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Proto- and Early Dynastic graves from Tell el-Farkha (Egypt) in three-dimensional view. A case study of grave no.100

The methods and techniques of field work documentation are constantly being improved. In the era of visual media it was necessary to upgrade traditional drawings and recording of structures unearthed during archaeological prospection. The documentation process of excavated sites was always crucial especially when considered feature, accordingly to specific destructive character of archaeological examination, is accessible for the researcher for limited time. In parallel to graphical and visual improvement go possibilities of data interpretation. The new way of view gives not only eye-catching images but could be a great resource for further considerations, testing hypotheses or research result presentation.

The omnipresent pressure to visualize has forced archeologists to make their results more appealing by means of the easiest and most accessible forms of drawings, photographs and eventually photorealistic computer reconstructions, which are often more expressive than a thousand words. Such reconstructions can become a didactic tool, facilitating for example acquisition of knowledge of architecture. This statement is true not only for book publications, but also for multimedia presentations of different kinds. Internet use is a particularly good example. The photorealistic reconstructions in a three-dimensional view are the main objective of this paper. As a case study the very unique grave no. 100 from the necropolis of Tell el-Farkha in Egypt has been chosen.

Tell el-Farkha site

Tell el-Farkha is a site located at the northern edge of the Ghazala village in district el-Sharqiya in the Eastern Nile Delta. It consists of three mounds and covers an area of about 4.5ha with the highest point of 5m above surrounding fields. The discovery of this site just like another 30 was made during Italian Archaeological Mission to the Eastern Nile Delta in 1987. The Italians performed only three years of trial excavations and were able to distinguish chronological range of the site. Without spectacular finds they suspended research and later on resigned from the concession. Since 1998 Tell el-Farkha is under examination by Polish archaeologists led by Marek Chłodnicki from Poznań Archaeological Museum - former member of the Italian Mission (Chłodnicki 2012a: 9-15) and Krzysztof Ciałowicz from the Institute of Archaeology, Jagiellonian University in Kraków.

The site consists of three tells (koms) according to their location labeled Western, Central and Eastern. On each of them different activities took place during over 1000 years of the settlement existence. The chronological range covers periods from the Lower Egyptian Culture (called earlier the Maadi-Buto culture) until the Old Kingdom (Naqada IIB - Dynasties 3-4) and was divided into seven occupational phases.

Western Kom

The earliest evidence of its occupation come from the Lower Egyptian culture. The Western Kom fulfilled back then the function of habitat zone with simple structures which quickly transformed into industrial zone. The sequence of brewery devices were located there. The subsequent breweries, constantly rebuilt in the same spot with maximum 13 vats at the onetime, suggest great significance of beer production most probably as a trade good. The industry area in later phase became the most important one since the large sized edifice were erected there. This so called Naqadian residence was not only an administrative but also cultic centre since apart from many examples of seals, seals impressions and tokens found there, the unique deposit of over 60 figurines, miniature vessels and models was discovered (Ciałowicz 2012a; 2012b).

Central Kom

The Central Kom, which is also the highest one, reveals remains of settlement lasting for over 1000 years. At the very beginning inhabitants from the Lower Egyptian culture established here a separated from ordinary houses large building – Lower Egyptian residence. The size and special treatment of the area together

