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Stones & Symbolism: An analysis of ecclesiastical architectural elements from the Byzantine church of Udhruh from 5th to 13th century AD in Southern Jordan

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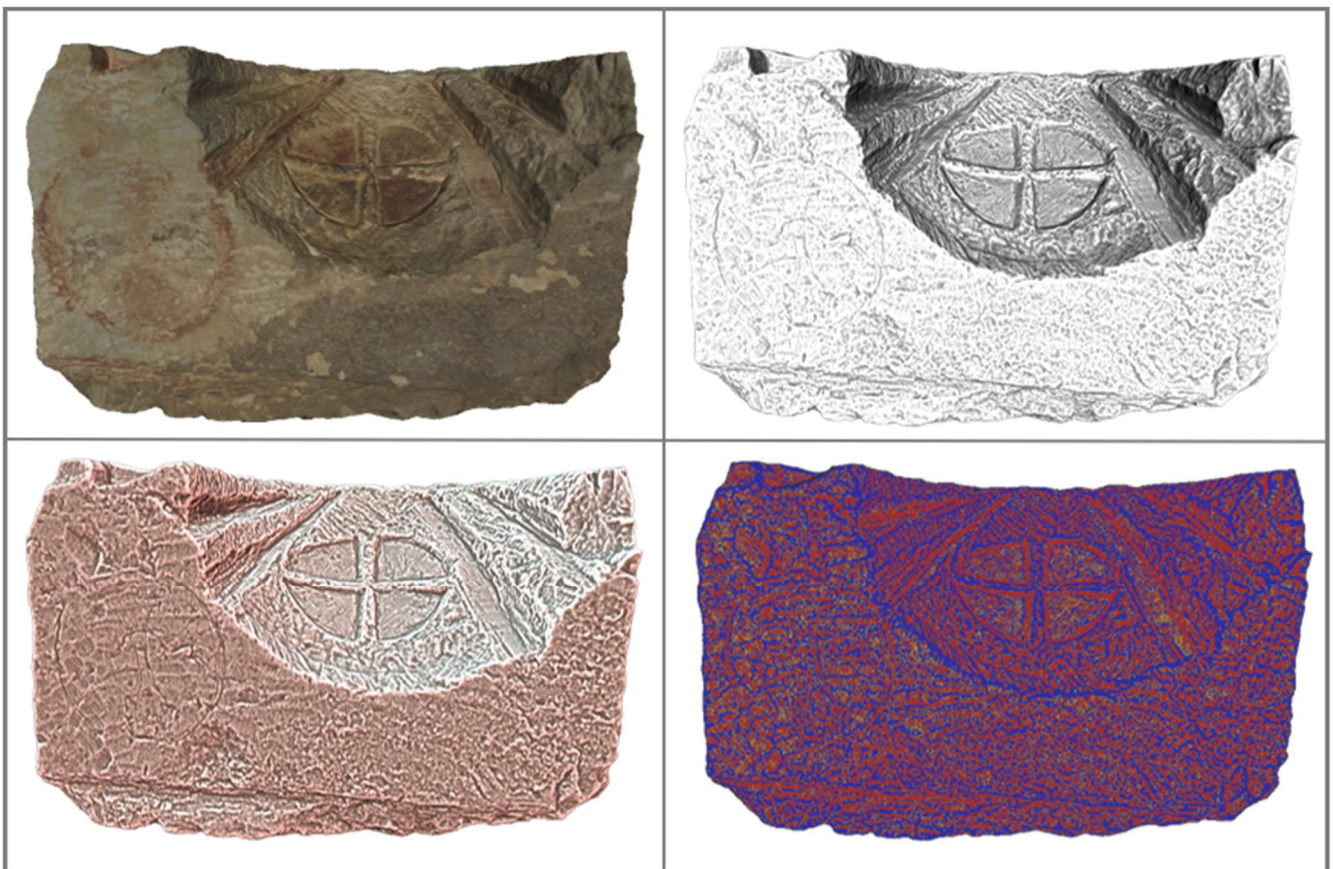
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Stones & Symbolism:

An analysis of ecclesiastical architectural elements from the Byzantine church of Udhruh from 5th to 13th century AD in Southern Jordan



Front figure: four representations of object F3031

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Chapter 1 Introduction

Eight hundred years of probable continuous use of a Christian church in a predominantly Islamic landscape has been discovered at Udhruh in the south of Jordan (Abudanah, 2006, p. 227-230; Al-Salameen *et al*, 2011, p. 232-242). During the last twenty years of archaeological surveys and excavations, Udhruh has developed from an archaeological curiosity into a significant site in the area. Its significance consists of many aspects. Important to mention is the historical military situation of Udhruh which concerns the sizeable Roman *Castra* in the centre of the modern village. Or the phenomenal man-made irrigation networks, constructed in the vicinity to enable intensive agriculture in a landscape that would not naturally be suitable for it. This in turn facilitated the growth of an urban society at Udhruh. All in all, a thought-provoking site, but possibly the most curious aspect of the village is its Byzantine extra-mural church. The building has remained in relatively good condition and analysis has resulted in an estimated age of 1600 years old, having been constructed in the late fourth or fifth century AD when the town went by the name Augustopolis (Fiema, 2002, p. 209). After only 200 years the area would come into the possession of multiple successive Islamic Caliphates, but evidence suggests that this development did not interfere with the Christian identity of the village and its church (Driessen & Abudanah, 2018, p. 185). The church is essential in understanding this situation, which has led to this thesis. There's a lack of knowledge concerning an ensemble of thirteen architecture blocks. The blocks pose two problems, namely it is unknown from where within the church they originate and secondly the blocks feature symbols engraved onto them, which have not been analysed as of today.

Therefore, I aim to determine the original location of the architectural elements within the Byzantine church by analysing the 3D-models of the blocks. After the probable original placements have been determined, the research goal will shift towards the other elements of the material, namely to analyse the array of shapes and patterns engraved into the blocks.

Background of study

The historical site of Udruh has been the subject of archaeological research predominantly concentrated in the early 21st century. However, this was not always the case, as before 2006 when Fawszi Abudanah published a PhD dissertation on the subject of settlement patterns and military organisation of the concerning region, little research had been done (Abudanah, 2006). The only prior research that would come to mind is the field surveys by Brunnow and Domaszewski in the late 1890's and the 1980's excavations by Alistair Killick, whose research is yet to be published (Brunnow & Domaszewski, 1909). Abudanah's publication facilitated the necessary momentum that propelled the archaeological site out of obsolence. In 2011 the Udruh Archaeological Project, a joint venture between the Al-Hussein Bin Talal University and Leiden University, commenced. The first five years of the project took the form of so-called inventory fieldwork, consisting of GIS-related field surveys and small-scale excavations (universiteitleiden.nl). It soon became clear that the status of the site as almost forgotten during the 20th century was certainly not the result of a lack of archaeological substance or significance. A more probable explanation, concerns the location of Udruh, more accurately the location in close proximity to the world-famous UNESCO site of Petra. The city of Petra has likely diverted the so-called archaeological limelight from Udruh since its re-discovery by the Swiss explorer Johan Burckhardt in 1812, subsequently making the remaining research in the region secondary in importance.

After 2015 the focus of the project evolved into larger scale excavations mainly taking place at the extra-mural church and the surrounding hinterland of Udruh. During the excavation of the church in the years 2016, 2017 and 2018 multiple blocks with shell-motifs were discovered. In the summer of 2019 I was fortunate enough to join the project. During the field work I first observed the basilica and was made aware of its significance. Additionally, I came in contact with an ensemble of weighty stone slabs, which my colleagues and I were tasked to haul, so that the objects could be photographed and further analysed.

The ensemble totalled seventeen objects, consisting of fifteen cut coquina limestone blocks and two marble elements. Their significance lies not so much in the blocks themselves, as they are fairly regular in size and have evidently been used as building material. The true attraction lies in their engravings, namely a set of seemingly early Christian symbols etched into them, which have raised questions. The symbols, namely multiple types of crosses, geometric shapes and shell-motifs, do not seem to completely conform to the conventional styles of symbolism seen in ecclesiastical context. The architectural elements have been found in the context of a Byzantine church in the vicinity of the central apsis or core, however not in situ. The team of archaeologists that recovered the objects

was able to clearly distinguish a portion of the engravings, namely the shell-motifs and the basic cross shapes were recognisable. However, a more detailed look was only made possible in 2022 as a result of the creation of the 3D-models. Before this operation, for many of the fifteen blocks, analyses would have been challenging to say the least.

Not only can the models and photographs of the objects enable me to precisely discern shapes and patterns etched into the stone, they moreover facilitate this entire research. The objects in question are currently stored approximately 3500 kilometres away from the University of Leiden in the depot of the Al-Hussein Bin Talal University in Wadi Musa Jordan and as a result of the Covid-19 pandemic travel has been heavily restricted. Therefore it would be impossible to reach them.

Problem statement

As of today, a respectable amount of data has been gathered in the form of artifacts, samples, photographs, drone footage etcetera, and a considerable amount of knowledge concerning the extra-mural church of Udhruh has been attained. A recent study in 2020, on the providence of the marble elements within the church pointed out a wide network of marble import to the South of Jordan (Al-Bashaireh, Abudanah & Driessen, 2020, p. 26). Through the use of C14 carbon dating we can now state with certainty that the Byzantine church was constructed during the fifth century AD and it was likely continuously in use until the thirteenth century AD. It also showed that the ecclesiastical building was constructed and expanded in multiple phases, meaning that some rooms are older than others (Driessen & Abudanah, 2018, p. 186). Another fascinating discovery came about as a result of an inscription found on one of the walls of the church. This was a Christian text written in Arabic dated to the eve of the Mamluk period (Al-Salameen *et al*, 2011, p. 232-242). At that time the region had been firmly controlled by Islamic overlords for centuries. Furthermore, the town of Udhruh played an important role during the late Antiquity and it has been identified through the translation of the Petra papyri as Byzantine Augustopolis (Nasarat, Abudanah and Naimat, 2012, p. 105-115). The Arabic Christian inscription in combination with the historical references to Udhruh have led notable researchers in this field to believe that this church, and the town it was located in, retained a special position within the Islamic Caliphate.

However, the corpus of knowledge about the church of Udhruh is not complete. Notably an ensemble of seventeen ecclesiastical architectural elements still hold possibly valuable information. These objects present a gap in the general understanding of the site. The architectural elements have not been found in situ and therefore their proper location, function and age are unclear. Furthermore the elements feature engravings, which at present could not be fully recognised as being part of the early Christian, Byzantine tradition. This gap in knowledge will be the reason for and the crux of this thesis.

Research aims and questions

In this paper I aim to continue the ongoing research on Udhruh, focussing on the mentioned ensemble. The thorough examination of the fifteen blocks by utilising 3D-models could enable me to pin-point the original location of the blocks within the church. Knowledge concerning location could then contribute to the determination of function and age, which will in turn be essential in the analysis of the symbols incised on to the surface of these blocks. In doing so, the means will be provided to confirm or disprove the unconventionality of the symbolism in early Christianity. Therefore I aim to present a comprehensive analysis of the architectural ecclesiastical elements found at the church of Udhruh. In layman's terms: "the what, where, when and why?"

The main goal is to understand what these blocks are and what they represent. This leads me to two main research questions, namely:

1. *"What were the coquina limestone blocks with Christian iconography used for in the extra-mural ecclesiastical building at Udhruh Jordan?"*

This question concerns the location, function, and age of the objects within the church. Next to that I will evaluate:

2. *"To what degree do the symbols on these blocks fit into, or stand out from, the wider tradition of ecclesiastical symbolism from early Christian history (circa 30 to 630 AD)?"*

Research area and time

The focus of this thesis lies on the greater Eastern Mediterranean and Middle Eastern region, with the precise focus on the south of Jordan, in which Udhruh is located. This area has gone by many names through the ages and has historically been part of larger regions. By the Romans it was referred to as Arabia Petraea, after the city of Petra which lies in close proximity. Later the Byzantines called it Palaestina Salutaris or Palaestina Tertia. During the time of the Crusades, Udhruh was part of the Kingdom of Jerusalem and the lordship of Oultrejourdain, with the region also being referred to as Transjordan. The historical context will be kept in mind during the research. As the research progresses the area will widen, to accommodate the theories concerning the possible external influences affecting the church and its symbols.

The time period, which will be primarily researched, concerns the development of Christianity. This period covers Early Christianity, 31/33 – 324 AD, to late Antique Christianity, 325 – 476 AD (Schlaff, 1998, p. 10). Church historians divide this time in three parts, namely the Apostolic Age, (circa 30 - 100 AD), the Ante-Nicene Period (circa 100 – 325) and Christian late Antiquity (325 – 476). The end date for late Antiquity is based on the fall of the Western Roman empire, which is of minimal concern to my research area of the eastern Mediterranean. For Byzantine Christianity a more precise date would be the Islamic conquest from 630 onwards, after which the Rashidun and Umayyad period came in to power. Therefore I aim to research ecclesiastical architecture and symbolism from circa 30 to 630 AD, the period of onset, development and persistence of Christianity.

Methodology

The research of these ecclesiastical architectural elements will be divided in two parts, in order to comprehensibly answer the two research questions. I will utilise a combination of methods of analysis. The first phase consists of the analysis of 3D-models concerning spatial positioning. The second phase consist of analysis of 3D-models and photographs, combined with a literature study.

The seventeen elements have been thoroughly photographed from all angles, after which a portion of them have been rendered into precise 3D-models using an Artec Space Spider, a type of 3D-scanner. These models enable the user to accurately measure the dimensions of the elements, such as the curvature and the condition of the surface. This data is indispensable in solving a crucial problem; none of the elements were in situ or could be located to their initial position (Al-Bashaireh, Abudanah & Driessen, 2020, p. 25). By analysing the acquired precise data on the architectural elements, the original location of these blocks could become clear.

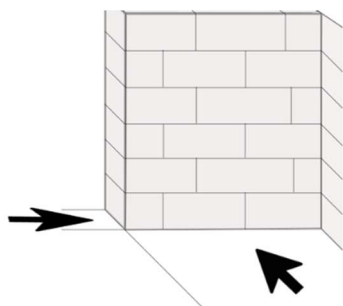
Three attributes will be essential in this part of the research: surface appearance, orientation and curvature. All could present ways to point to and exclude possible locations. For all attributes the layout of the church, which has been precisely mapped during prior research, is of great importance (Driessen & Abudanah, 2018). This mapped layout follows the uniform structure of an early Byzantine church when compared (Krautheimer, 1986, p. 41; Michel, 2001). Both the uniformity of the layout and the prior research will be discussed in following chapters.

Curvature, surface appearance and orientation

The church consists of a narthex, nave, apsis, and other functional rooms. It is established that only the sanctuary (and the dome above) and side chapels are known to have a rounded architectural plan. The other church sections are made up of straight angles. Therefore the presence of curvature seen in the 3D-models would exclude them from originating from the rounded sections. By discerning the curvature of the walls within, for example, the apsis and comparing this to the 3D models, I will be able to produce scientific predictions on the probable origin of the element in question. This procedure will be carried out for all of the elements rendered into models.

The attribute of surface condition connects to that of the orientation. It deals less with the layout of the church, but more with the placement of the individual blocks. The limestone blocks have been handcrafted and the engravings are deliberate. A block within a wall consists of six sides, of which only one, namely the front facing side, will be visible to passing people. The other five sides would neatly be attached to the other blocks in the wall. An exception to this rule can be found in certain walls, that is those which are visible from multiple sides, as seen in the figure below.

Figure 1.1: A wall of which two sides of the blocks are visible to the viewer



The established presupposition is that the craftsmen responsible for creating these objects would put less or no effort in to the appearance of these five “invisible” sides. However the possibility of partially visible sections of the sides should not be ruled out. The surfaces of the invisible sides are therefore expected to be more rough and containing more imperfections. Whereas, the outfacing side or sides should be more smooth, polished, painted or containing engravings such as symbols. From this logical inference, it is probable that blocks with six rough, imperfect and less refined sides would be placed somewhere within the walls, where they would not be viewed. The decorated blocks would serve as ‘attention-grabbers’ and would therefore be placed in view of an audience, assumably close to eye-height.

Symbol analysis

The second phase concerns the engraved shapes and patterns. After having analysed the 3D-models and photographs a categorisation of the types of symbols as seen on the blocks will be presented. These types of symbols will be further described and placed in temporal context. By the means of comparing and contrasting these symbols to those found in literature, I aim to confirm their connection to the early Christian period. Firstly I will attempt to present evidence that the symbols fit into the standard tradition of early Christian ecclesiastical architecture. Afterwards the possibility of external influences will be discussed.

