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Pedagogy and Experimental Archeology

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Abstract: *In order to identify the operative stages of construction, firing and construction of ceramic objects, I appealed to experimental archeology, trying to get as close as possible to the original models and materials. I performed several similar experiments, together with students of the County Cultural Center "Teodor T. Burada" and in partnership with the Museum of Callatis Archeology in Mangalia, using the kiln made during the project Maps of Time: Real Communities - Virtual Worlds - Experienced Past, funded project within the IDEA Program. The objects were made of clay from the Medgidia quarry. The aim was to obtain an oxidizing combustion, using a furnace built vertically. The main objective of the reconstruction was to obtain an oxidizing burnt pottery, in an enclosure built of brick and clay mixed with sand.*

Keywords: *kiln; ceramics; experiment; archeology; teaching; burning; technique;*

1. Introduction

In order to identify the stages of the operators of construction, firing and construction of ceramic vessels, I appealed to experimental archeology, trying to get as close as possible to the original model and material. One of the first experiences in this field was facilitated by the initiator and director of the Exploratory Research Project Time Maps: Real Communities - Virtual Worlds - Experienced Past, project funded under the IDEI Program, Ph. D. Dragoş Gheorghiu. In this project, the emeritus professor opened the past to the future, redefining the relationship between art and science and creating www.timemaps.net, a pedagogical tool, whose purpose is to help us imagine the past, to recover through experimentation the technologies and introduce them into the contemporary education system. In my turn, I performed several similar experiments, together with the students of the County Cultural Center "Teodor T. Burada" and in partnership with the Callatis Archaeological Museum in Mangalia, using the oven made within the project Maps of Time: Real Communities - Virtual Worlds - Past experienced, project funded under the IDEI Program.

2. Objectives

The aim was to obtain an oxidizing combustion, using a furnace built vertically. The main objective of the reconstruction was to obtain an oxidizing burnt pottery, in an enclosure built of brick and clay mixed with sand. To recognize and revive the craft pedagogy and its values of human formation means to face the complexity of a historical situation that endangers the survival of societies, of cultures that refuse to die.

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3. Material and Methods

Within the project Archaic Burns - Experimental Burns (Experimental Archeology) the objects created by the students were made of clay from the Medgidia quarry. For this experiment, objects with different dimensions were made, manually, by modelling, from the same type of clay, without respecting any similarity with a certain type of ceramic, the vessel wall having different thicknesses. The modelling was done by the technique of overlapping cords, followed by fixing them with a wooden tool, by hammering.

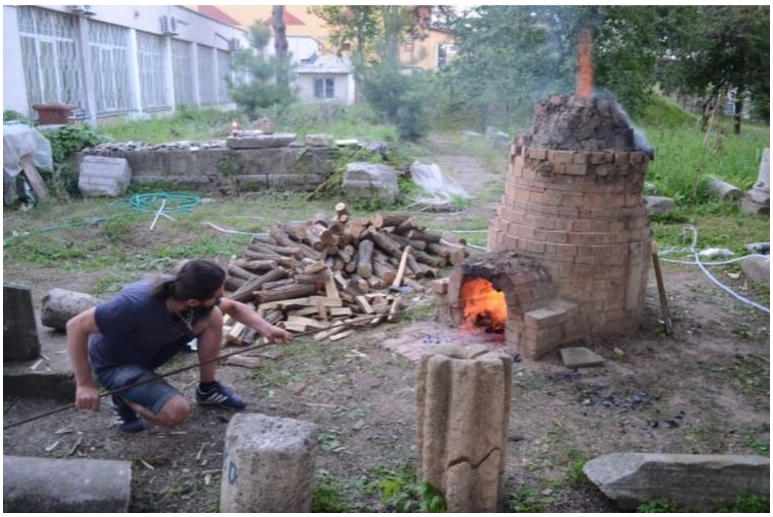

Fig.1. *Experimental combustion, Mangalia*

Fig.2. *Experimental combustion, Mangalia*

Burning started slowly, thin wood was introduced into the kiln's combustion chamber, this first stage lasting about two hours. Students were explained that the phenomenon of slow temperature rise in the first part of the burning process is due to the physical process of removing water from the clay composition. In the thermal interval between the ambient