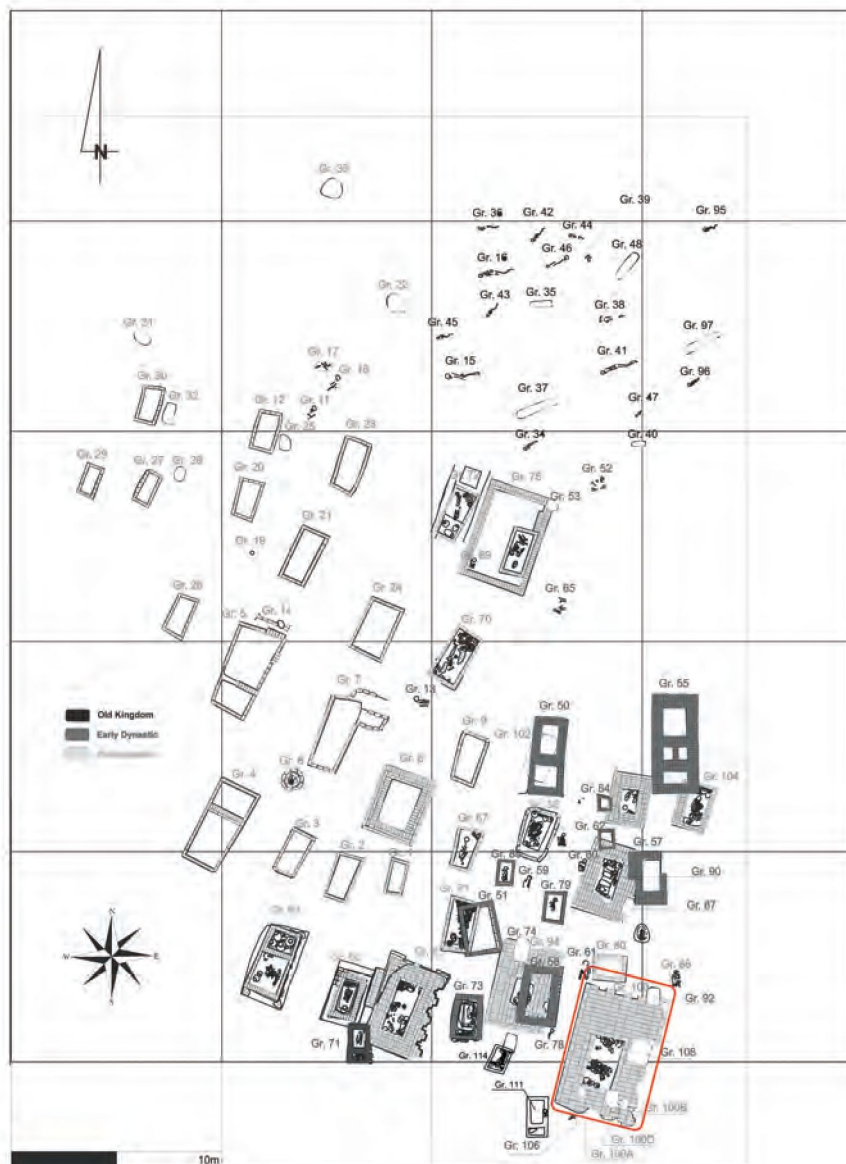


Fig. 1. General plan of Tell el-Farkha cemeteries

with many examples of imported items stress the fact that a kind of elite group might have inhabited this location. It seems that this elite controlled beer manufacturing at the Western Kom since the brewery from the beginning were always surrounded by a fence. In both cases the area was separated with, at first organic fences which were very early replaced by mud brick massive walls. With certain date of Naqada IIC for this event it creates the earliest mud brick construction in the Nile Delta.

The arrangement of the housing zone at the Kom was always on the NE-SW axis. The area was sometimes interrupted with small industries such as small brewery or flint workshops. The Central Kom was constantly settled until the abandonment during the Old Kingdom (Chłodnicki 2012b; Chłodnicki and Geming 2012).

Eastern Kom

Fourteen seasons of excavations at the Eastern Kom have shown what an exceptional part of the site it was. Up to date over 120 graves divided into three groups were discovered (Fig.1). The earliest however probably sepulchral activity here is connected with feature no.10 later called the mastaba. Since works on the structure are not terminated the exact date of it is difficult to state. Only judging by stratigraphical dependences we can prescribe it to the Naqada IIIA2/B1. Cemeteries underlying one above another were occasionally in some parts separated by poor settlements. In other parts they were placed exactly at the spot of previous graves disturbing them. It might be due to the fact that when a new wave of people arrived at the site, the plan of the previous cemetery remained unknown for them.