Organisation of the thesis

This thesis is structured to facilitate the duality of my research, namely the partition of architecture and symbolism as mentioned in my research questions. Firstly in chapter two the background information is presented, which will give the reader a basic understanding of the location, history and fields in which the research will be conducted. It starts off with the historical of Udhruh accompanied by a timeline and a concise summary of all factions who played a major role in the region. Afterwards the church building, its plan and dimensions of Udhruh and in general will be discussed in more detail. Then the topic of symbolism in Christian context will be presented with the relevant symbols to the research. In chapter three the material dataset will be discussed, concerning material, dimensions, weight and attributes. Then in chapter four the spatial analysis part of the research commences. The method of analysis will first be explained, after which it is used to present a precise description and typology of the blocks, accompanied by pictures and the 3D models thereof, which can be found in appendix A and B. The chapter continues with the surface condition

and curvature analysis. Subsequently it will be demonstrated how this type of analysis provides means to determine location. The relation between location, functionality and date will also be mentioned. Chapter five will focus on the second part of the research, the potential symbols on the blocks. The goal is to discern if the shapes and patterns are symbols and if the determined symbols are early Christian in nature, or possibly later Christian or influenced by external cultures. After the symbols are described and categorised, they will be compared to the normative symbols in Christian ecclesiastical contexts discussed in chapter two. Afterwards possible external cultural influences on the symbols which do not fully fit in shall be discussed. The results of both analyses will be discussed in chapter six. Finally a conclusion of the complete research is presented in chapter seven. This thesis is accompanied by three appendices which present all the objects based on the aspects of surface appearance (appendix A), curvature (appendix B) and symbols (appendix C).

Chapter 2 Background

Introduction

Udhruh, the location where these ecclesiastical architectural elements have been found, has a rich history and it would only be proper to first discuss this, before delving deeper into the actual blocks and the questions surrounding them. To understand the present state of an object, one needs to understand the past, and this is exactly what I aim to do in the first part of this chapter. A clear and detailed timeline will be presented and all major factions in the region through the ages will be mentioned and concisely summarised. This background information will act as a framework for the entire research. After this I will shift the focus towards a description of the church, which the blocks were a part of. Then I will present a basic study on ecclesiastical symbolism which will serve as the backbone of the research which will be performed in chapter five.

The current state

Coordinates:

Udhruh, Ma'an, Jordan

30° 20' 0" North, 35° 36' 0" East

In the year 2022 Udhruh is a modestly sized village in southern Jordan, bolstering a population which was last surveyed in 2015 to be approximately 1700 inhabitants. The ruins of a massive Roman legionary fortress, located in the middle of the village, would catch the eye of any visitor and can be described as Udhruh's main attraction. The spelling of the village varies, as it can also be written as Adhruh and has been spelled in the past as Adrou, Adroa and Odroa (Kennedy & Falahat, 2015, p. 152). For the sake of consistency I will work with the name 'Udhruh' when referring to the town. It falls under the administration of the Ma'an governorate and is located in the vicinity of the site of Petra, approximately 12 kilometres to the west.

Figure 2.1: Map of Jordan with Udhruh



The town lies on the eastern shelf of the Jabal ash-Sharat mountain range, which contributes to the relatively high average elevation of 1.200 meters above sea level. The climate of the region ranges from a cool temperate Mediterranean climate (Csb) to a cool semi-arid climate (Bsk), when using the classification of climate zones by Köppen. The geology consists of the bedrock, made up of Cretaceous and Tertiary limestones, and the soil, primarily inceptisols and aridisols (Driessen & Abudanah, 2018, p. 26).

History

Historical summary

In the 3rd century BC the **Kingdom of Nabataea** was founded, which can be seen as the end of a long period. Because, before this moment, the region of Jordan had always been dominated by outside powers. The Levant as a whole could be seen as an area in which great nations, such as the Babylonians, Egyptians, Hittites and Assyrians, were able to exert their power and enlarge their territories or spheres of influence. But the Nabatean Kingdom would end this and keep a hold on power for approximately four centuries, up until the Roman conquest of the kingdom in 106 AD. The Nabateans started off as one of many nomadic Bedouin tribes that called the Arabian Peninsula their home. They were known to be pastoralists before finding a new niche in the trans Arabian trade, which enriched and therefore empowered them greatly. The trade in frankincense, myrrh and other spices originating from southern Arabia, is what set them apart from the other Bedouin tribes. The best representation of the resulting immense wealth is the capital of the Kingdom, namely the city of

Petra. Petra was a major hub in the trading network at the time and bolstered many architectural marvels (Kennedy & Falahat, 2015, p. 151).

During the reign of Emperor Trajan, in 106 AD, the lands of the Nabateans were annexed by the **Roman Empire** and incorporated as the province of *Arabia Petraea*. Udhruh or Augustopolis as it was called then had become part of the Roman empire (Frösén, 2004, p. 142). The exact *casus belli* and method of annexation of the Romans is still unclear, as no historical sources concerning this process currently exist (Taylor, 2001, p. 25). However historical records do suggest that Roman garrisons were stationed in the region, namely in Petra and Bosra, from 107 AD onwards (Ball, 2016, p. 270). It could be argued that the 'conquest' of the territory went relatively uneventful, as no major battles are mentioned and trade by Nabateans continued to flourish during the period (Taylor, 2001, p. 27). Evidence of its Roman history still stands in Udhruh to this day in the form of a sizable Roman *castra* and the extra-mural church. Although the definite chronology of said *castra* has not been established, Kennedy and Falahat (2015, p. 155) have studied it extensively. Their verdict states that the construction of a fort, possibly a *vexillation fortress*, commenced soon after 106 AD and that the *castra* of which the ruins are present to day was the result of rebuilding efforts after circa 300 AD (Kennedy & Falahat, 2015, p. 153).

After 286 AD, the Roman Empire was divided into two self-governing, but aligned empires. The Western and Eastern Roman empires would face different struggles over the centuries, as a result of their different geo-political situations. The Western empire, ruled from the capital of Rome, would collapse due to invasions and instability in 476 AD, while its Eastern counterpart would withstand until 1453.

The **Eastern Roman empire** controlled a vast area, through direct ownership and client states (Shahid, 1995, p. 103). One of such client states, was the **Ghassanid kingdom**, which was established in 328 AD. The Ghassanids had been in the region east of Palestine and the Jordan river from approximately 200 AD, but only became a client state or *foederati*, when King Imru al-Quais, "King of all the Arabs", signed a treaty with the Byzantine Emperor Constantine I. Petra and by extent Udhruh would be governed by the Ghassanid kings, who had sworn fealty to the Byzantine Emperors for a solid 300 years (Masalha, 2018, p. 138). Up until the defeat of the Byzantine Empire and its allies at the Battle of the Yarmuk in 636, at the hands of the Rashidun Caliphate (Ibrahim, 2002, p. 20).

In the late fourth century AD under the reign of the Ghassanids, and therefore indirect control of the Eastern Roman empire, the church of Udhruh was constructed (Michel, 2001, p. 155). Soon after this in 431, Udhruh, or Augustopolis as it was called, would house a bishop called Johannes of Augustopolis (Fiema, 2002, p. 210).

After half a millennium of Roman rule a 'new player entered the arena'. In 630 the **prophet of Islam Muhammad**, priorly having consolidated Arabian proper, set his eyes on the west. He "granted peace" to Udhruh and annexed the southern and eastern part of the province of Arabia Petraea (Al-Waqidi, 1966, p. 65). The prophet Muhammad died in 632, after which the region of Udhruh became the heartland of the **Rashidun Caliphate**. This first successor Caliphate expanded rapidly in three decades, at its largest extent it would cover a region of 6.400.000 square kilometres. This empire would connect Libya in the west to India in the east and Yemen in the south to Armenia in the north. The Rashidun Caliphate would push the Byzantines further back to eastern Anatolia with its military might.

In 656 the first *Fitna* occurred, leading the Islamic community in to civil war. The two opposing sides decided to discuss possible terms for peace in 657 at two locations. The second of which was Udhruh, which hosted the arbitration until 658 (Donner, 2010, p. 160). Peace would however not be reached and the civil war would continue for three more years.

In 661 the Rashidun Caliphate was supplanted by the **Umayyad Caliphate**, which continued the *al-Futuhat al-Islamiyya*, or Islamic conquest (El-Hibri, 2021, p. 30) Under the Umayyad dynasty the Islamic Caliphate would reach its largest size, forming a massive empire of 11.100.000 square kilometres. After almost a century of rule the Abbasid revolution in 749-750 broke the Umayyad hegemony (Hawting, 2000, 1) . In 775 the **Abbasids** had conciliated and stabilised their empire, starting a Golden Age, in which the territorial conflict with the Byzantine Empire would recommence. In 861 the Abbasid Golden Age came to an end, resulting in the fragmentation of the Caliphate. In the region of Egypt and Syria the **Tulunid dynasty** overthrew the Abbasids and took absolute control in 868, holding the region for almost fifty years (El-Hibri, 2021, p. 153). The Abbasid Caliphate was however not disintegrated and reconquered the area in 905, after which they would put another smaller Islamic dynasty in control of the region in 939 (El-Hibri, 2021, 155). The **Ikhshidids** were a Turkic dynasty ruling over Egypt, Nubia, the Levant and Hejaz region as a vassal of the Abbasid Caliphate (Bacharach, 1993, p.411). In 970 a major Islamic dynasty from the *Magreb* and *Ifriqiya* regions, the **Fatimid Caliphate**, would defeat the Abbasids and their vassals, becoming the dominant Islamic power. The reign of the Fatimids in the Levant region was relatively unstable, leading to revolts and major uprisings. Only one year after the Fatimid conquest, the **Qarmatians** joined by local Arab Bedouin tribes, plundered the region (Daftary, 2009, p. 162). In 975 the Fatimids resumed control, only to lose it in 977, after which the region would be *de facto* ruled by local **Bedouin tribes** until 1010 (Moshe, 1997, p. 370). The Fatimids were able to retake the region again in 1010 and held control up until the **Seljuk Turkic** invasion of Syria and Palestine which started in

1063. In 1071 the city of Jerusalem was handed over to the Seljuks on the condition that it would not be sacked (Basan, 2010, p. 85). Once again the Fatimids returned and recaptured Jerusalem in 1098.

While the prior Caliphates had tolerated the Christian pilgrims traveling to the Holy Land for centuries, the Seljuk Turks had not kept to the same tradition. During the 11th century Christian access to the holy city of Jerusalem was denied and the Holy Sepulchre was despoiled (Egan, 2004, p. 66). This resulted in the outrage of Christian Europe and led Pope Urban II to exhort Christendom to go to war at the council of Clermont. The time of the Crusades would commence and in 1099 Jerusalem would be captured. The **European Christians** held the Holy land for almost a century. The Crusader state ruling over Udhruh was the Kingdom of Jerusalem and its King Baldwin III was mentioned to have crushed a riot in Wadi Musa in 1144, only twelve kilometres to the west of Udhruh (Locke, 2006, p. 46). But the Kingdom would lose its territories to a new Islamic power, the **Ayyubid Caliphate** under the command of *Ṣalāḥ ad-Dīn*, or Saladin. After first having conquered large areas of the Palestine and Transjordan region, Jerusalem would fall in 1187 (Lane-Poole, 1906, p. 235).

The Ayyubid Caliphate held on to the region and expanded its territory until the Mamluk revolt in Egypt in 1250. **The Mamluks**, allied to the crusaders, would wage war on the remaining territories loyal to the Ayyubid in Syria and Transjordan. This was a dire situation for the last remnants of the Ayyubid Caliphate as they were also being attacked by the Mongols from the north and east. By 1260 the Ayyubids would be completely integrated by the Mamluk Empire.

Timeline

In order to not go overboard concerning the timeline and thus stay focussed on the period of interest I will restrict myself. For this timeline the principal focus is on the lifespan of the church of Udhruh, namely approximately 400 to 1300 AD. However it is necessary to also include the periods directly preceding and superseding it. All events and periods in the timeline and tables (2.1 and 2.2) below are based on the aforementioned sources used in the *History* section. In earnest, this so-called “restricted” timeline would still be defined as considerably extensive due to the abundance of historical events and factions at play.

For the same reason it is additionally important to clearly define the area of interest. The town of Udhruh or *Augustopolis* is mentioned multiple times in the annals of history, however to accurately produce a general timeline it will be necessary to widen the scope from the town to the larger area it was part of.

Timeline



Tables

Table 2.1: Historical factions in the region of southern Jordan

Faction	Time period
Nabateans	±350 BC - 106 AD
Roman Empire	106 - 286 AD
Eastern Roman/Byzantine Empire	286 - 328 AD
Ghassanid Kingdom (Client State)	328 - 630 AD
Rashidun Caliphate	630 - 661 AD
Umayyad Caliphate	661 - 750 AD
Abbasid Caliphate	750 - 868 AD
Tulunid Dynasty	868 - 905 AD
Abbasid Caliphate	905 - 939 AD
Ikshidid Dynasty	939 - 970 AD
Fatimid Caliphate	970 - 971 AD
Qarmatians and Arab Bedouin tribes	971 - 975 AD
Fatimid Caliphate	975 - 977 AD
Bedouin tribes <i>de facto</i> independence	977 - 1010 AD
Fatimid Caliphate	1010 - 1071 AD
Seljuk Turkish Empire	1071 - 1098 AD
Fatimid Caliphate	1098 - 1099 AD
Outremer/Kingdom of Jerusalem	1099 - 1187 AD
Ayyubid Caliphate	1187 - 1260 AD
Mamluk Empire	1260 - 1517 AD

Table 2.2: Major events concerning the Udhruh region

Event	Date
A reference to Udhruh in a Ptolemaic texts	2 nd century BC
Roman annexation of Nabataea	106 AD
Roman emperor Diocletian splits the empire in two	286 AD
Roman emperor Constantine makes Christianity legal	313 AD
Roman emperor Theodosius makes Christianity the official religion of the empire	380 AD
Bishop called Johannes of Augustopolis	431 AD
The basilica of Udhruh is constructed	5 th century AD
Udhruh is annexed by Muhammad	630 AD
Udhruh is the site for an political arbitration between Islamic powers	657 AD
The First Crusade captures Jerusalem	1099 AD
Balwin III crushes a revolt in Wadi Musa	1144 AD
The church complex of Udhruh is abandoned	13 th century AD

Archaeological history

The history of archaeological projects taking place at Udhruh is relatively short and consist of three major periods, with five specialised archaeologists publishing academic papers on the subject. Only from the 2000's onwards has the intensity grown exponentially.

It should be mentioned that the local population of Udhruh has been aware of the presence of the Roman fortress and church in its proximity, long before archaeological activity started. The site of Udhruh can therefore not be described as an "archaeological (re)discovery". The first archaeological activity at Udhruh should be defined as a new found interest in the site.

In 1897 and 1898 the archaeologists Brunnow and Domaszewski performed monumental surveys in the region of southern Jordan, resulting in the tracing of two Roman frontier routes (Brunnow & Domaszewski, 1909). These routes were thought to be roads forming a fixed defensive frontier (Killick, 1987, p. 173). After these surveys a century of archaeological silence commenced, which was broken by Alistair Killick in 1980. He would carry out surveys and excavation all through the 80's. His work is still to be published, but the new found academic interest in the region would persist.

Fawzi Abudanah wrote a preliminary report on the archaeological survey of Udhruh in 2004 in the Annual Journal of the Department of Antiquities of Jordan (Abudanah, 2004, p. 51-69). After this he published a paper on water supply systems in the region of Udhruh in 2006 (Abudanah, 2006, p. 485-496), which was picked up by Mark Driessen, an archaeologist with a background in agriculture. What ensued was a fruitful cooperation between the University of Leiden and the al-Hussein Bin Talal University, which commenced its first joined project at Udhruh in 2011. Archaeological surveys and excavations were carried out annually, only being brought to a halt by the Covid-19 pandemic. In the late summer of 2022 the tenth excavation is planned.

Ecclesiastical architecture

The Udhruh church specifics

The church of Udhruh has a total surface area of 33,5 metres in length by 24,5 metres in width (Al-Bashaireh, Abudanah & Driessen, 2020, p. 25). Research has proven that the building was constructed in multiple temporal phases and can therefore be split into multiple sections. These sections in order of oldest to newest consists of: the core church, the two side chapels and narthex, multiple extra narthex rooms and a third side chapel. For the research the main focus will rest on the core church section. The entire structure can be defined as a church complex, as it consist of multiple attached sections. Before delving deeper into the specifics of the Udhruh church a basic explanation of layout and terminology is needed.

Figure 2.2: Top plan of Udhruh church from Al-Bashaireh, K., Abudanah, F., & Driessen, M. (2020). Provenance analysis of marble ecclesiastical elements from the extra-mural Byzantine church of Udhruh (South Jordan) p. 4.

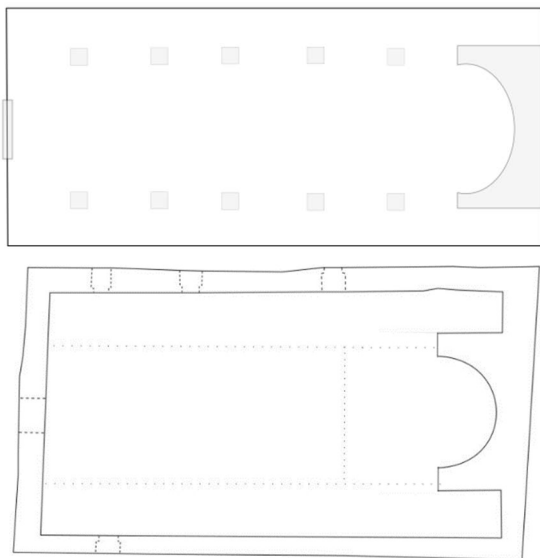


The core church is the oldest section of the structure and the centre of all expansion. This core can be partitioned into three main areas: the nave, the aisles to the north and south, and the sanctuary or apsis to the east. The nave is the largest part of the core church and extends from the main entrance to the sanctuary. On either side of the nave an aisle, or walking path, can be found. The

sanctuary is the eastern area where the altar is located and consists of the surrounding *solea*, a stone “fence”, and the apsis, the semi-circular recess at the end of the church. On both sides of the apsis lay the two *pastophoria*, which were functional chambers. The dimensions of the core church are 20,5 metres in length and 12 metres in width. The area to the west, attached to the main entrance is the narthex and counts eight rectangular rooms. The narthex functions as a type of lobby. The three chapels are separately dedicated rooms attached to the core church.

