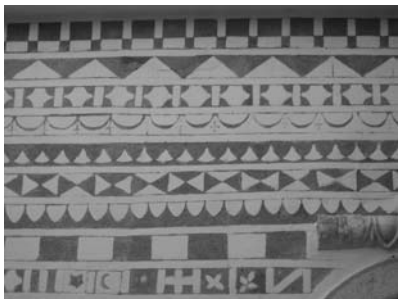
When studying the tradition of *xysta* in the framework of culture and mathematics, it is of great importance to understand how this tradition was incorporated and developed in this particular culture and what the meaning of it for the community is. On the other side, it is important to explore the mathematical ideas that are incorporated in them, noting that

it is about informal mathematics, as *xysta* are products of craftsmen who have acquired this cognition through experience, without have been taught something in school.

A few indicative patterns presented here are going to be examined in order to help us to pick out interesting mathematical ideas. A main mathematical notion that is apparent in them is the construction of geometrical shapes such as rectilinear or circular figures.

Among others, the notion of transformation is one that appears very often in these patterns. The kind of transformation used in *xysta* patterns is isometry, since in all cases the shapes that are transformed do not change the distances between the points. The isometric objects are congruent; that is to say, we can turn one into the other just by sliding and flipping. The kinds of isometries that are found are translation, rotation, and reflection.

More analytically, in every picture we can observe the following mathematical ideas.



Figs. 15-16

The photos in figs. 15 and 16 show different parts of the façade of a church. Before starting the discussion about the geometrical figures it is interesting to notice some other elements on these pictures. For example, in the same place we can see religious symbols (such the cross) and other symbols (such as the half-moon and the point that refers to the East). Contradictions like this are characteristic of the Aegean islands, because they combine the culture of the West with that of the East, in particular the Greek Orthodox.

Observing the picture that covers larger surface we can see some zones that separate different motifs. The subdivision of the surface in parts could be considered as a set that is separated in sub-sets, a fact that also indicates a mathematical notion.

On the first clear zone we can see triangles that seem to be produced by a translation. Every triangle (black or white) is the union of two orthogonal triangles, while these orthogonal triangles come from the division of the rectangle in two equal parts by the diagonal. For this construction the informal notions that are implicitly used are the construction of the rectangle; the tracing of the diagonal; the fact that the diagonal divides the rectangle in two equal parts, and that alternating black and white triangles are congruent because they are derived from equal rectangles.

In the next zone the main notion is that of symmetry. In this there are two motives that are repeated. So, first of all we could speak about translation. Furthermore, in every motif there are two axes of symmetry: the one horizontal, the other vertical. Also the construction of circles (circular sectors), rectangles, and interstices between lines and circles are important mathematical ideas.

The other zones continue with similar mathematical notions and produce variants of the figures that have already been discussed above.

While the majority of the motives are constituted of rectilinear figures in some cases they are made of circular figures (fig. 17). As Maria Xyda noted, when the craftsmen didn't have enough space to develop a rectilinear figure, as for example in the space between a door and a window or under a balcony, they constructed circular motives [2000, 63]. The size of the circles, which they call "moons", depends on the available area. The only tool that is needed for the construction is dividers.

Fig. 17

In the preliminary stage for this pattern the craftsman constructed a quadrangle. After he had determined the centre of this, he traced the three concentric circles. Then, using a random point of the perimeter of the original circle as the centre, he traces a new circle whose radius is equal to that of the origin circle (all lines outside the original circle are later erased). He continued the procedure by tracing new circles, each time using the intersection of the previous circle with the original one as the new centre. After constructing the first six parts, which they call "daisy petals", by finding approximately the middle of one of the six arcs in which the circles have been divided, he continued with the same procedure. Scratching the lime of the common area of the petals as well as the area external them brings into evidence the final design. By continuing to scratch in the middle circle, the two rings are created. He finished the construction with the semi-circles on the outside of the circle.

In this pattern a lot of important implicit mathematical notions are present. First of all, there is the tracing of circles. For the construction of the main circle the centre of the quadrangle has to be determined. Behind the construction of equal arcs on the main circle is the equality between the meter of the arcs and the corresponding epicentre angle. Furthermore, in the main motif twelve axes of symmetry are noticed: six of them are diameters that connect two opposite points that are the intersection of the circles with the original circle and the other six are diameters than connect the middle of the arcs that are opposite.

An interesting façade is shown in fig. 18. It shows a *xysto* from the period 1930-1940 and it is reproduced from Maria's Xyda book [2000, 66]. As she notices, *xysta* of this period are the most naïf and characteristic since they combine the origins of the Pyrgi tradition and at the same time give solutions and perspectives for popular art.

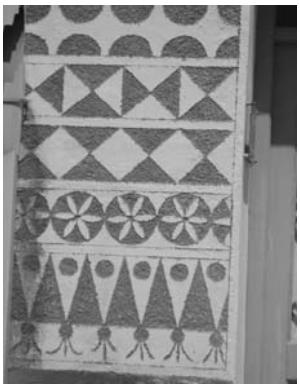


Fig. 18

The patterns here are also a combination of geometrical figures. The constructions concern circles, semi-circles, quadrangles, equilateral and orthogonal triangles (half of a quadrangle), and the tracing of diagonals.

In the first clear zone, starting from the top the main figures are semi-circles. In this zone we can talk about translation as well as axial symmetry. In every motif two axes of symmetry are noticed: one horizontal and one vertical. Similarly in the next zone translation and axial symmetry are observed. The difference here is that there is only vertical axis in every motif. The equilateral and orthogonal triangles were produced by diagonals of the quadrangles.

In the next zone there is a more complicated design. The original figures are rectangles in which a horizontal line (parallel to the horizontal sides) and diagonals are traced. By scratching the triangles that are 1/4 or 1/8 of any rectangle we obtain these designs. By taking one rectangle as one unit, the next rectangle is produced by rotation. In the case that two adjacent rectangles are considered as one unit, we can talk about a translation.

It should be generally noted that all these patterns are constructed only with two tools: dividers and a straightedge without markings. Thus these constructions recall the only constructions that were acceptable in the mathematics of ancient Greece.

6 Some concluding notes

Xysta of Pyrgi is an interesting design activity because of both the significance for its inhabitants' culture and the mathematical ideas with which it is connected.

Current approaches of didactics of mathematics discuss the use of everyday mathematical cognition as well as examples of several cultures in teaching mathematical notions in the classroom. Patterns like these could be used in the introduction of mathematical notions such as transformation and symmetries.

By teaching mathematics through patterns, students can not only learn mathematics but can also understand that mathematics is a component of everyday life. Furthermore, they are motivated to find information about the corresponding community in which mathematical ideas are met in traditional activities, and thus see the connection between culture, cognition, and context.

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Notes

1. The number of layers of plaster on the façade depends on the technique as well as on the material that was used in the construction. The original *xysta* were only on stone houses, but now the majority of houses are brick.

2. Personal communication.

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