Cemeteries

Protodynastic graves

The chronology of graves in this group is estimated based on ceramic material and dates back from the dynasty 0 (Naqada IIIB-IIIC1-C2) to the half of the Dynasty I (Jucha 2012; Dębowska-Ludwin 2012: 53). Typical graves had the dimensions: 2-3 m x 1.8-1.2 m and were North-South aligned with a slight East deviation. The predominating form was a pit with regular and rectangular shape with walls lined with one row of bricks (most probably to support them)¹. The majority of graves consist of a chamber containing both the remains of the deceased and elements of his equipment. Grave goods were usually placed by the shorter side but

¹ The reason of lining walls with bricks can be also explained with an attempt at making graves more like houses from mortal life. This thesis can be supported also by division of a grave into multi-chamber structure similar to ordinary house from these times.

could circle the body as well as be placed under the body. In the case when gifts consisted of more significant number of items the inside of the tomb was divided into a bigger grave chamber and small storage chamber/s². The chambers were divided by a brick wall as well. The superstructure part was also built. It was frequently solid brick cover with the height similar to the underground part. Probably none of such covers survived in full. The superstructure parts found nowadays are heavily wasted due to subsequent burials and episodes of abandoned necropolis inhabitation. Another type of graves found in Tell el-Farkha cemetery counted among this group is mastaba. The underground part of this type consisted of one-chamber burial with brick walls surrounding it. The difference is immediately noticeable in the bigger superstructure part. The superstructure part was still a solid brick cover, however in some cases it was decorated with niches of sine and steplike projection (eg. graves nos. 63, 94, 100 – see: Dębowska-Ludwin 2010: 7-9). Apart from the above mentioned examples, some simple pit burials belong to the group due to its stratigraphic position rather than equipment.

The main factor in assessing to which group a grave belongs is pottery and its dating. Among the most frequent findings are clay dishes from beer and wine jars of medium and big size, cylindrical dishes and even products imported from the Levant (Jucha 2012: 77-79). Another substantially represented group are stone vessels, mainly bowls, jugs and cylindrical dishes (Pryc 2012: 299-300).

Early Dynastic graves

The second group of Tell el-Farkha graves is dated with the pottery starting from the middle of Dynasty I to its end or even to the beginning of Dynasty II (Naqada IIIC2 - IIID). The rules of a burial are set at that time and strictly obeyed subsequently. There are no forms proving the search for new solutions. Simultaneously, a schema for grave goods was also set. It seems not to consist of elaborate sets but rather repeating, non variable shapes.

The constructions belonging to this group are similar to the Protodynastic graves. They are still simple grave pits representing the poorest social group, graves with surrounding brick walls and mediocre equipment of middle class and bigger richly equipped graves.

The majority of burials are single. The deceased were placed on the left side of the body in more or less huddled head-north position. The axis is still north-south but with deviations to the west rather than east as was the case in the first group (Dębowska-Ludwin 2012: 66-72).

² For multi-chamber graves from Tell el-Farkha see Rosińska-Balik 2013: 41-52.

As was in case with the Protodynastic, in the Early Dynastic period the most frequent gift for afterlife is pottery, however in standardized form this time. Similarly, stone vessels had less elaborate forms and were made of alabaster (eg. Pryc 2006). Jewellery such as beads, cosmetic palettes, and other every-day-use items are also frequently offered as grave goods. However, one unusual set of models of granaries found nearby one of the biggest grave constitutes extraordinary example of deposit related to a burial (grave no. 50) (Kołodziejczyk 2009).

Among graves belonging to above described group of the Early Dynastic graves there is at least one example of unique grave complex – no. 55. This particular burial represents rare for this period and more popular in later periods enclosure which encircle the grave with kind of low wall with adjacent two subsidiary burials³. This group seems to be a continuation of the former but a hiatus between those two periods seems to be the case. Although, it were the same people that chose the same place for their place of burial, the lack of knowledge of the previous cemetery plan is noticeable. It is mainly seen in the repeated damages of the older graves. This is due to digging new graves and establishing new burials over the older ones, which disturbed the upper elements of the older graves and, even though protected, sometimes their burial chamber were damaged as well.

Old Kingdom graves

This group includes the youngest burials from Tell el-Farkha. Due to the lack of burial goods the exact time of those tombs is not possible to estimate with certainty. Generally they are dated to the Old Kingdom times. Stratigraphically, the Old Kingdom graves lie on the top of the tell, just under the surface of a present day level of the terrain.