The basic layout of the core church falls in line with the *basilica* type of church. A comparison can be seen in figure 2.3. Krautheimer (1986, p. 53) describes a wide array of variation in the layout of the basilica but in its basic form the structure is rectangular, with a nave connecting the entrance to the apsis from west to east, *ad orientem*. Attached to the nave on both sides lay the two side aisles. The dimensions and proportion vary, based on region and period.

Figure 2.3: Schematic of basic basilica (up) and schematic of Udhruh core basilica (down)



Moreover the complete church complex falls under the extra-mural type, referring to its position thirty meters to the south of the walls of the Roman legionary fort or *castra*. Whereas an intramural church would benefit from the defensive capabilities of a fortress with its walls and towers, the church at Udhruh could not. This might also give a reason to the relative small size of the church, especially in comparison to the *castra*. In general a correlation between a greater size and better defensiveness can be determined when comparing intra- and extra-mural churches. The risk of pillaging and destruction by invading forces, would discourage the construction of larger and more expensive buildings.

The development of the Church building

The *basilica* was not always synonymous with Christianity. Immediately after the death of their prophet, Jesus Christ, the Christians had neither the monetary means, the social organisation, nor the interest in the creation of an ecclesiastical architecture (Krautheimer, 1986, p. 24). The followers would gather where possible, having no designated space of worship. Public meetings would occur outdoors and the private meeting of Christians were limited to domestic dwellings of individuals during the first two centuries. Due to the rapid growth of the Christian congregations in the third century in the Roman empire, they would need to assemble in larger structures, so-called community houses or *domus ecclesiae* (Krautheimer, 1986, p. 26). From the fourth century the evolution of an ecclesiastical architecture was able to truly commence. With the edict of Milan in 313 AD emperor Constantine recognised Christianity and it would become the dominant religion by the next twenty years (Clark, 2004, p. 95).

The Christians would use a larger pre-existing building, which had already gained a multifunctional status at this time; the *basilica*. The *basilica* is a civil semi-public building, with its origin in the mid-Republican period of Rome. The structure at its basis is a covered hall, with many variants such as the forum palace, the drill barracks, *thermae basilica*, etcetera (Krautheimer, 1986, p. 42). The Romans in turn were inspired by the audacious Hellenistic royal halls of the east, with which they came into contact through diplomatic dealings (Welch, 2003, p. 5). The Roman *basilica* was multifunctional, however it would only come to be religious in function after the Christians adopted it as the standard model for spaces of congregational worship. Welsch describes one of the main functions of the Roman *basilica* to be diplomatic in nature, namely as a designated space for receptions and banquets for foreign dignitaries (Welch, 2003, p. 5). The *basilica* would be exported to all corners of the realm, where it became an universal symbol of the influence of Rome (Donati, 2014, p. 14).

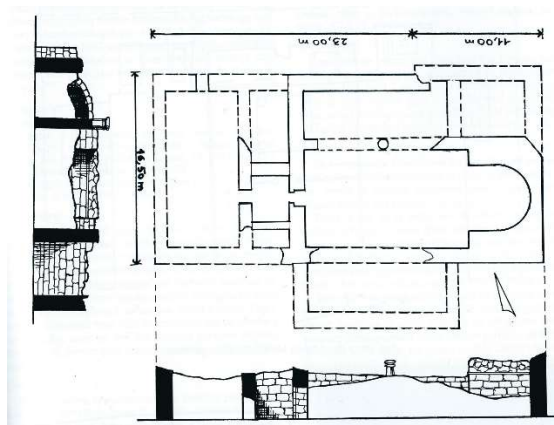
Krautheimer (1986, p. 42) states that the Christian *basilica* did not derive from a specific type of Roman *basilica*, rather the genus *basilica* would be the framework in which the Christian architecture would develop. After the second major decree, the *Cunctos populos* of 380, also known as the edict of Thessalonica, made Christianity the *de-jure* state religion of the Roman empire. This major political decree would somewhat overshadow the architectural development seen in the resulting conversion of Roman *basilicae* into the Christian *basilicae*. This change was, in the beginning, rather insignificant, as the *basilica* would keep its original plan, only changing the interior and the function of the apsis by adding an altar to it (Krautheimer, 1986, p. 48).

It is important to mention the terminological difference between the architectural *basilica* and ecclesiastical *basilica*. As an architectural term the *basilica* refers to the type of church building, relating to the layout, namely a nave, aisles and an apsis. The ecclesiastical *basilica* refers to a church building which has had certain privileges conferred on it by the Pope, therefore it is an ecclesiastical title. In Byzantine period Udhruh, or *Augustopolis* as it was called at the time, gained the status of Bishopric (Fiema, 2002, p. 210). However no evidence suggest this ecclesiastical status of the church. So therefore, the church of Udhruh can most certainly be considered a *basilica* in architectural form.

Byzantine churches in Jordan

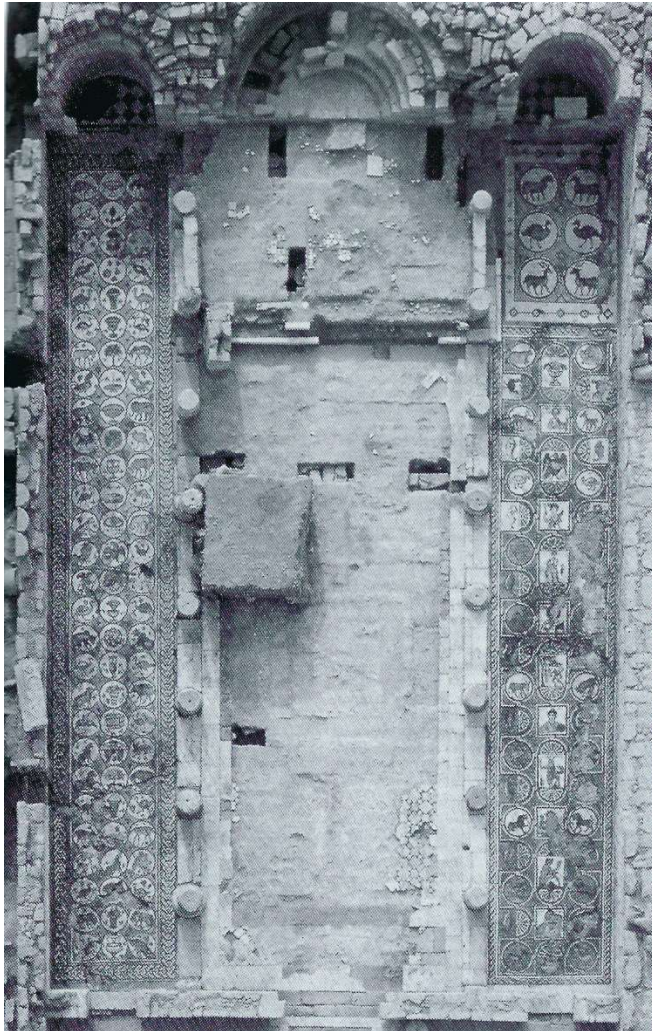
As mentioned, the Udhruh church falls in line with the general layout of the *basilica*, but more interesting is its comparison to the contemporary churches in Jordan. Anne Michel has set out to compose a complete study on typology and architecture of 180 churches during the Byzantine and Umayyad period in Jordan. In “Les églises d'époque byzantine et umayyade de Jordanie”, Michel (2001, p. XI) states that most buildings in Jordan are *basilicas*, with some exceptions belonging to the centralised or cruciform church type. The church of Udhruh is shortly mentioned as well. Using the dated reports from Brunnow and Domaszewski of 1904, the church is identified as a three nave *basilica* with three apsis. This however has been proven incorrect, as a result of further excavation. The lateral side chapels attached the core church were hypothesised to be naves leading to their own apses (Michel, 2001, p. 155).

Figure 2.4: Plan of Udhruh church by Brunnow-Domaszewski, 1904, p. 461. In Michel, 2001, p. 153.



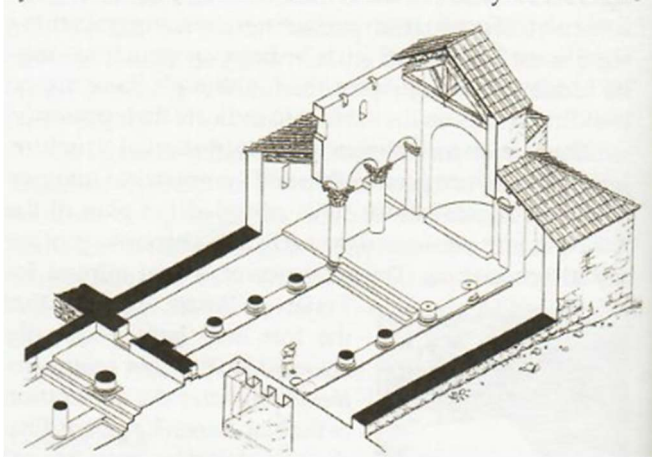
If the typology of a three apses *basilica* by Brunnow and Domaszewski was correct the core layout would fall in line with that of a church complex close by Udruh, namely the Petra Church near the Temple of the Winged Lions (figure 2.5).

Figure 2.5: Church of the Winged Lions, by Fiema-Schick, 1995, p. 287. In Michel, 2001, p. 158.



However the Udruh church consists of a nave with aisles and one apsis with two *pastophoria*. We don't have to wander far to find a sublime analogy to the Udruh church, as this can be found in one of the churches in Petra, namely the Ridge church. This basilica is described as small, measuring 18,1 metres in length and 13,5 metres in width. The core *basilica* of Udruh measures 20,5 by 12 metres, only surpasses this surface by 9,2 square metres. A reconstruction of this church was presented in the ACOR Jordan newsletter in the summer of 1996 and depicts a *basilica*, comparable to the Udruh church, seen in figure 2.6.

Figure 2.6: Reconstruction of Ridge Church Petra, by Kannelopoulos, in ACOR Newsletter, 8.1, summer 1996, p.10



Architectural decoration

A central aspect of ecclesiastical architecture, aside from layout, is the décor or ornamentation. The interior and exterior of the church was a canvas for the late Antiquity artists. After Christianity was installed as the state religion of the Roman empire in 380, the Christian community gained the organisation and means to not only procure larger assembly buildings, but also to invest in the décor of said structures. Before this the house-churches could be summarised as very modest in nature, with a great focus on utility (Krautheimer, 1986, p. 33). The space functioned primarily as an assembly room. Krautheimer (1986, p. 33) also mentions the occasional addition of an altar, which would function as a shrine in memory for fallen martyrs (Milburn, 1988, p. 88-89). During the latter half of the fourth century ecclesiastical decoration of the *basilica* became more pronounced. Three main types of ornament stand out: mosaics, engravings and paintings (Krautheimer, 1986, p. 43).

Mosaics

Mosaics is an artform in which small cubes of cut stones, named *tesserae*, are inlaid to create a depiction. The artform was well established in the Roman empire before it became synonymous with Christian church contexts (Dunbabin, 1999, p. 236). According to Britt (2019, p. 1), the study of wall mosaics was historically preferred by scholars, as they expected the floor mosaics to be less significant. A hierarchal arrangement by height in the decorations was assumed, however this theory lacks proper evidence (Britt, 2019, p. 2). Britt (2019, p. 2) proposes that all sections of the mosaics would combine to form a liturgical environment, meaning that every part is needed to understand the total décor. The types of depictions varied greatly, from Biblical scenes to floral and faunal motifs. Depictions of Paradise are omnipresent, and show the Christian desire to experience Eden itself (Brown, 1999, p. 33).

Stone engravings

The tradition of engraving material cannot be attributed to one single culture, it is an universal practice and can be found anywhere in history. The engravings found in early Christian churches are a continuation of earlier styles of decoration, mostly from the Greek and afterwards Roman schools (Milburn, 1988, p. 58). Especially the use of columns in church contexts and sarcophagi reliefs come to mind. The column rows were a standard feature in the *basilica* and were adopted by the Christians, predominantly using the columns from the Corinthian type (Hamilton, 1933, p. 26). The Corinthian is an originally Greek type of column used by the Romans, in which the capital, and possible pillar, is floral in form. These floral motifs, also seen in mosaics, are also present on the friezes and other décor such as the altar.

Paintings

Paint in the form of frescoes is a more secondary decoration type in churches, as mosaics was the main manner of artistic depiction (Milburn, 1988, p. 99-101). Frescoes would not reach the same popularity of mosaics in church context. They were generally confounded to the catacombs during the first three century AD as had been the Roman custom (Milburn, 1988, p. 44-45; Esler, 2001, p. 52). These sepulchre frescoes, or catacomb paintings, displayed scenes that could also be found on walls of contemporary Roman villas, but also scenes of Paradise, biblical stories and characters, such as Jesus, the virgin Mary and the Apostles (Esler, 2001, p. 53-54). Esler (2001, p. 55) furthermore states that in church context the frescoes would follow the same motifs, with a strong emphasis on Biblical stories instead of individual characters.

Symbolism

Having discussed the main types of decorations in ecclesiastical context, an all-important concept needs to be mentioned; symbolism. Art is not exclusively aesthetic, it can and frequently does function as a medium to convey messages or meaning, becoming a symbol. Ornaments should therefore be divided in representational (symbolic) and non-representational (purely aesthetic).

Semiotic and symbology

When studying symbols two distinct branches of science become apparent, namely symbology and semiotics. Symbology studies the symbols, with a clear focus on their use. Whereas semiotics is more concerned with symbols as a means of communication and behaviour. Umberto Eco (1976, p. 14-15) wrote in “a Theory of Semiotics” on the meaning and definition of signs, referencing Saussure and Peirce as the founding fathers of the discipline. Saussure contributed the ground breaking notion that the sign is composed of the signifier and the signified. Namely the form which the sign takes and the concept it represents (Saussure, 1983, p. 67). A relevant example is the Christian cross: its signifier is the four armed shape, and the concept that it represents is the crucifixion of Christ or Christianity as a whole.

The philosopher Charles Sanders Peirce (1982, p. 56) categorised the symbol as a type, although the most significant, of signs, and defines it as “the object of the understanding considered as interpretations”. Differentiating itself from the categories of icons and indices, the symbol does not have to be grounded in immediate application, such as likeness or logic. In other words: a symbolic object can represent something or some concept, without it having to make sense.

Ernest Jones, a scholar of semiotics, states in his ‘Theory of Symbolism’ that there exists a maze of meanings of symbols, and that the commonly used definition as “a sign” has its shortcomings (Jones, 1948, p. 31-32). He later summarises six essential attributes of symbolism, relating to the fields of linguistics, art and psychology. When the criteria of attributes is met, he proposes it can be defined as “true symbolism” (Jones, 1948, p. 135). A concise definition of the concept, which Jones abstains from constructing, can be produced with the help of these essential attributes of his true symbolism. From these attributes I propose a working definition of symbolism as *a mode of communication in which a more abstract or complex idea is represented by something concrete or common through cultural association*. By cultural association I imply the role of the relationships between peoples, as symbolism is produced and consumed by individuals, who make up groups. Representation and association will differ greatly from group to group.

Christian symbolism

Using the semiotic meaning of symbolism: a mode of communication, symbolism can be seen as a language. For the analysis of the ecclesiastical blocks the language will be that of Christian symbolism. Christian symbolism comes in many forms, all aiming to convey the message of Jesus and the Christian God. In "the symbolism in Christian art" by Edward Hulme aims to put together a complete summary of Christian symbolism, in which he discusses all manner of forms. Language, action, amount, colour, letters and shape can all be considered symbolic (Hulme, 1908, p. 4). For example the numbers three and seven are sacred and represent the holy trinity and the number of perfection respectively. The symbols of Christianity are representations of persons, events or lessons from the Old and New Testament. However the scriptures are not the only source of inspiration for symbolism, much was adopted from preceding (pagan)religions, such as the Roman and Greek pantheon and Judaism (Jensen, 2000, p. 32). Motifs, story arcs, myths and godly domains were adopted and slightly changed to better suit the setting. Possibly the most endemic and pre-eminent symbol of Christianity is the cross, recognisable in a vast array of styles. For the Romans the cross had been a sign of infamy and humiliation, whereas the early Christians appropriated the sign as a symbol of victory by association with their Saviour of mankind (Hulme, 1908, p. 12).

Relevant symbolism

There are a myriad of early Christian symbols in existence, however this study cannot go over all of them. I will concentrate on the relevant symbols relating to the archaeological site of Udhruh. The two relevant symbols, present at Udhruh, are the Christian cross and the scallop shell, which need explaining.

The Cross symbol

Despite the cross being seen as the most pervasive symbol the crucifixion and of Christianity as a whole, this has not always been the case (Dreyer, 2000, p. 5). Jensen (2017, p. 49) states that before the fourth century AD the cross only rarely appeared in visual art. For three centuries after the death of their Messiah the Christians did not seem to venerate the cross, although symbols resembling the cross, such as anchors and ship masts, can be found sporadically on personal items and grave markers (Jensen, 2017, p. 49). Only in the middle of the fourth century would the Christian cross become a regularly seen feature in the Christian iconography. This is argued to be the result of two developments in the fourth century.