temperature and 100 ° C, the water that is added to the clay composition to give the plasticity necessary for the modelling, and the absorbed one of the parts, is completely eliminated.
It was then explained to them that, on reaching the second temperature threshold, 300 ° C, the absorption water and the colloidal water, which are naturally present in the clay deposit, are removed. The consequences are obvious: the decrease of the work volume and an accentuated porosity. The slow rise of the temperature is extremely important, because it coordinates the resistance of the vessels in the combustion process. Evaporation of water involves the production of stresses on the walls of objects and therefore its elimination must be done gradually. A sudden this process can lead to the explosion of the dishes in the oven. The imperfections that appear on the walls of the objects burned in the oven are the result of some problems identified in this thermal interval. Students observed that too sudden a rise in temperature or contact of objects with flames can lead to cracks or imperfections.
The control of the flame intensity can be achieved by modifying the upper opening of the furnace (chimney), which is partially covered with tiles. Ancient ovens used to be covered with pieces of stone and fragments of vessels.

The next temperature range - 300 ° C - 500 ° C - is also extremely relevant in terms of the structural strength of the ceramic and the success of the firing process. Specifically, this is the step of removing chemically bound water. This stage has a critical point, difficult to control, located between 450 ° C and 500 ° C. The measurement of the temperature inside was made with the help of a thermocouple inserted in the middle of the oven, the temperatures being read by the students. They found that when the temperature inside the oven reaches approx. 550 ° C, its exterior can no longer be touched by hand, and the tiles that block the opening begin to take on a red, incandescent color.

This is when the last stage of the burning process begins. More precisely, from this moment, the fuel supply was made continuously by the teacher and students, the flames becoming visible in the upper part of the oven, due to the draft that was formed between the hearth and the chimney. In the case of my experiment, the final stage lasted about seven hours. At the end of this stage, the hearth of the furnace was loaded with wood and the preparation for the stage of gradual cooling of the furnace began.
The next day, the oven was opened. Using protective gloves, I removed the bricks and tiles, and then removed the work from the oven, along with the event participants.

4. Results and Discussions

The pedagogical experiment performed with students without artistic training was an original experiment in teaching ceramics techniques. Students were sensitized to understand the relationship between the structure of the paste, the thickness of the walls and the shape of the vessels. We started from examples of objects from antiquity, but through these exercises the students understood that they can also produce contemporary objects, if they take into account the composition of the paste and the thickness of the walls. At the same time, the students understood that certain shapes are dependent on the composition of the material used and thus, starting from Antiquity, they managed to contribute to the efficiency of contemporary ceramics.

Most of the vessels used in the experiment had a uniform color, except for those positioned at the top of the combustion chamber, vessels with light shades of brown and gray, which resulted from a lower temperature in this part of the combustion chamber, except making those that were decorated with another glaze. Analyzing the ceramic material and observing the results displayed by the thermocouple located inside the combustion chamber, we could

observe that different temperatures are obtained from one area to another inside it, these differences being significant. Thus, in the middle of the oven we reached the temperature of 900 ° C, near the hearth - 1050 ° C and on the opposite side of the hearth - 850 ° C.

The red color of the ceramic resulted mainly from the presence of iron oxides that can take or give oxygen molecules and can be in the form of red ferric oxide or black ferrous oxide. These exchanges can only be made when the pottery is at a relatively high temperature. Therefore, the baking atmosphere determines the color of the dishes at the exit of the oven.

It is important to emphasize that the transformation is reversible taking into account the condition that the ceramic is annealed by changing the atmosphere. Thus, a gray ceramic can be burned in red and vice versa whenever desired.