Structures belonging to the Old Kingdom graves include very simple and shallow pits, usually in elongated, oval shape graves enabling the straight lying position. Deceased were put to the grave on his right side with head turned west, usually without any goods (Dębowska-Ludwin 2012: 72-74). Distinct funeral ritual manifested itself in different burial shape, the manner of burying and a completely different orientation of tombs are among the proofs that a diametrical change of practices occurred in that time, which might be caused by an inflow of a new population. Future research can answer to that question. Nevertheless, it is almost certain, that deceased buried in this group belonging to the last phase of peopling the Tell el-Farkha settlement.

³ The complex of grave no. 55 is described in details with its virtual reconstruction in Dębowska-Ludwin and Rosińska-Balik 2014: 535-540.

Grave no. 100

To display three-dimensional computer reconstructions, a very interesting burial that represents the first group of Tell el-Farkha graves – grave no. 100 was chosen. In this grave dimensions of the only chamber are rather typical of this group (2.7 m x 1.6 m) but its superstructure is a large, over 6m long, mud brick construction of the mastaba type (Fig. 2). This mastaba reached about 1.5-2 m and was decorated on its three sides with niches creating a sine curved plan. It is probably one of the oldest examples of mastaba in the Lower Egypt (Ciałowicz and Dębowska-Ludwin 2013).

Grave no. 100 belonged probably to a male in mid-thirties. He was laid down on his left side with head pointed to the North. With the deceased there was a relatively rich set of offerings lodged. Among them were 35 pottery and 6 stone vessels, 1 pottery shovel, 1 grinder, 1 bead of carnelian and several animal bones. To preserve these goods and to provide peaceful rest there was not only a massive superstructure, not even depth of main chamber 1.9m but it was greasy mud fulfilling as well. It seems to be a very good solution since there were some traces of unsuccessful trial of rubbery (Dębowska-Ludwin *et al.* 2010).

The biggest peculiarity of this burial are 4 accompanying burials. Deceased buried in the subsidiary graves belonged to the age group of 5-10 years, while the condition of preservation of remains of one of them made impossible the examination of his/her age. All four burials were placed in the interior of superstructure, and an open arrangement of the bricks points to fulfillment of these burials in the course of its rising. The buried were not equipped with sepulchral gifts, but they were put in the contracted position, on one side, with heads to the North or South. This example of inhumations with subsidiary graves constitutes one of the earliest such sepulchral practice in Egypt (Dębowska-Ludwin and Rosińska-Balik, in print).

Reconstruction

To begin work with virtual reconstruction the first step one has to make is to collect all possible data about the structure of interest. In this case it was necessary to gain the best documentation available such as photographs and drawings made during excavation process. The more detail drawings, the more accurate virtual reconstruction. Also important are precise measurements which help in three-dimensional model building process. In the case of grave no. 100 from Tell el-Farkha drawings were made by using tachymeter and obtained this way observations on the basis of x, y, z coordinates were then transformed into a plain drawing on paper. This method allows measure precisely and reduce a human error. The other advan-