Firstly, the adoption of the cross by Emperor Constantine seen in the Christogram after his victory at the Battle of the Milvian bridge in 312 AD. Subsequently he would make use of the cross symbol as an imperial standard and later adopted the Christian religion in 320. Constantine's version of the cross, the Christogram, differs from the now well know Latin cross, because his version was a combination of the Greek letters Chi and Rho, namely the first two letters of Christos (figure 2.7). The symbol is formed by intersection of the letters X and P. The second development was the discovery of the True Cross, on which Jesus died, led to the development of the *quadrata crosses*, such as the Latin and Greek cross. According to tradition, Constantine's mother, Helen, discovered the True Cross in 324 in Jerusalem. Although no sources describe the actual shape of the cross, later representation depict it as four arms with the lowest being elongated Latin cross (Jensen, 2017, p. 66).

According to Benson (2013, p. 22) all variants of the Christian cross have evolved from three main types, namely the Tau, Greek and Latin cross, seen in figure 2.8. Later he suggests there are three or four forms of the cross with many modifications, but he only elaborates on the Latin and Greek cross (Benson, 2013, p. 75).

Figure 2.7: Christogram as seen in Seymour, 1898

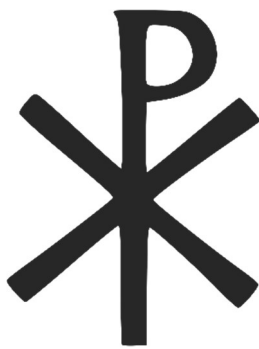
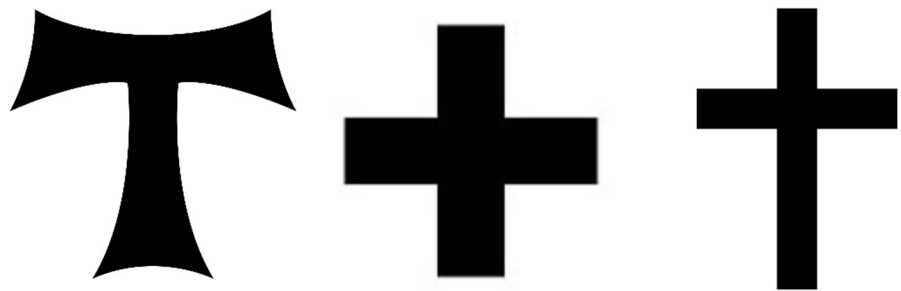


Figure 2.8: Tau, Greek and Latin cross as seen in Seymour, 1898



From the fifth century onwards the Christogram would be displaced as the cross emerged as the dominant symbol of Christianity (Jensen, 2017, p. 52). Multiple types and variations on the cross would be in use depending on time and location. These types are based on the length of the arms, the curvature of the arms, the angle of the cross, the amount of points on the ends of the arms, the shape of the background, the colour, etcetera. The two main types of crosses in early Christianity are the Greek and Latin cross.

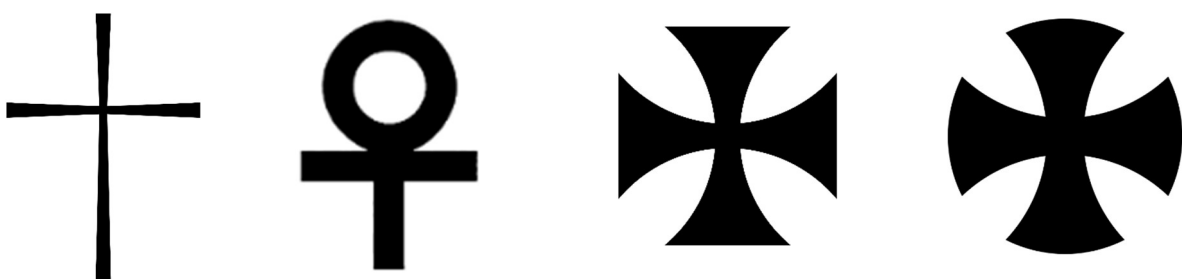
Later variants of the cross

As mentioned there is a large quantity of variants of crosses, it therefore seems wise to go over three relevant variants in the region and time period. In the Eastern Roman empire or Byzantine empire as it was later referred to, the Byzantine cross was used to a great extent. This cross was a modification of the Latin cross, with arms appearing thinner and flared outwards. This cross likely originates from the Resurrection of Triumphal cross appearing as a staff (Seymour, 1898, p. 355).

The second relevant type is regional, tied to Egypt. The cross ansata is made up of a capital T (tau) shape with a raised attached loop. Although visually very similar to the Egyptian *ankh*, scholars and writers are divided concerning the origin of the *ansata* cross (Spalding-Stracey, 2020, p. 93). Purely based on the appearance of the cross, compared to the ankh, many have proposed a continuation of the ancient Egyptian symbol (Gabra & Eaton-Krauss, 2006, p. 41). Others argue the symbol is not only native to Egypt but also to Syria, where it also could have influenced the *ansata* cross. Gillian Spalding-Stracey (2020, p. 93) states in the “*Cross in visual culture of Late Antiquity Egypt*” that the *ankh* motif definitely has strong ties to Ancient Egypt, but she suggests the *ansata* cross to have Roman roots. When discussing the looped cross, she argues it to be a combination of the Latin cross and a circular wreath overlapped (Spalding-Stracey, 2020, p. 94).

The last type to be mentioned is the cross *pattée*. This variant of the Greek cross consists of flared vertical and horizontal arms, in general of equal length. The cross is for the most part tied to heraldic imagery in Europe and the Crusades (Seymour, 1898, p. 368). From the Crusades onwards the cross would be connected to the Knights Hospitallers, Order of Saint John and Templar Knights, who adopted it. The cross *pattée* can also be depicted more circular, which makes it a cross *pattée alisée*. The cross, although predominantly connected to the Crusader period, was not exclusively used by the crusading Europeans in the 1095-1291 AD. Although seemingly popularised by the crusaders, the cross *pattée alisée* was already in use in Egyptian and Syrian monasteries during the 4th to 7th century AD (Spalding-Stracey, 2020, p. 101). This claim is further supported by the presence of the cross *pattée*, or variants thereof, on lintels found during the Christian period in Syria (Prentice, 1906, p. 138-140).

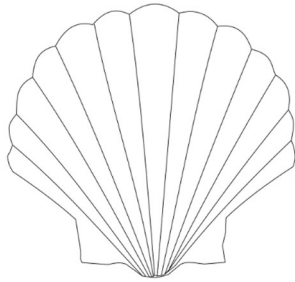
Figure 2.9: Byzantine, ansata, pattée and pattée alisée cross as seen in Spalding-Stracey, 2020



The Shell symbol

The shell or scallop motif is omnipresent in Christian architecture and symbolism. It was a major symbol in the preceding religions of the Roman and Greek pantheon and Judaism. In Christianity it symbolism covers many aspects. Before going into the symbolism it is necessary to clarify what type of shell is seen in Christian symbolism.

Figure 2.10: drawing of scallop shell



The symbol is a depiction of the Mediterranean scallop or *Pecten jacobaeus* (figure 2.10). The scallop is a type of marine mollusc indigenous to the Mediterranean sea and as the Linnaean name '*jacobaeus*' suggest it has been connected to Saint Jacob or James, hence the name Saint Jacob's shell. The shell has also colloquially been referred to as the "Pilgrim's scallop".

Symbol of pilgrimage

So even the scientific name of the mollusc is tied to Christian symbolism, the legend of Saint James. After the death of Jesus Christ one of his twelve disciples, the apostle James, travelled from Jerusalem to Galicia in Hispania to spread the holy word. During his travels, according to legends, he met and rescued a knight covered in scallop shells. However this symbol only became synonymous with the saint James pilgrimage until the route to Santiago the Compostela in Galicia gained more popularity in Europe. Michael Costen (1993, p. 138) states this popularity would arise in the middle of the tenth century. And after the 12th century, the pilgrims to Santiago would outnumber those to Rome (Costen, 1993, p. 138). The pilgrims to Santiago would use the shell as a drinking cup and carry it as a badge of pilgrimage and proof of completion of the route, which cemented the shell as a symbol of pilgrimage. Only the outwards facing shell relates to Saint James and the Pilgrimage.

Symbol of the Virgin Mary

The mother of Christ can be represented by the shell, this is a metaphor for her being the womb that carries and protects the pearl, namely the Jesus Christ (Steffler, 2002, p. 24). The Mary symbolism also connects the shell to the (divine) conception. This womb and fertility symbolism related to the shell is not only seen in Christianity. This connection between the shell and Mary, the most prominent female character in the Christian faith, is theorised to be influenced by the preceding state religion of the Roman empire, namely a member of the Roman pantheon.

The followers and new converts of Christianity did not have an established method of practice in the early days of Christianity, as this was still in development. The rules and rites were not yet set in stone. Therefore early Christians adopted tropes, traditions and personas from the known religions to forge a new one. The virgin Mary would inherit the function of Queen of Heaven (*regina Caeli*) and the Lady of the Sea (*Venus marina*) from the Goddess Venus (Marcovich, 1996, p. 48). The shell symbol and the entire maritime domain had long been tied to Venus, as the Goddess was born from the sea. The most famous representation of this, is the painting “the Birth of Venus” by Botticelli, in which the Goddess is depicted standing on top of a massive scallop shell.

Symbol of rebirth and baptism

The shell symbol is also linked to the act of baptism, in which the shell is used to cover the individual in holy water, so that they can be reborn a Christian (Cramp, 2000, p. 87). The symbol is connected to the Christian rite of baptism and subsequently rebirth. During baptism water would be poured onto the head of the individual using a scallop shell, to purify and admit them to the Christian community. The shell as a tool for baptism could be natural or man-made of metals such as silver or gold. This ritual dates back to John the Baptist who poured water onto Christ’s head using a shell (Steffler, 2002, p. 24). In “Living Water” Robin Jensen (2010, p. 44) mentions the scallop shell in relation to baptism and burial, namely as baptism iconography on early Christian sarcophagi. The deceased would be portrayed within a medallion of a scallop shell. This shell motif can be seen on many sarcophagi, which also leads to the shell’s connection to death, and therefore Christian heaven. Milburn (1988, p. 70) describes the depiction of the deceased in a scallop medallion form as “classic”, and the motif can indeed be found in many sarcophagi, example can be seen in figures 2.11 and 2.12.

Figure 2.11: Sarcophagus 183: two brothers, of the Vatican Museum in Rome (left) and Sarcophagus of Lot., of the San Sebastiano in Rome (right). In Milburn, 1988, p. 69.

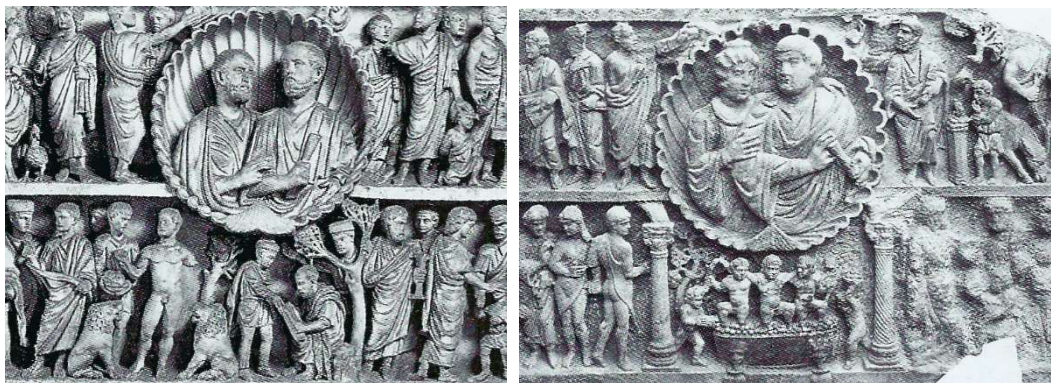
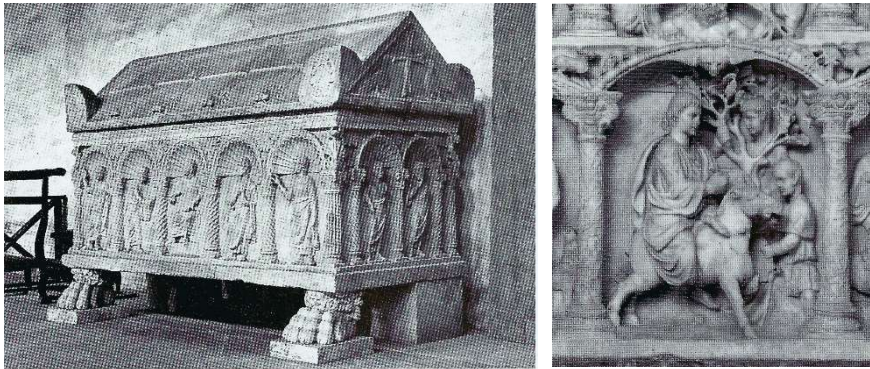


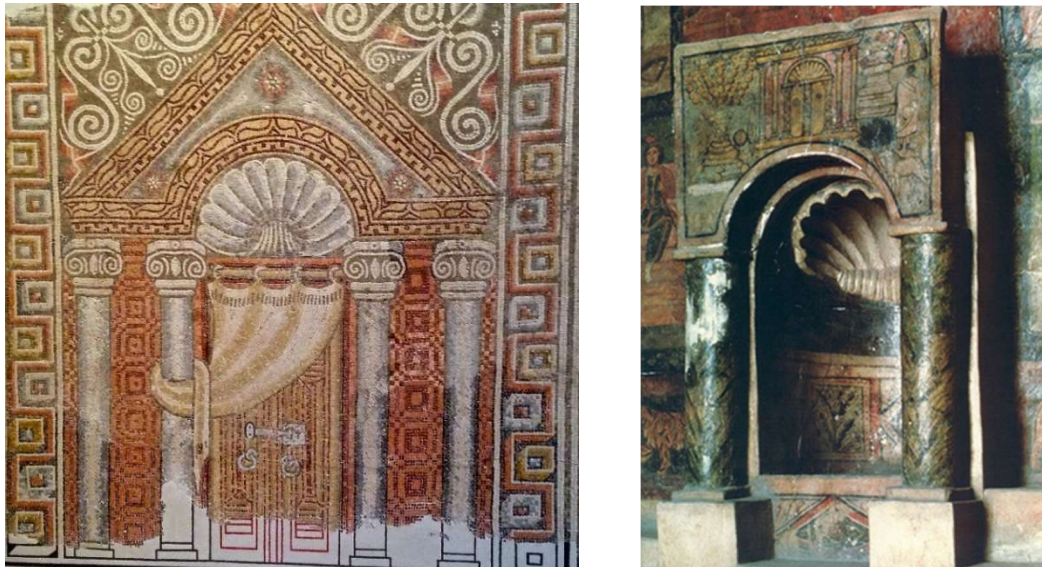
Figure 2.12: Marble Sarcophagus of San Francesco in Rome (left) and Sarcophagus of Junius Bassus of Vatican Grottoes in Rome (right). In Milburn, 1988, p.77 and p.71



The shell as an architectural motif

The depiction of the shell motif in the sarcophagi of Junius Bassus and San Francesco (figure 2.12) differ from the classic medallion. The shell is raised and has pillars on both sides. This depiction moreover echoes an architectural design seen in Greek, Roman and Jewish temple context. The holy scripture of the Jewish faith, the Torah scrolls, were placed within a central wall shrine. This shrine or Torah niche was opulently decorated, with most importantly a carved shell above the space where the Torah scroll would be presented, seen in figure 2.13. Rachel Hachlili refers to the shell symbol as being uniquely Jewish, in the same list as the Menorah, the ark and showbread table (Hachlili, 2013, p. 285).

Figure 2.13: Carpet mosaic depicting Temple facade with Torah Ark dating to the 4th century CE. Excavated at Khirbet es-Samarah. In the Israel Museum, Jerusalem (left) and The Torah niche at Dura-Europos, in a third-century C.E. synagogue excavated in modern day Syria. Photo: Department of Antiquities, Syria. (right).



A similar design can be found in the north of Jordan in the ancient city of Jerash. Multiple wall niches with shell motifs can be found on the grounds of the archaeological site of Jerash seen in figure 2.14. In “From synagogue to Church” archaeological research proved that the Torah shrine to the west of the synagogue was removed to make way for the central entrance when the basilica of Jerash was constructed in 530 AD (Lichtenberger & Raja, 2018, p. 89). This Torah shrine could have been similar to the ones seen on the site now.

Figure 2.14: Shell niches in Jerash, Jordan. Photos by Mark Driessen 2011.