In the case of primitive combustion, rapid cooling counteracts the reoxidation and decarburization of the shard. Reoxidation is often partial, especially in the thickness of the paste that retains a gray heart, even if the surface has taken on a red or brown color. "In the absence of iron oxide, which is the case with kaolin, the clay remains white."[2]

On the other hand, clean paste is found in a "light, red or beige color, depending on its composition".[3]

All the technological information, together with the results of the chemical analyzes of the ceramic pastes, as well as the experimental burns, helped to outline the identification of the operative stages specific to the field of ceramics.

This stage of the research is important because through it it was possible to have a much better understanding of the technological process of ancient ceramics.

Fig. 3. *Objects burned in the experiment*

[2] M. Picon. 1973. *Recherches de laboratoire sur la céramique antique*.Revue Archéologique, Paris: Presses Universitaires de France, pp. 119-132.

[3] M. Picon. 1973. Introduction à l'étude technique des céramiques sigillées de Lezoux. Dijon: Faculté des Sciences Humaines, p. 83.

Fig. 4. *Experimental combustion, Callatis Archaeological Museum of Mangalia*

Fig. 5. *Objects burned in the experiment*

5. Conclusions

As old as the first craftsmen, craft pedagogy has its origins in the distant past. Later, it developed within the medieval guild corporations and encouraged thinkers and educators to seek and recover in the origins of crafts the foundations of education that took place in these workshops, through a long exercise of observation and practice.

The pedagogy of craftsmen consolidates a process of ethical and aesthetic education, which promotes teaching and learning experiences based on ancestral knowledge, cooperation, fraternity and values that come from artistic practice, constant action on the subject, aesthetic encounter with creation itself and, in consequence, with themselves.

The history of education says little about crafts and their formative importance. However, the master's pedagogy is a mirror of traditional cultures. Artisanal pedagogy reflects the metamorphoses of these communities in their quest to update and sustain their permanence.

In craft pedagogy, the relationship of teaching and learning established between master and apprentice goes beyond the simple transmission of techniques. In addition to assimilating concepts and procedures related to the expressive potential of materials or the manipulation of instruments, the disciple learns to relate to the craft by possessing a repertoire whose exchange of knowledge involves awareness of his way of being in the world. Learning to do a good job and develop one's own style depends, in particular, on the degree of closeness and affinity between master and apprentice.

Therefore, craft pedagogy, articulated in oral transmission, aims to contribute to the emergence of what is singular in person, referring to the etymology of the word education, which comes from the Latin education, education: *to bring out*.

Another distinctive sign of artisanal pedagogy is repetitive action. Repetition is the driving force behind the teaching and learning of crafts and, in this case, ceramics. To repeat the same gestures on clay many times does not require, absolutely, a mechanical execution, without spiritual significance.

On the contrary, relentless repetition offers a state of transcendence, a surrender of the body, which in its aesthetic search thinks through the creation of forms. By repetition and, consequently, by mastering the technique, the apprentice reaches maturity and consolidates his own style.

Artisanal education promotes the structuring of the personal and social spheres of the subject's identity; anchored in his de facto learning, it allows a formative experience that is an end in itself, wise, helps the person to fulfill his essence and to recognize his place in the community. In this journey, the role of the master is decisive.

I have shown that the pedagogy of craftsmen is based on ancestral knowledge, but it does not only look at the past and its preservation, in a linear and univocal notion of time. As in the Quechua tradition, in which the past is before the person, because it shapes his vision of the world, and the future is behind, because it is unknown, craft pedagogy fuels the constant dialogue between tradition and the emergence of the new. In the universe of crafts, in their ways of teaching and learning, the layers of memory accumulate from the daily activities, past and present, opening at the same time to glimpses of the future.

In the 21st century, potters live in an increasingly individualistic world, which has lost its sense of community; however, their existence is based on cooperation with colleagues. The pedagogy of craftsmen consolidates a process of ethical and aesthetic education, which promotes teaching and learning experiences based on ancestral knowledge, cooperation, fraternity and values that come from artistic practice, constant action on the subject, aesthetic encounter with creation itself and, in consequence, with themselves.

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