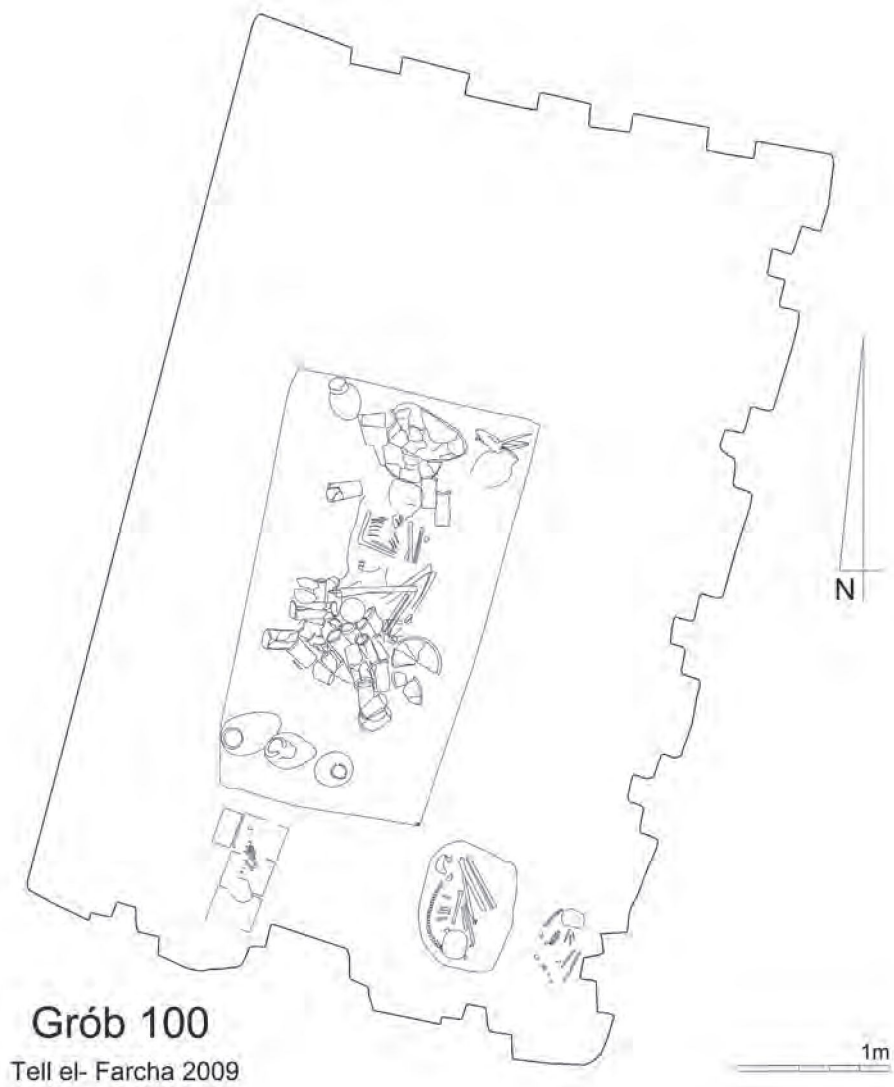


Fig. 2. Grave no.100 (drawing by K. Błaszczyk and M.Czarnowicz)

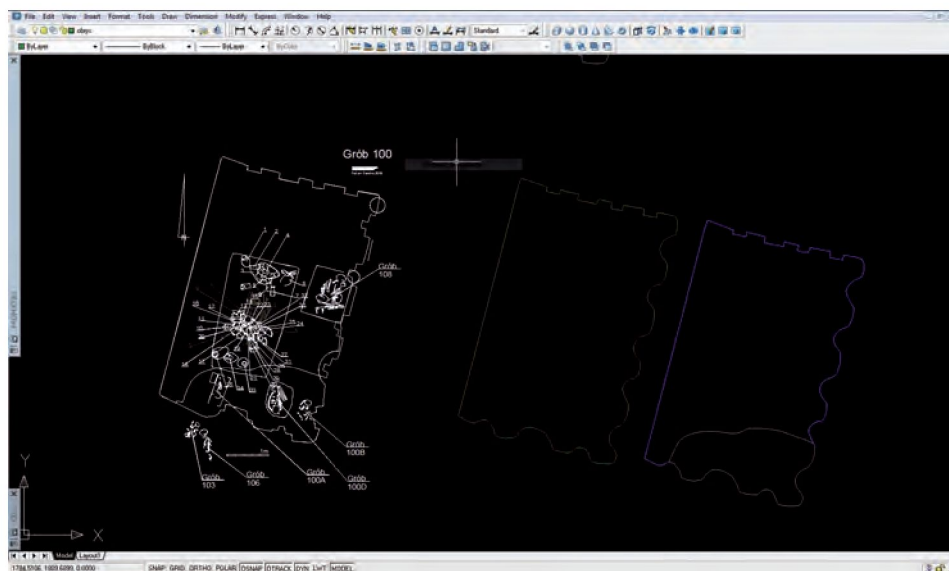


Fig. 3. Digital 2D plan of grave no.100 (by the author)

tage of the drawing supported by Total Station is the possibility of saving digital data in files operated by a graphic computer CAD (Computer Aided Design) software.