Evidence of Christians symbolism in an Islamic world

The engravings on the blocks of Udhruh are likely part of a Christian genre of symbolism. This is a logical assumption, following the date of the construction of the church, in the fourth century, and the recognisable Christian cross-patterns incised into the stone. The church of Udhruh has been transformed into a mosque by the end of its lifespan, and the region in which the church is located has only been in control by Christians for approximately 250 years, namely during the Byzantine period and for a difficult to define span of time during the Crusader states. Far less than the almost 700 years that it has been in the Islamic spheres. However evidence point to the church of Udhruh having continued its function as a Christian ecclesiastic building until certainly the eve of the Mamluk period, from which I would surmise that the symbolism too continued to be Christian in nature (Driessen & Abudanah, 2018, p. 185). The first pieces of evidence come from the historical records concerning the Bishops of *Augustopolis* in 431 and the “granting of peace” to the town of Udhruh by the Prophet Muhammad in circa 630 AD. Even the amount of tax that was imposed on the town, 100

dinars, is known (Al-Waqidi, 1966, p. 65). The granting of peace and imposing of tax, instead of the traditional rapid total conquest which characterised Islam's first phase of expansion, implies a special status of the town. Afterwards in 657 the town of Udhruh was the location of an political arbitration between Islamic powers, during which time Udhruh kept its Christian identity. Although no specific records exist to guarantee this, it seems probable that the town of Udhruh was allowed to practise their Christian religion provided the *Jizia* tax was paid in full. A second piece of evidence comes from the thirteenth century and takes the form of an inscription found on one of the walls in the extra-mural church of Udhruh. This inscription makes a strong argument for the presence of Christians in Udhruh who still made use of the church, as the text discusses Christian subjects written in Arabic (Al-Salameen *et al*, 2011, p. 232-242).

I do not propose that the church of Udhruh must have been a continuous bastion of Christianity from its construction to its ruination, because there is simply too little evidence concerning the time in between the seventh and thirteenth century. I however suggest that with the evidence currently at hand it seems improbable that the town of Udhruh lost its Christian identity during the centuries in between.

Conclusion of background

All in all, this chapter has presented the backbone of this thesis. The history, as well as the archaeology, of the site of Udhruh have been discussed extensively. After which the architecture of the church, specifically that of Udhruh but also in general, has been presented accompanied by a summary of church decorations. This led to the distinction between decoration and symbolism, which was explained in depth. Then the relevant symbols were described in a historical context. Lastly, the significant position of Udhruh was mentioned, describing current research on the site. Now that the essential aspects concerning history, architecture and symbolism have been presented and explained, the focus can shift to the dataset, namely the architectural ecclesiastical blocks, and the answering of the main research questions.

Chapter 3 The Material Dataset

Dataset

The dataset consist of ecclesiastical architectural elements found within the Udhruh church and in the vicinity in spoil heaps. A total of 17 elements have been recovered and recorded, however not all have been photographed and rendered in to 3D-models. Furthermore some are not of concern to the main research questions, and will therefore not be analysed in depth.

Table 3.1: Data on material, 3D-model and photographic documentation

	Objects	Material	3D model	Photo
1	F358	Marble	Yes	Yes
2	F2100	Limestone	Yes	No
3	F2238	Limestone	Yes	Yes
4	F2239	Limestone	Yes	Yes
5	F2240	Limestone	Yes	Yes
6	F2242	Limestone	Yes	Yes
7	F2244	Limestone	No	Yes
8	F2245	Limestone	Yes	Yes
9	F2247	Limestone	Yes	Yes
10	F2251	Limestone	Yes	Yes
11	F2376	Limestone	Yes	No
12	F2401	Limestone	Yes	No
13	F2535	Marble	Yes	No
14	F2565	Limestone	No	Yes
15	F2566	Limestone	No	Yes
16	F3031	Limestone	Yes	Yes
17	F3124	Limestone	No	Yes

In the table the elements, which are named using the capital F and a three or four digit number, are presented in combination with information concerning the material and the possession of 3D-models and/or photographs. It becomes apparent that the dominant material is limestone, with only two elements (F358 and F2535) being composed of a different material, namely marble. These two marble elements will not be important in the analyses, not as a result of their material but due to their form and shape. Both elements differ from the general limestone blocks. F358 is a fragment of a basin and F2535 is a cylinder column. All in all, this compresses the list of elements to fifteen blocks.

For the spatial analysis and the symbol analysis both the 3D-models and photographs will be used. However because the 3D-models are of vital importance in the spatial analysis, this limits the analysis to eleven blocks. The four remaining photographed elements will be mentioned during the research, but without the precision facilitated by the use of models, not much information can be gained.

For the symbol analysis all fifteen elements will be used. Although the models enhance the detail in which paints, polishing and incision marks can be viewed, the large quantity of photographs of the four blocks will suffice. It should however be mentioned that during this analysis of objects F2244, F2565, F2566 and F3124 more data could be gained from future models, and some present patterns and shapes could have gone unnoticed.

Table 3.2: 3D-modeled blocks

Blocks with 3D-models
F2100
F2238
F2239
F2240
F2242
F2245
F2247
F2251
F2376
F2401
F3031

Material attributes

As mentioned the elements are composed of limestone and marble. The precise limestone type of the blocks is coquina limestone, a type of sedimentary rock formed entirely of sorted and cemented sea fossil debris, such as mollusc or gastropod shells (Geology.com). The stone is porous and relatively soft, therefore easy to shape and engrave. Its density depends on the amount of debris it contains, but is 2,8 to 2,9 grams per cubic centimetre on average. Its malleableness attribute comes at a cost, namely that the material is also less durable and less strong, which does not always make it an ideal construction material. The stone is very likely locally quarried to the north-west, because archaeological evidence suggest the presence of a mining settlement 2,2 kilometres from Udhruh, where the unfinished blocks are still visible to this day (Driessen & Abudanah, 2015, p. 300).

Figure 3.1: Unfinished block in quarry. From Driessen M.J. & Abudanah F. (2015), *The Udhruh Archaeological Project – the 2011-2012 Field Survey*. p. 301



The two other elements are of marble, a more durable material. Only of F358 the specific type of white marble is known, namely dolomitic marble. This marble was proven to have been imported from Thasos Island in Greece by an analysis on the provenance of multiple marble elements found at Udruh (Al-Bashaireh, Abudanah, Driessen, 2019, p. 6). Object F2535 was not part of this research, and the precise type of marble is unknown. However it is likely to be one of two types of marble as presented in the provenance analysis, namely dolomitic or calcite (Al-Bashaireh, Abudanah, Driessen, 2019, p. 9).

Data concerning dimensions and weight of the blocks had not been obtained yet. But with the use of the 3D models this has been gathered for eleven of the thirteen blocks. The procedure consisted of measuring the length, width and height, resulting in average surface in square centimetres and cubic centimetres. This in combination with the density of coquina limestone, which I equated to 2,85 (Geology.com), results in the estimated weight of each block in kilogram. However not all blocks are in good condition as a result of damage, also most blocks have engravings and hollow sections. Therefore I categorised the actual amount of volume lost, due to damaged or hollow sections, in percentages. This percentage is then subtracted from the total weight, resulting in an estimated weight per block. The result of this process can be seen in table 3.3 and 3.4.

Table 3.3: Dimensions and weight of elements

Objects	Density Gr/Cm ³	Damage %	Dimensions(Mm)			Surface ~ Cm ²	Volume ~ Cm ³	Weight ~		
			Length	Width	Height			Gram	Kg	Kg(corr.)
F2100	2,85	15%	331	221	183	3483,3	13386,6	38152	38,15	32,43
F2238	2,85	5%	332	355	189	4954,1	22275,5	63485	63,49	60,31
F2239	2,85	20%	356	340	179	4912,5	21666,2	61749	61,75	49,40
F2240	2,85	20%	572	381	195	8075,3	42496,7	121116	121,12	96,89
F2242	2,85	10%	424	372	190	6179,4	29968,3	85410	85,41	76,87
F2245	2,85	25%	457	363	192	6466,6	31851,1	90776	90,78	68,08
F2247	2,85	20%	278	293	193	3833,1	15720,6	44804	44,80	35,84
F2251	2,85	10%	457	383	192	6726,2	33606,0	95777	95,78	86,20
F2376	2,85	20%	284	262	107	2656,6	7961,7	22691	22,69	18,15
F2401	2,85	15%	257	208	172	2668,7	9194,4	26204	26,20	22,27
F3031	2,85	10%	308	375	200	5042,0	23100,0	65835	65,84	59,25

Table 3.4: Average and median dimensions and weights

Data type	Dimensions(Mm)			Weight ~	
	Length	Width	Height	Kg	Kg(corr.)
Average	368,7	323	181,1	65,1	55,1
Median	332	355	190	63,5	59,3

Dimensions

The length, width and height of the objects is not based on the original orientation but on the orientation of the blocks when they were scanned and photographed. In this orientation the top side is the surface on which the hinge of the shell and the geometric patterns are visible. From this surface the length and width is measured. The other important side is the front, where the lip of the shell and crosses are visible. The front view holds the measurements on height and length.

With these findings patterns can be determined, by looking at the averages, medians and specific outliers. When analysing the length of the objects it becomes apparent that there is a great variation within the dataset. The difference between the object with the smallest and largest length is 315 millimetres. The lowest length is approximately 30% less and the highest length is 55% more than the average length of 368,7 millimetres. From this data, which presents little uniformity, I surmise that the length of the blocks was most probably related to its position and use, instead of complying to a standard size. A similar conclusion can be obtained when analysing the width, again the difference between the dimensions is great. Percentage-wise the average width of 323 millimetres differs 35% from that element with the smallest width and 20% from that with the largest width.

More uniformity can be found in the height of the blocks, averaging to 181 millimetres.

Differentiation between highest and lowest from the average is approximately 10% and 40%.

However this 40% seems to be the result of an outlier in the dataset, namely object F2376 with a height of 107 millimetres. When this object is removed, the average height changes to 188,5 millimetres, which is far closer to the new median of 190 millimetres. Secondly the new smallest object becomes F2401 measuring 172 millimetres in height, differing only 10% from the new average. The largest object now differs only 5%. From this data I would argue that a standard of height in the blocks was maintained of approximately 190 millimetres. If the block was oriented in a manner in which the mentioned front side was visible, than this identification of height would be correct. The use of a standard measurement of height in a block speaks to reason as blocks would be stacked in layers on top of each other. Great variation would result in unstable walls, while the uniformity in the height of the blocks facilitates more vertical stability.

Weight

The results on the estimated weight of the blocks do not present clear patterns. The average weight of a block is 55,1 kilograms and the weight without the subtraction of the percentage of damaged and/or hollow sections is 65,1 kilograms. A clear outlier in this dataset is object F2240, which is estimated to weigh 96,9 kilograms. This can be explained by the fact that this block has two shell motifs and is double the size of the standard block. Even without this outlier the variation in weight persists. The obvious reason for this, is that the blocks differ greatly in dimensions, except for height, which results in a vast area of sizes and weights.

Fundamentally, it should be mentioned that the finding on weight and dimensions are based on the measurements pertaining to the current state of the blocks. And in the case of weight, estimations relating to hollow sections and damaged sections are also variables grounded in modernity. This could be problematic because the data only relates to the current state of the blocks, rather than the original state.

Part of a larger entity

It is important to note that the architectural elements are analysed as individual objects, as single entities. However, this should not misrepresent their past situation. The blocks were part of a larger entity, a church complex, and were found near the apsis in the east and in the vicinity of main entrance to the west. They were likely located higher within the wall, but as parts of the walls crumbled the blocks, they became scattered within the core church. The core church is therefore also the hypothetical original location of the blocks. The natural scenario of walls falling down, which in turn displaces the blocks seems the most probable theory. If the blocks were removed intentionally, the purpose is unclear. The practice of removing material from buildings to be reused in other construction projects is well-documented and omnipresent during late Antiquity and the entirety of the Middle Ages, described in Maria Hansen her book "The spolia churches of Rome, recycling antiquity in the Middle Ages" (2015). But this does not explain their find location still within the church, making the *spolia*-theory vapid.

Chapter 4 3D spatial analysis

Introduction

In the summer of 2019 fundamental steps were taken to enable the research of the years priorly discovered blocks. Utilising an Artec Space Spider, all dimensions of the objects from all angles with hundreds of photographs were captured. The entirety of these photographs were stored on a server, from which Maarten Sepers, a digital archaeologist from *Saxion University*, was able to produce highly accurate 3D models. In April 2022 I was able to come in possession of the models and work with them. In chapter three the ensemble of objects have been described through the lens of basic physical characteristics. This however is not the complete extent of 3D-modelling techniques. By utilising programmes such as *Cloudcompare*, *Meshlab*, *Meshroom* and *Cinema 4D* two fundamental features of the stone blocks can be determined, namely the curvature and surface appearance of the blocks.

This however will only pertain to the limestone blocks, I will not be able to pin-point locations of the marble elements using the 3D models. Therefore the total amount of elements for spatial analysis is eleven, seen in table 4.1.

The use of 3D models in archaeology is wide-spread and has been increasing exponentially over the last decades. Nicolo dell'Unto and Giacomo Landeschi (2022, p. 18) categorise it in to three types, namely surface, boundary and volume representations. I have already touched upon the first type of representation during the dataset description and will continue with this type in this chapter. 3D object of the surface representation type are composed of points, lines and surfaces, and could be described as presenting the external "shell" of the object, instead of the internal characteristics (Lock, 2003, p. 152). Internal characteristics such as volume, mass and centres of gravity can be important in archaeological research, however in this analysis the lines, dimensions and surfaces are essential.

Table 4.1: 11 objects for spatial analysis

Objects
F2238
F2239
F2240
F2242
F2245
F2247
F2251
F3031
F2100
F2376
F2401

Types of blocks

From the data gathered concerning the blocks it becomes apparent that the blocks can and should be divided into two general types, because of distinct differences. I propose the first group to consist of “true blocks”, with which I imply rectangular blocks with a very similar height, general design and orientation. The second group is more miscellaneous, it consist of trapezoidal blocks and blocks not sharing the same features.

The first group consist of eight blocks and is characterised by the eye-catching shell motif and additional engravings such as geometrical patterns and crosses on the surface. A representational object for this group is F2339, seen in the figure below. In general the rectangular elements are longer in length than in width and maintain a similar height of 191,3 millimetres (table 4.2). Although only images are on hand objects F2244, F2265, F2266 and F2124 also fit the description of a true block based on the presence of shell motif, geometrical patterns and possible crosses. In the true block group of twelve objects, one element does not comply with the standard layout of the block. Object F2251 possesses the shell motif but instead of the expected position of geometrical pattern on the side where the hinge of shell is visible, it appears at the side with the lip. This is peculiar and will be discussed further during the surface analysis and later analysis of the symbols.

Table 4.2: Measurements of “true blocks” in millimetres

Objects	Length	Width	Height
F2238	332	355	189
F2239	356	340	179
F2240	572	381	195
F2242	424	372	190
F2245	457	363	192
F2247	278	293	193
F2251	457	383	192
F3031	308	375	200
Average	398	357,75	191,25

Figure 4.1: 3D-view of object F2339



The latter group only has its distinction to the true blocks in common. The three blocks in this category are smaller but lack similar dimensions (table 4.3). For object F2376 and F2401 the surfaces were difficult to distinguish, therefore the length, width and height are based on the side with features. Object F2100, although lacking the shell motif, with additional crosses and geometrical patterns, seems to be placed closer to the true blocks, because of its corresponding height of 183 millimetres, only 8 millimetres smaller than the average height of true blocks.

Table 4.3: Measurements of miscellaneous blocks in millimetres

Objects	Length	Width	Height
F2100	331	221	183
F2376	284	262	107
F2401	257	208	172
Average	290,67	230,33	154

3D-model surface appearance

It is improbable that all surfaces of the six sides of blocks are of the same quality. More likely, the craftsmen produced the general shape of a block out of the stone, after which they would then continue on the side or sides which would be seen. This later process could consist of polishing, engraving, painting, or a combination. I propose that a well-processed and/or decorated surface is expected to be placed outwards, in clear visibility to the onlooker. Every block will be analysed from all sides in order to determine which side or sides would have been visible. So this analysis of the surface condition of the blocks will assist me in determining the original orientation of the blocks. Although it should be mentioned that this presumed outward orientation of decorations does not always have to be the case. For example, in the scenario of the use of spolia, the orientation of the engraving does not have a determinable correct orientation.

Two apparent hypothesis concerning surface appearance:

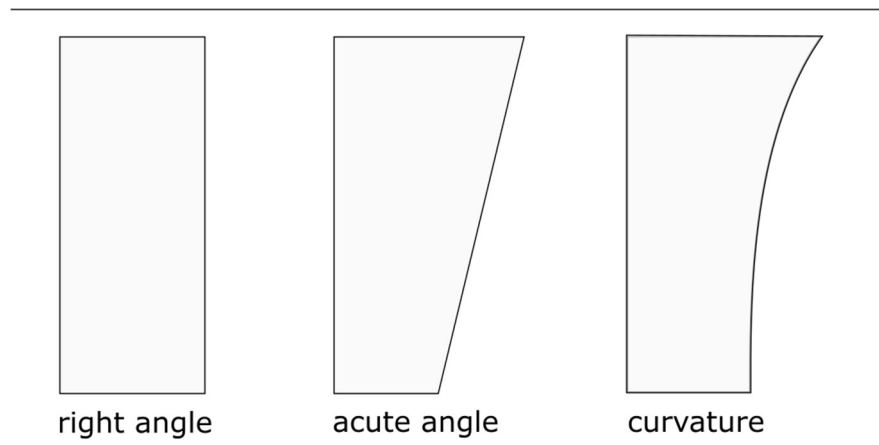
“A side of the block, of which the surface exhibit signs of extensive workmanship, high quality or decoration were likely visible, as they would be not be fitted into the wall.”

“A visible side oriented downwards must have been positioned raised up, to enable the viewing of said side. Vice-versa can be said for sides oriented upwards.”

3D-model curvature

Curvature in building blocks is purposeful and functional. All blocks are handcrafted and fit together when placed correctly following the planned layout. First the curvature in all eleven blocks is determined, after which these curvatures are overlayed and compared to those we see in the layout of the church. The elements with an absence of curvature will certainly not be worthless, because the lack of curvature also provides information. The straightness of the elements implies that their original location must be in the context of a straight wall. This localisation is less precise, but still useful.

Figure 4.2: Diagrammatic comparison of angles and curvature



Vertical and horizontal curvature

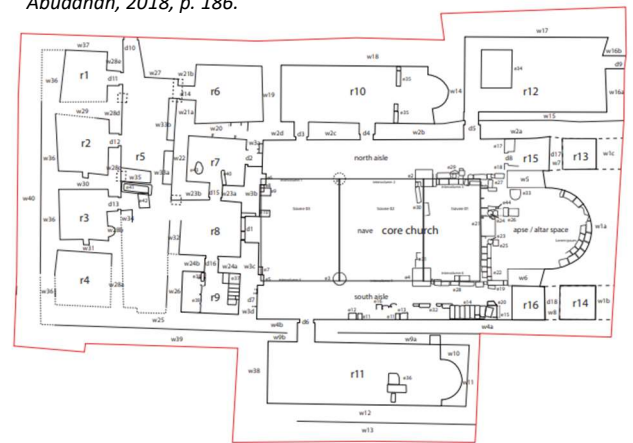
Curvature in the blocks should be divided into two types, namely vertical and horizontal. Vertical curvature concerns arching in a vertical direction, thus a curve up to down. Blocks of this type can be expected to be found in arches at elevated positions, where the wall meets the ceiling, or on top of pillars. The counterpart of the previous type is the horizontal curvature, which involves sideways arching. Horizontal curvature is not so much based on elevation, as it can be found at any height, but on the architectural layout of the structure. The layout of the general *basilica* was a mixture of rectangular and circular sections. Sections such as the narthex, nave and aisles were consistently rectangular with sharp edges in the plan. Whereas the apsis and chapels would be circular, generally taking the shape of a semicircle. The types are not exclusionary and ample examples of blocks incorporating both vertical as well as horizontal curvature exist. These dually curved blocks can be found at the elevated area within the circular sections of the structure, for example in the dome. The determination of the type of curvature depends entirely on the orientation of the block.

Connection to layout

The outcome of the surface and curvature analyses of the blocks can then be compared to the layout of the church. The blocks, after having been pin-pointed to a location, can also be dated as knowledge concerning the age of specific sections of the church is known. A detailed study on the construction and expansion of the church has been performed in 2016, resulting in accurate dating of the core basilica, the narthex rooms and chapels added to the church (see figure 4.3). This data has been obtained by the method of C14 dating of wood fragments within the mortar layers present in the building.

The wood fragments mostly consisted of relatively small twigs, which results in the most accurate carbon date achievable. Shrubs and bushes generally have a shorter lifespan than a tree, which can survive well over a hundred years depending on the species. Therefore the age-range of wood fragments originating from trees can vary greatly, resulting in an imprecise dating. The conclusion of the before-mentioned study was that the layout of the church can be divided by multiple expansion phases. The basilica, or core-church, consisting of the apsis, aisles and nave pre-dates all other connected structures. This is a key piece of data, as all blocks were discovered within the core of the church. The probability that they also originated from the oldest section of the structure is high, but not absolute.

Figure 4.3: Layout of the Udhruh church complex. From Driessen & Abudana, 2018, p. 186.



Analysis appendix

The eleven architectural elements are presented in the appendix A and B. During the analysis I refer to and use pictures of the relevant objects, as seen in these appendices, concerning aspects of surface condition and orientation, curvature and probable location within the core church. The analysis will be divided into the before-mentioned true blocks and miscellaneous blocks.

True blocks

Surface appearance

In all eight blocks, categorised as true blocks, two surfaces are consistently well-processed and decorated, namely the sides of the temporarily designated top and front view. These are the sides attached to the corner in which the concave shell motif is positioned. The other four sides of the blocks are generally also smooth, but possess more imperfection resulting in less flatness in the surfaces. It is however difficult to determine if the imperfections are the result of damage or an intentional decision during the production process of the blocks. This distinction between damage and intentional quality is clear in certain objects, especially when it comes to blocks that have been broken, seen in objects F2240, F2247 and F3031, seen in the figures below.

Figure 4.4: Damage on object F2240



Figure 4.5: Damage on object F2247

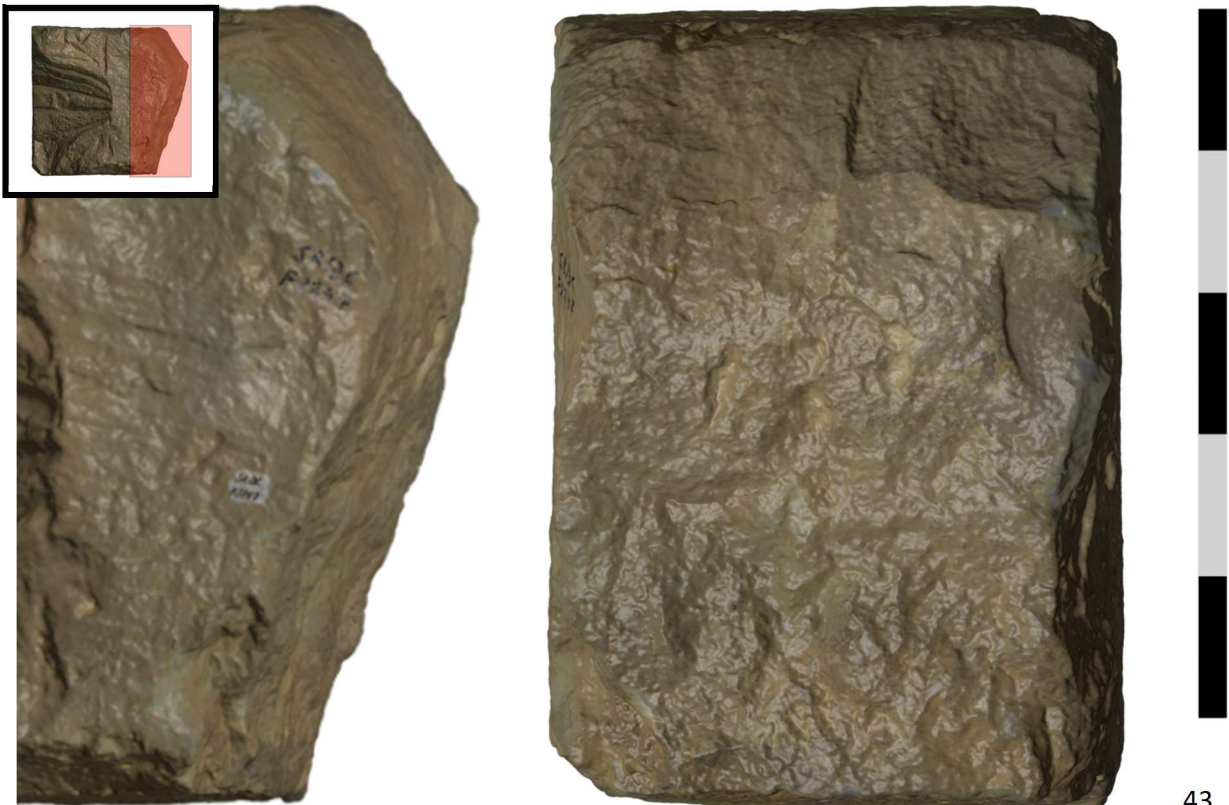


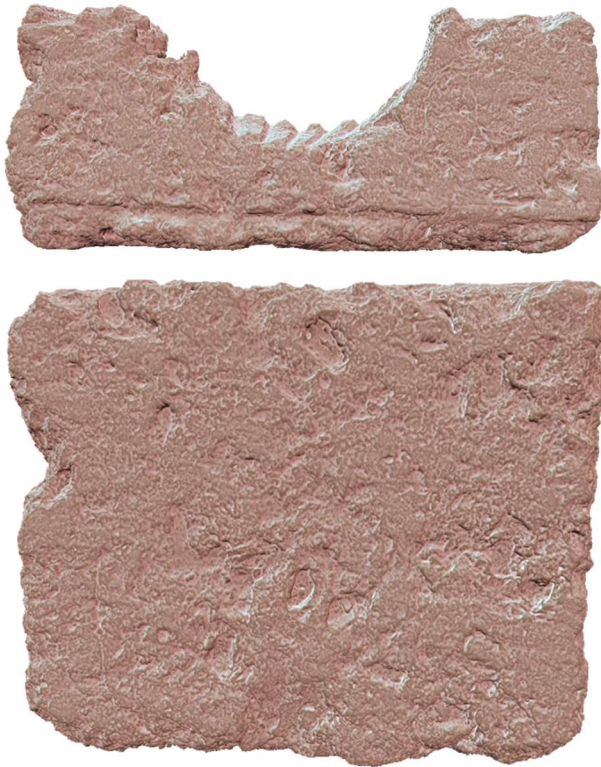
Figure 4.6: Damage on object F3031



The signs of breakage are apparent in these objects. The surface is riddled with grooves and notches, randomly scattered on the damaged side. I suggest these blocks show signs of “hard” damage, instead of the other five blocks, which are not without damage, but certainly less significant. The damage on those blocks can be defined as “soft” damage, likely the result of weathering and/or friction.

In appendix A the six sides of all the objects are presented and generally show relative flatness, which has to be the result of polishing. However the degree of polishing cannot be determined due to the damage of the surfaces. In many blocks it can be seen that the sides, holding the engraved decoration, have a similar level of soft damage as other sides. It would be expected that these decorated surfaces would be of a distinctly better quality than the non-decorative side, but this is not visible in the condition of the blocks as of today. In object F2251 for example it can be seen that the bottom of the block is of similar quality than the front. In figure 4.7 a radiant shader has been added to enhance the present concave and convex imperfections.

Figure 4.7: Front and top surface of F2251



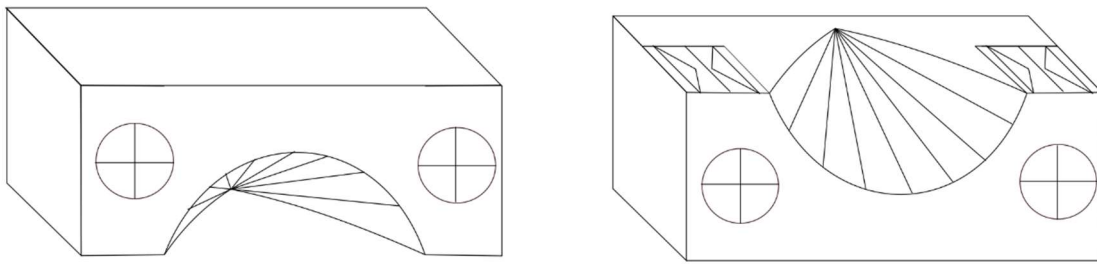
All in all, based on the data, and because of the lack of clear differentiation between intentional inferior quality and soft damage, it can only be concluded that the two decorated sides would most probably have been visible. These are the sides on which the craftsmen would have had to put more effort into, compared to the other four sides, even if all of them were originally finely polished.

Orientation

The visibility of sides of the blocks is connected to the original orientation. The conclusion that two sides instead of one side were visible opens up many possible hypotheses on the original placement. If it had been determined that only one side was visible, the block would have certainly been fitted in to the wall, with all five sides attached to another block.

Two visible sides lead to two types of orientations with each two variants. But as mentioned, the unifying aspect of the blocks, aside from the decorations, is their standard height, which is a critical factor in determining the orientation of the sides. Namely if the hypothetical standard height is correct only two scenarios remain, in which the side with the measured height is in front.

Figure 4.8: Two scenarios, based on standard height



In the first scenario (4.8 left) the front view consists of the outer edge or lip of the shell motif below with additional cross engravings or paintings in front. The bottom view shows the inner shell with hinge and the geometrical shapes. This orientation is only possible if the block is placed at a higher position in the wall, at least above the average height of the viewer. In this scenario the bottom section of the block must be partly resting on top of another block. The surface above, in the back and on both sides of the block are most probably attached to other blocks. The orientation creates a half suspended position in a wall. A 3D reconstruction of this orientation and positioning of object F2238 can be seen in figure 4.9.

This half suspended position seems most probable, considering that the block needed to be stable. The other position which would facilitate optimal stability can be seen in figure 4.10, where the block forms a niche within the wall. The problem with this placement is that the geometrical patterns on the bottom side of the shell would be completely covered, a scenario I would argue against. Because why put considerable effort in the creation of decoration if it was not to be viewed.

Figure 4.9: 3D reconstruction as suspended block

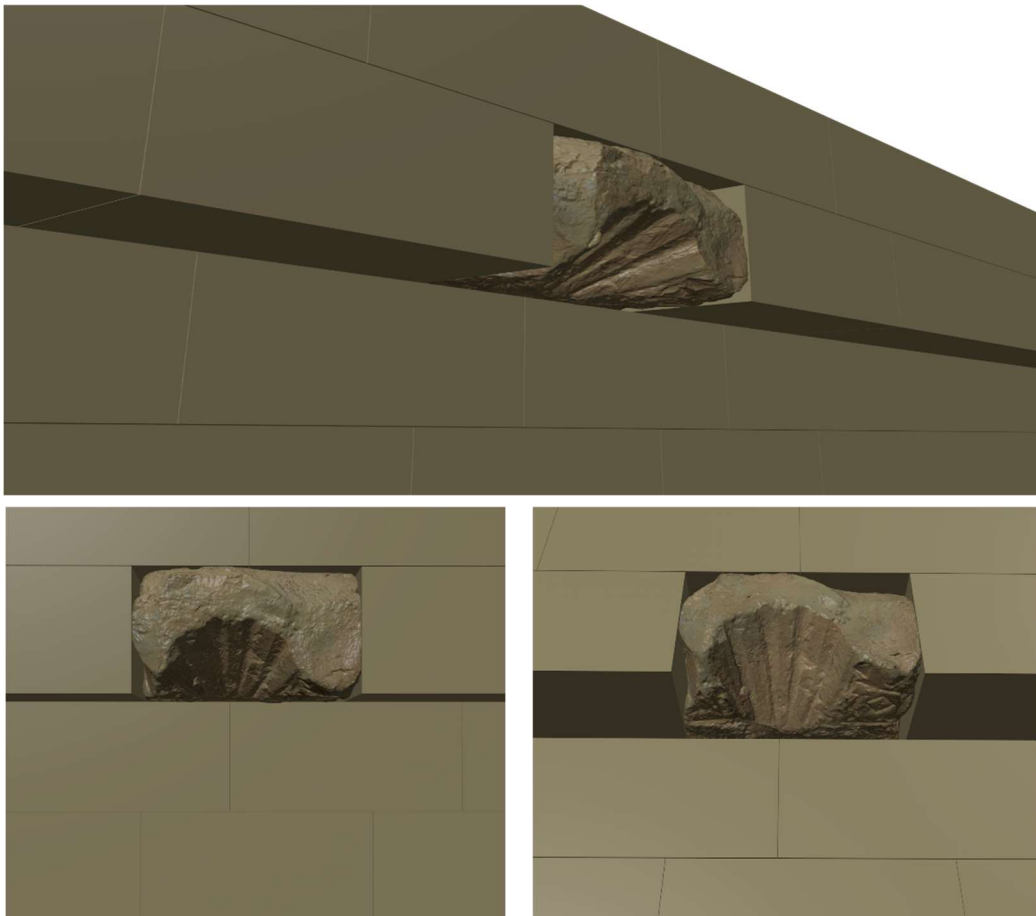
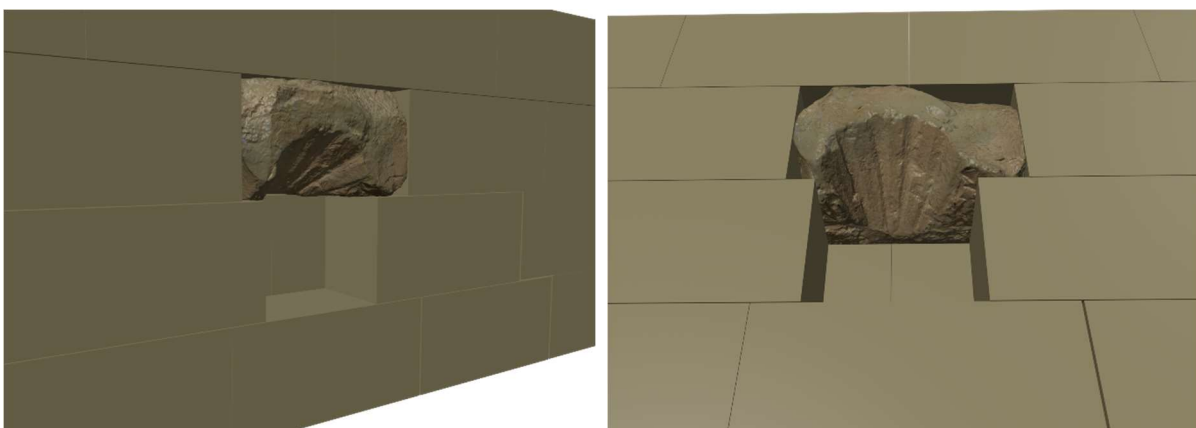


Figure 4.10: 3D reconstruction as wall niche



In the second scenario (4.8 right) the blocks need to be flipped. Again the outer rim of the shell motif appears in front in combination with crosses on the sides. In contrast the interior part of the shell and geometrical shapes are now present on the top surface. Only a recessed position and an elevated perspective would permit the viewing of these decorations, therefore the blocks in this orientation would have had to be placed in a lower section of the wall or not in a wall at all. Figures 4.11 and 4.12 show potential wall placements.