The next step is to load digital data into computer and connect them with previously scanned paper drawings. Having such prepared background we are now ready to create digital plans of a structure – in this case grave no. 100 - in different stages of examination. Of course using only traditional paper documentation is also good but might be infected with small errors. Very important thing at this step is to prepare the CAD to fulfill all needs in further work. To make work easier later it is very useful to prescribe to each group of objects created as a digital drawing a separate layer marked with label, colour and/or linetype. In this project there were separate layers for e.g.: grave goods, skeleton, underground structure, superstructure and others (Fig. 3). Later on layers help in managing a project, especially a complicated one. It is possible to hide some object not in use in the moment or to reveal underlying items. In case of grave no.100 this property was very helpful especially dealing with subsidiary burials located right above main chamber. To gain clear view of burials configurations, all “lower” layers (objects originally placed deeper in the ground) were undisplayed. Prepared in such way 2D drawing of the grave with all details of the structure and equipment was ready to further process.

In order to transform 2D drawings into three dimensional model it is necessary to use another tools designed to this purpose. Such tools allow to add to the plain object

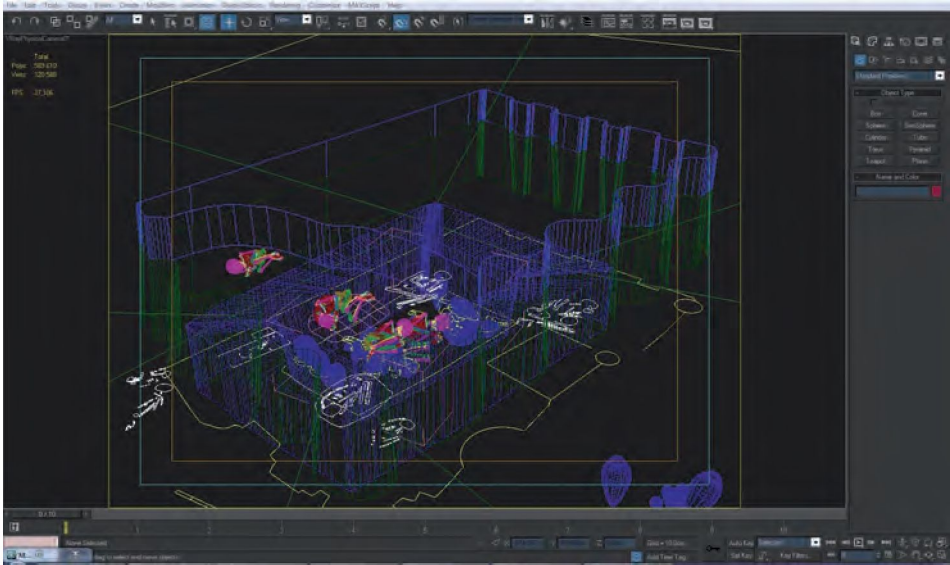


Fig. 4. Three dimensional model of grave no.100 (by the author)

its volume. There are several modes. For simple figures it is just prescribing proper thickness to the object but as a result we can gain most often angular solids. There are other tools which can change their edges by smoothing or rounding them. For other features such as e.g. pottery or stone vessels – a cylindrical or spherical items - more convenient tool is giving a volume of the object by rotating the previously prepared contour of it. All objects composing sepulchral gifts, the remains of the buried people - in form of three-dimensional skeletons - and all architectural elements were subjected to such action. Making models of all features and objects is just a half of the work. The other one is to arrange them in a way as close as possible to the reconstructed and preserved structure (Fig. 4). To this purpose serve general plans drawn during excavation and photographs taken as a standard documentation. As the creation of raw 3D computer model was completed the process of visualization could occur.

In order to achieve the final effect, which is photorealistic visualization, it is necessary to attribute proper textures to the given objects. This phase can be done either in the same computer software, or a different one which was designed mainly for 3D modeling such as e.g. 3DStudio Max. Textures, that is, the photographs of the materials from which the objects were made, make the so far created blocks look in characteristic way and give them facture, which brings them as close as possible to the actual look (Fig. 5). After assigning each element an appropriate texture, one can begin picture setting (Fig. 6). It looks like the setting of the photographer to take a