Figure 4.11: 3D reconstruction of low wall

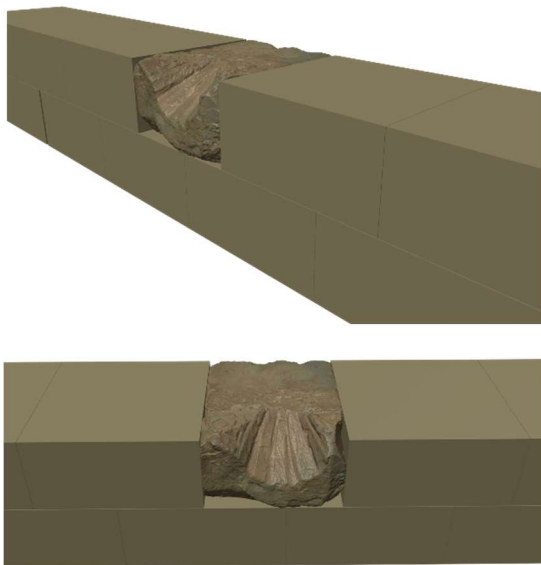
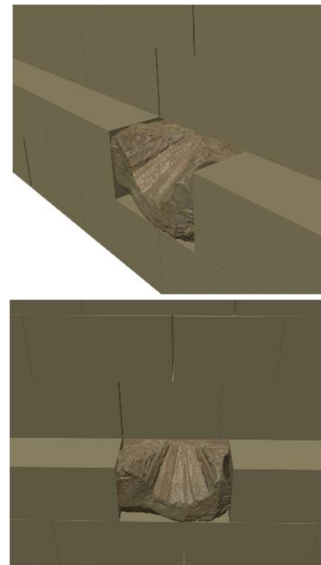


Figure 4.12: 3D reconstruction of "bench" wall

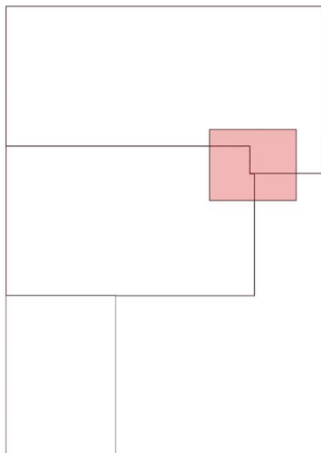


Both orientations are possible, however the first seems more probable as the shell is more often depicted with the lip up in Christian contexts. Secondly the orientation with the lip downwards demands the presence of a low wall or a type of bench attached to the wall, otherwise the geometrical patterns and interior of the shell are not viewable. There is currently no evidence in the Udhruh church of such structures. And lastly the surface of the side with the lip of the shell holds a clue which could indicate the half-suspended positioning of the blocks. This clue pertains to the horizontal groove above the shell ridge close to the upper corner of the block. The groove is present in seven of the eight blocks and is never deeper than 10 millimetres (see figure 4.13). The only block without the groove is severely damaged in the section where the groove would be expected to be.

Figure 4.13: Object 2239 with groove above shell lip



Figure 4.14: Side view of groove interlocking in semi-suspended block



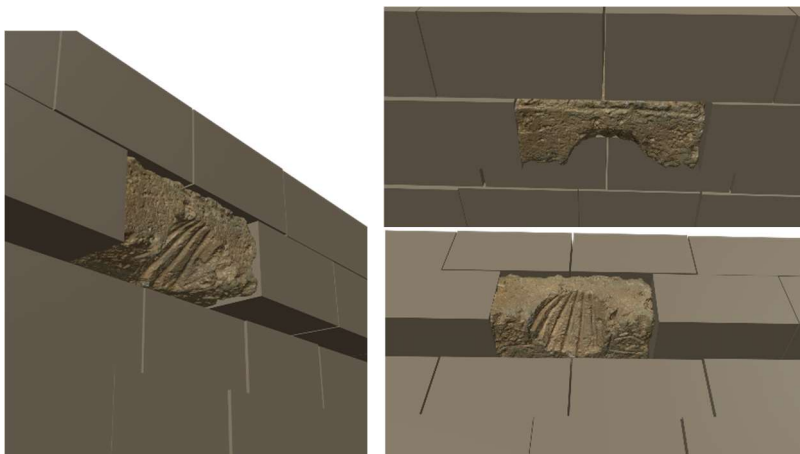
This groove could have been used to facilitate a better fit with the row of blocks above the semi-suspended block, improving overall stability. The blocks above could have had a protuberant ridge, which would interlock with the concave groove on the ornament block, seen in figure 4.14. This interlocking would significantly diminished the downward pressure concentrated in the suspended section of the block. These protuberant ridges on blocks have not been mentioned in prior research. However future research could affirm this interlocking theory if blocks with convex ridges were to be found.

Object F2251 should be mentioned at this stage as it is an anomaly (figure 4.15). I have classified it as a true block, as it is rectangular in shape with a height of 192 millimetres and consists of a shell motif accompanied by cross and geometrical patterns. However the block differentiates itself from the rest as its design is reversed. The standard block consists of a side where the lip of the shell together with crosses is visible and a side on which the hinge of the shell with geometrical patterns is visible. However object F2251 combines the lip of the shell with the geometrical shapes and hinge side with crosses. The reason for this reversed design is unknown. The object does contain the before mentioned groove and its orientation would likely stay similar to that of the other true blocks (see figure 4.16).

Figure 4.15: Ornaments on F2251

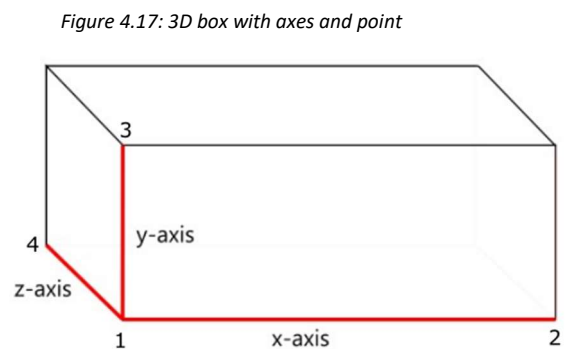


Figure 4.16: 3D reconstruction of F2251 in wall



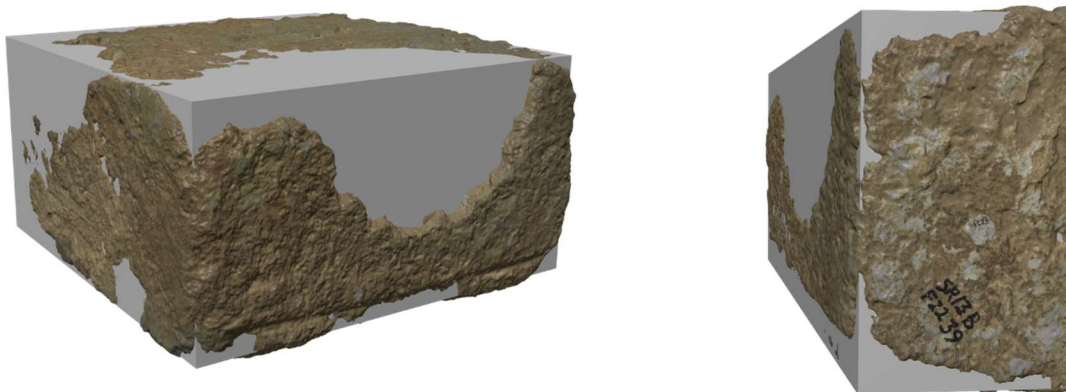
Curvature

To determine curvature the three axes of the blocks need to be analysed (see figure 4.17). The x-, y- and z-axes should form straight lines to and from the relevant numbered points, if the object is without curvature. Curvature on the x-axis (1-2) and z-axis (1-4) determines horizontal curvature, whereas the y-axis only contributes to the verifying of vertical curvature.



In appendix A, the axes of the blocks can be seen in the six perspectives. A more visually understandable manner of representing the comparison of the present lines and the ideal straight line can be produced in Cinema 4D. After the model has been rendered in MeshLab, the object has to be positioned precisely on its own axis centre. Then a perfect rectangular 3D box can be imported, which will then be connected to the eight corner points of the rendered block. By then shrinking the box, the surfaces of the block become visible, precisely presenting where the side is or is not straight. The product of the analysis of object F2239 can be seen in figure 4.18. From this model it can be determined that the object does not possess curved sides. The upper left section of the left side of object F2239 is damage, if it was curvature the shift to greyness would be gradual.

Figure 4.18: Object F2239 with comparison box in 3D perspective (left) and side view of front (right)



All eight true blocks have undergone this analysis (see appendix B) which resulted in no curvature having been found in the objects. Although damaged, all blocks have been produced at a 90 degree angle, lacking rounded curvature. That is neither horizontal nor vertical curvature.

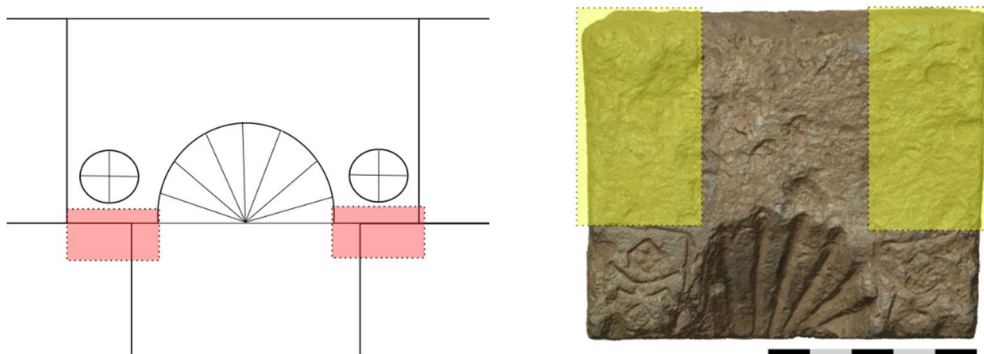
Potential original placement

The results of the analyses on surface appearance, orientation and curvature of the true blocks lead to three major consequences:

1. The two sided visibility of the objects exclude their placement in a wall fitted on all sides.
2. The presence of decoration on the bottom side of the object requires the block to be positioned above the eye-height of the viewer.
3. The absence of curvature in the objects exclude their placement in rounded architectural sections of the church.

The first consequence rules out the function of the blocks as standard wall bricks. The decorative blocks were likely semi-suspended, protruding out of the wall. Their function as lintels above entrances is possible, although very improbable. The blocks could not have rested on the side walls, in the same manner a standard lintel structure is set up. The presence of the geometrical patterns on either side of the bottom of the block makes that impossible. In figure 4.19 this hypothetical lintel construction is presented in a front view, with the presence of the geometrical patterns is marked in red. The lintel set up could only have been possible if a small section of the sides was used to support the block, in order to not obstruct the vision of the patterns, marked in yellow on object F2251 in figure 4.19. Although this structure could have been possible it seems highly improbable, as the blocks are also relatively narrow, see table 4.2. All in all the blocks are unlikely lintels.

Figure 4.19: Schematic front view of block as lintel(left) and object F2251 bottom view with sections in contact with walls (right)



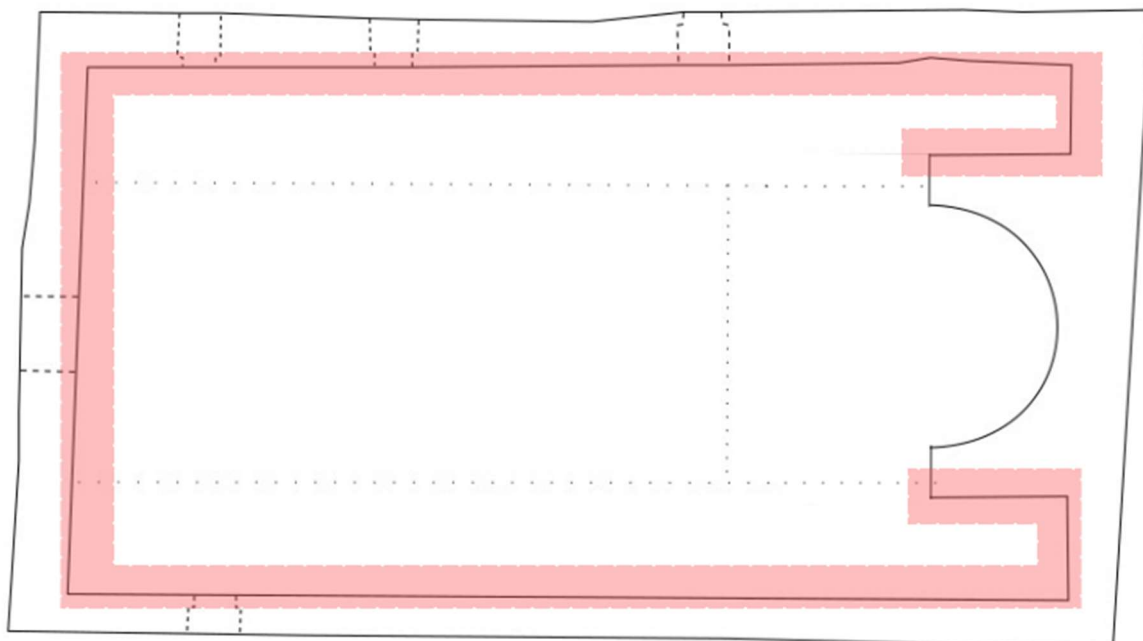
The consequence related to orientation means that the blocks would have been positioned at a significant height, close to or possibly attached to the ceiling. The average onlooker would have had to be able to view the decoration underneath the block, which excludes all sections below the direct frontal view of the onlooker. The average height of a modern male in Jordan is 173 centimetres (Ministry of Health of Jordan, 2020, p. 51). This would likely have been considerably lower during the

second half of the first millennium, but an average cannot be produced due to the lack of data. The average height of the entrances in the church, still standing, is a far better indicator of elevation. The measurements of a number of entrances of the church complex have been analysed and calculated, which resulted in varying heights. The lowest door height was just 1,35 metres, while the main entrance to the core *basilica* was 2,53 metres (Driessen & Abudanah, 2018, p. 186-187). To calculate an average from all present entrance heights would not be reasonable, as most entrances were produced by the later opening up of existent walls. The main entrance is the oldest dated entrance of the church and should therefore be used as a logical indicator of elevated height. So considering the height of this oldest main entrance, I would argue that the blocks had to be elevated at approximately 2,53 metres or higher.

The last consequence speaks for itself, the lack of curvature excludes its original position to be in the rounded architecture seen in the apsis and side chapels. This does not seem to assist the pin-pointing a great deal, however all new data contributes to the larger picture.

In figure 4.20 the layout of the core basilica can be seen with potential original placement of the true blocks marked in red, based on the analyses. It should be considered that all marked areas are above two and a half metres and semi-suspended.

Figure 4.20: Schematic layout of core basilica of Udhruh with potential original placement of blocks in red



Miscellaneous blocks

F2100

Object F2100 is a trapezoidal shaped block with a ringed cross on one of its sides. The block is smaller than the average true block but does share the a similar height of 183 millimetres. The block does not possess the corner groove seen in the true blocks.

Surface condition and orientation

Of this block only one side shows signs of polish and decoration. Although the sides to the left, right and below the side with the cross have relatively smooth surfaces, they are not of the same quality as the surface with the cross. The top, back and bottom part of the block are severely damaged. It seems probable that only the cross surface would have been visible, leading to an orientation in which the block is fitted within the wall, obstructing vision of the other five sides. Because the height is so similar to those of the true blocks, only 8 millimetres off the average, I would argue that this block is oriented in the same manner as the true blocks, concerning height, length and width. Only one visible side and the following the standard height the object could be placed two ways, as seen in figure 4.21.

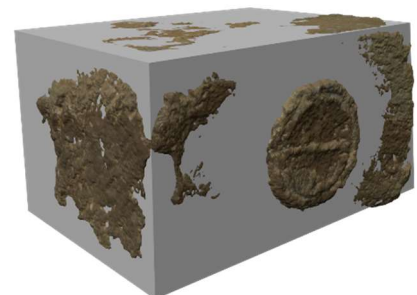
Figure 4.21: The two potential orientations of F2100



Curvature

As mentioned the shape of the object is trapezoidal, which does not imply anything about curvature. To analyse the curvature the comparison box needs to be connected to the eight corner points of the block, seen in figure 4.22. Only the front side of the block is curved inwards. However this curvature is superficial, the surface of the side is concave but the vertical and horizontal corners of the block do connect when a straight line is place between the points. This concave surface relates to the ornament in the middle

Figure 4.22: Surface curvature of F2100



of the side. The production process would probably have started with a straight surface, which was then carved out except for the envisioned ringed cross. This ringed cross would finally be convex at the end of the production process.