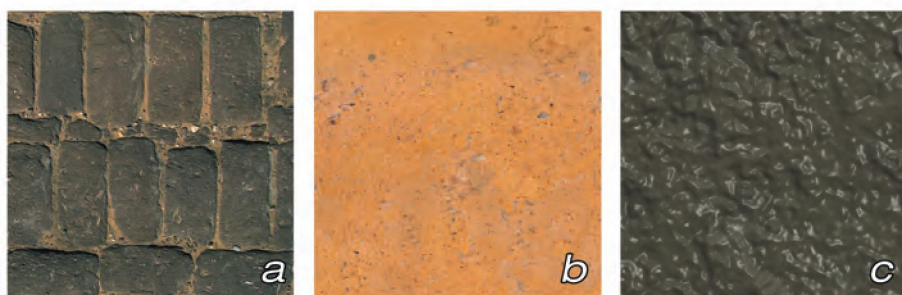


Fig. 5. Textures used in visualization; a) mud brick, b) pottery, c) liquid mud

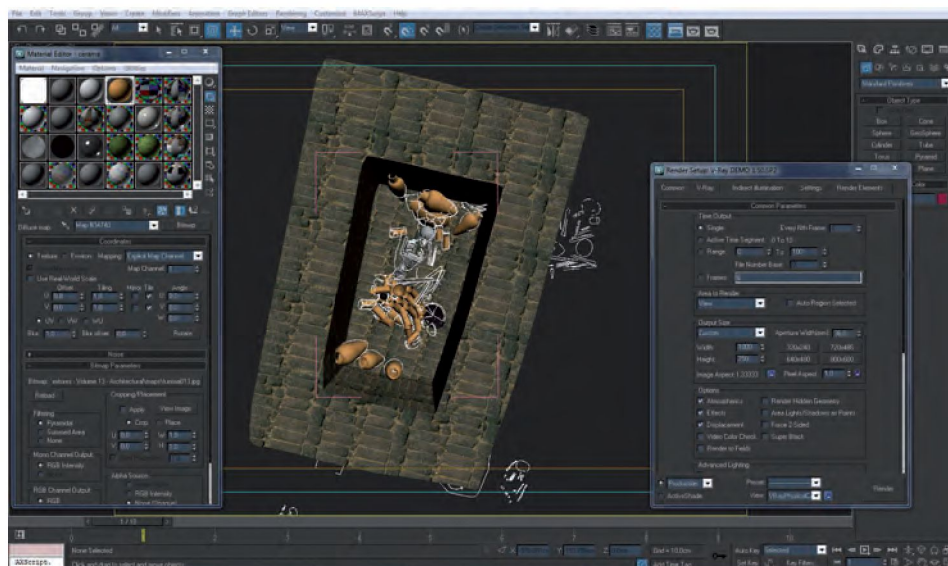


Fig. 6. Virtual model with assigned textures (by the author)

shoot, with the difference that it is possible to set the direction and intensity of incident light, setting unfeasible or difficult shots from above the lens, or to eliminate shadows, which in nature is impossible. But the work is performed by the computer. It consists in carrying out the calculations in order to achieve desired visualization of the construction (Fig. 7).

The next step is a creation of an animation on the basis of the reconstruction done before, allowing to watch the virtual tomb as in motion. There is a possibility of setting the camera to show the object in the most interesting way. It is also available – what had been presented during the conference – to animate the whole



Fig. 7. Three dimensional reconstruction and photographs (visualizations by the author, photo by R. Słaboński)



Fig. 8. Three dimensional reconstruction of superstructure with subsidiary burials and general view of superstructure remains (visualizations by the author, photo by R. Słaboński)

process of putting into a grave a deceased together with his grave goods, filling the tomb with liquid mud for protection, further construction of superstructure and finally placement of subsidiary inhumations during the last stage of covering the grave with mud brick mastaba (Fig. 8).

Conclusions

The constructions made that way let to capture objects in their initial forms, not frequently unavailable for us, or lost as a result of invasive research method, which undoubtedly is archeological prospection. The given example shows single architectural object. Of course, the possibilities are endless, and the next step will probably be to show the complex of the tombs, in their often interrelated configurations and intertwining systems. This type of combinations aiming at reconstructing e.g. the first system of all burials contemporary to themselves, can reveal numerous new facts invisible to the researcher using traditional methods (Dębowska-Ludwin and Rosińska-Balik 2014).

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