Potential original placement

The analyses were not able to exclude many sections of the church, although two consequences have come to pass. The block would have been placed fully fitted into a wall and this wall could only have been straight. This leads me to exclude the apsis as a potential original placement, leaving the rest of the church open.

F2376

Object F2376 is severely damaged showing clear marks of breakage. The block holds two small crosslets, which was used as a reference for the photographed sides in the appendix. The crosslet side has been referred to as top as a means of orientation.

Surface condition and orientation

Of the object sides currently only four remain as a result of damage. Three surfaces of these remaining sides are smooth but also damaged, namely the front, bottom and left as seen in the appendix. Remarkably the surface on which the crosslets are engraved are of poorer quality than the other three. The crosslets can be found near the broken part of the block and are located seemingly randomly on the block. With random I imply that the crosslets are not centred or part of a design, moreover resembling an engraved graffiti. This leads me to believe that the crosslets were later additions and should not affect the determination of orientation. Because the surface of the front side is of the best quality, it could have been visible. However the other sides are damaged, meaning that they could have been of the same quality as the front side. This leaves too little certain data to base a potential orientation on.

Curvature

The object does not display curvature. Although lacking corners, due to damage, the block mostly adheres to 90 degree or lower angled corners seen in the top view (figure 4.23). The bottom part however is slanted inwards, it is unclear if this is the result of damage or intentional production. The current state of the block does not display curvature, but it cannot be excluded.

Figure 4.23: Top view, side view and surface curvature of F2376



Potential original placement

Without a clear orientation, only the curvature remains as a possible indicator. And with the lack of curvature determined in the current state of the blocks, it can be concluded that the block must have originated from a straight section the church.

F2401

Object F2401 is trapezoidal in shape and inscribed with Arabic Christian texts on two sides. The colour of the material of the block is more greyish, however it is still coquina limestone.

Surface condition and orientation

The block is mostly in good condition with the damage being concentrated around the back, left and right side. The quality of the front, bottom and top is great, clearly having been finely polished. The Arabic inscriptions are situated on the front and bottom side of the block, and would have had to be visible. It seems likely that only the left and right side were not visible in the original orientation of the object. Therefore the object would have to be oriented in a manner in which the inscribed sides were viewable. The likely scenario is that the sides would be attached to other blocks, whereas the front and bottom would be detached, resulting in a front view of the orientation as seen in figure 4.24.

Figure 4.24: Front view, side view and surface curvature of F2401



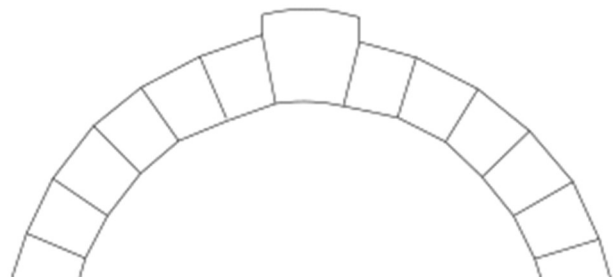
Curvature

The object consists of many curved sections. The top and bottom sides have curvature seen in the front view, and more so for the top surface than the bottom it can also be detected in the side perspective. The sides are curving inwards towards the back side, resulting in smaller surface area of the back side.

Potential original placement

Due to the two sided orientation of the block in combination with the curvature it is very probable that the object was part of an archway, possibly a keystone. These blocks when put in a row would produce a stable circular structure. Within the church of Udhruh these archways could be expected to be found in the nave above the pillars and in the narthex section.

Figure 4.25: Schematic of archway



Conclusion

The blocks have been divided into two groups. The true blocks have been determined to have been originally positioned in straight sections of the church, at a semi-suspended and elevated position. The miscellaneous group consists of three blocks, with all different analysis results. Object F2100 was likely a standard block fitted into a wall. Secondly, object F2376 could not be pin-pointed as the orientation of the block was unclear. Lastly object F2401 was determined to likely have been a portion of an archway.

Chapter 5 Symbol analysis

Introduction

Now that the blocks have been placed in a spatial context, the research enters its second phase, aiming to answer questions concerning the engraved patterns and shapes, of which some could be considered to be symbols. To reiterate the definition as stated in chapter two, symbolism is: “A mode of communication in which a more abstract or complex idea is represented by something concrete or common through Christian association”. All engravings which have been made visible on the blocks through the 3D models and photographs are analysed and reasons will be put forward concerning why a shape or pattern is a symbol. The determination of symbols is not the main goal, but simply a necessity for answering the research question, namely: “do the symbols belong to the known tradition of early Christian ecclesiastical symbolism?”. Which can only be resolved by first establishing whether or not they are symbols. I aim to determine which of the engravings are symbols by comparing them to known Christian symbolism as described in chapter two.

The fifteen objects of interest have been photographed during the excavations between 2011 and 2016. This was done to facilitate the rendering of 3D models, which has been performed for eleven of the blocks. With these modelled blocks the analysis of the surface is highly detailed. By using the software programme MeshLab, I am able to focus on specific areas and add renders and shaders, revealing patterns. Many of these patterns cannot be seen with the naked eye. The four remaining objects will also be analysed, however only by studying their photographs.

Table 5.1: Objects for symbol analysis

<u>Objects for symbol analysis</u>
F2100
F2238
F2239
F2240
F2242
F2244
F2245
F2247
F2251
F2376
F2401
F2565
F2566
F3031
F3124

For this basic analysis using photographs, I aim to highlight the patterns by taking one or two photographs of an individual object, from an angle in which all engravings are visible, and overlaying the contour and all grooves, in a secondary layer. By turning visibility off and on, I can present three types of models:

- F(number code) P, the original picture(P) without alteration
- F(number code) P + D, the original picture in combination with the added overlay drawings(D)
- F(number code) D, the overlay drawing without the original picture

A good example of these types can be seen in figure 5.1 below, concerning object F3031. This process has been carried out with all objects and is presented in appendix C. I will show the patterns and shapes of interest, such as seen in figure 5.2, when necessary, otherwise I will refer to the appendix.

Figure 5.1: F3031(P), F3031(PD) and F3031(D)

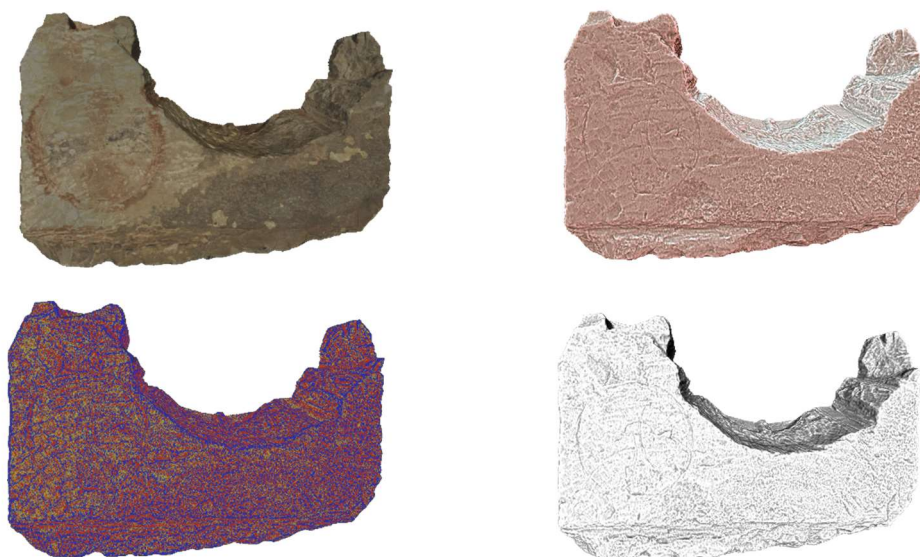


Figure 5.2: Close-up and highlighted cross of F3031(PD)



The engraved patterns of 3D models will be analysed using shaders and special renders in Meshlab, after which the patterns will be presented using the multiple models. The shaders are a powerful tool, enabling me to discern indentations, lines and damage. An example of three of the shaders and the original view can be seen in figure 5.3. All these models can be found in appendix C.

Figure 5.3: Object F3031 original and three shader types



Categorisation

Currently three types of shapes and patterns can clearly be discerned on the surface of the fifteen blocks. Many blocks hold multiple types and seem to follow the same structural layout. I propose they are categorised into main groups:

- Shell motif, the interior of a scallop shell engraved into the block
- Geometrical shapes, such as rhombuses, kites, squares and triangles
- Cross pattern, variants of the four-armed cross

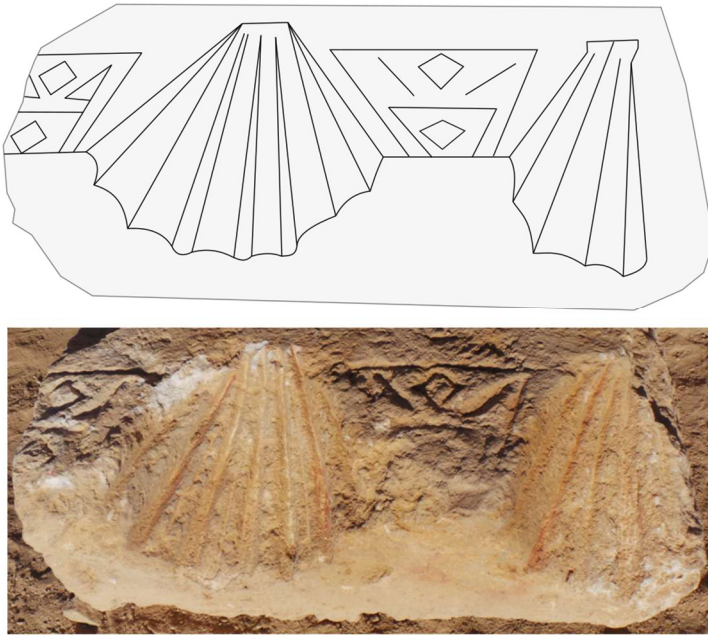
Table 5.2: Objects categorised by shape and pattern

Objects for symbol analysis	Shell motif		Geometrical pattern		Cross pattern		Extra description
	engraved	painted	engraved	painted	engraved	painted	
F2100	x	x	x	x	✓	x	Ringed cross convex
F2238	✓	x	✓	x	x	x	Likely crosses, but damage
F2239	✓	x	✓	x	✓	x	Two engraved crosses
F2240	✓	✓	✓	x	✓	x	Two shells and two crosses
F2242	✓	✓	✓	x	✓	x	One cross to the right
F2244	✓	x	✓	x	x	✓	Two painted crosses
F2245	✓	x	✓	x	✓	x	One engraved cross to the right
F2247	✓	✓	✓	x	✓	x	Unfinished crosses
F2251	✓	x	✓	x	✓	x	Two engraved crosses
F2376	x	x	x	x	✓	x	Two engraved crosslets
F2401	x	x	x	x	x	x	Arabic inscriptions
F2565	✓	✓	✓	x	x	x	Pigment in cross area
F2566	✓	x	✓	x	x	x	Sanded down front side
F3031	✓	✓	✓	✓	✓	✓	Cross convex in shell and to the left
F3124	✓	✓	✓	x	✓	✓	Severely damaged

The normative layout

In general, the twelve true blocks follow the same structure, concerning the positioning of the engravings. Of the six sides of every block only two sides have a processed surface, featuring engravings. The perspectives are based on the orientation argued for in the prior chapter. So bottom view consist of the side on which the elongated interior display of the shell with the geometrical patterns is observable. And the front view refers to the side on which the exterior lip of the shell is visible, where the addition of crosses is possible.

Figure 5.4: F2240 schematic original state(up) and current state(down)



The engraved shell is omnipresent and is always positioned on the lower surface of the block. To either side of the shell it can be expected to find rectangular outlines with geometric shapes. The patterns are never attached to the sides of the shells, approximately four centimetres is kept empty between the two. A view of the block following this general layout can be seen in figure 5.4.

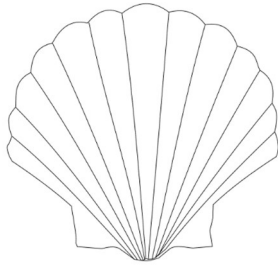
An exception to the rule of this standard design is object F2251, which possesses all three elements. However the layout is flipped. The shell motif and geometric patterns are always seen in combination on all twelve blocks. The cross can be found separately, seen in objects F2100 and F2376. Crosses appear on ten of the fifteen blocks and vary greatly in style and form. Most are engraved, with some being painted with a red pigment.

Determination

In chapter two, the relevant types of symbols from early Christianity and their symbolic meanings have been discussed. Now it needs to be determined if those symbols correspond to the content of the blocks. All patterns need to be made visible in order to establish this. The shell and geometrical patterns are apparent from the start, but the quantity of crosses have expanded as a result of 3D analysis.

The Shell motif

Figure 5.5: Drawing of interior scallop shell with hinge corners



The shell motif can be found on twelve of the fifteen blocks and is always positioned in the before mentioned normative layout. The interior side of the shell is shown in the carving and artistic liberty seems to have been taken concerning the hinge corners, which are absent on the blocks (figure 5.5). This falls in line with the architectural depiction of the shell in churches in which the half circular shape takes precedence.

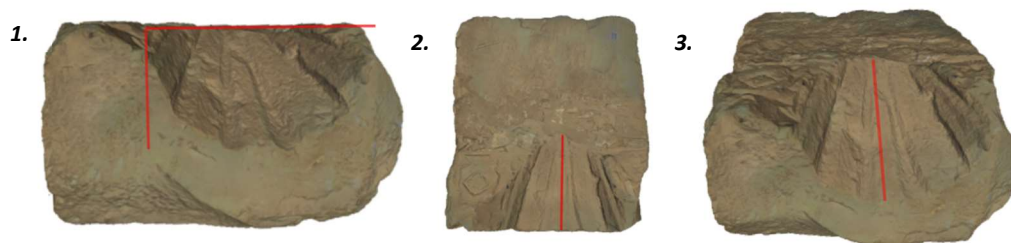
Based on the data on the shell motifs on the twelve blocks the shell appears to have standardised dimensions. The width, depth and length of bottom and front can be seen in table 5.3 and figure 5.6.

Table 5.3: Dimensions of the shell motif in millimetres

Shell objects	width	length bottom	depth	length front
F2238	200	123	172	99
F2239	232	126	160	104
F2240	235	117	191	98
F2242	218	116	180	89
F2244				
F2245	203	126	179	91
F2247	190	119	195	106
F2251	229	134	184	104
F2565				
F2566				
F3031	212	138	174	113
F3124				
Averages	214,9	124,9	179,4	100,5

*The grey region columns refer to the objects of which only photographs have been made

Figure 5.6: Dimensions of the shell motif on F2238: 1. Width and front length, 2. Bottom length and 3. Depth



The shell symbol seen on the blocks, in combination with the in chapter four determined probable orientation, corresponds to the shell motifs as a Christian symbol.

Geometrical patterns

A box with geometric shapes can be found on one or both sides of the shell motif. This pattern can be seen in twelve out of the fifteen blocks and is homogeneous in layout, however due to degradation the engraved lines are not equally visible. From the front facing view the primary layout resembles the capital letter *H* with two rhombuses in between the upper and lower “legs” of the letter, which can be seen in figure 5.7. The legs of the *H* are stylised by angling their connection to the middle bar. The side view of the best preserved object, namely F2566, creates a stylised capital *I*, showing resemblance to a chalice.

Figure 5.7: Three models of object F2566

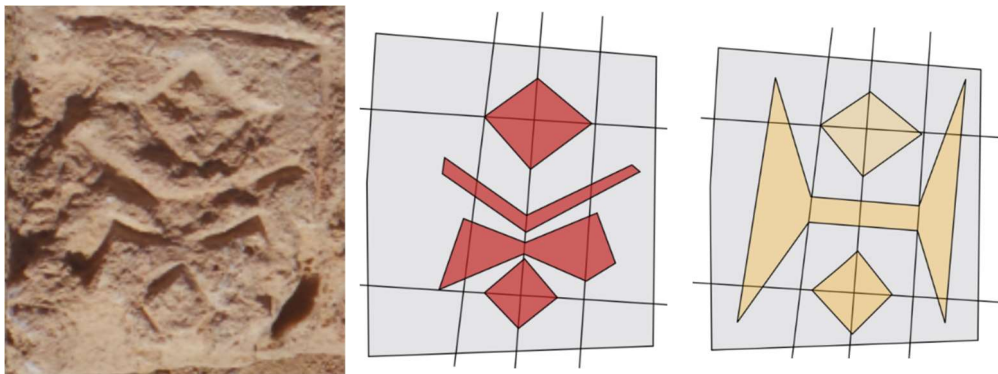


Out of the twelve blocks featuring geometrical patterns only one does not fully fit in, namely object F2251 (figure 5.8). This large block has a shell pattern and two geometrical boxes on either side. The upper and lower rhombuses are present, however the *H* is missing and additions have been made. When overlaying the pattern with the known *H* and rhombuses, it is clear that they do not match. Even when factoring in the possibility of weathering, missing features such as the legs of the *H*, the smaller size of the lower rhombus and the addition of two extra rhombuses, it seems more probable that this can be classified as an alternative type of geometrical pattern. It can be described as an outlined box with a rhombus in the upper section and three smaller rhombuses in the lower section with an echelon shape pointing downwards in between the two sections. This alternative pattern is compared to the standard patterns seen on other blocks in figure 5.9.

Figure 5.8: Photograph of object F2251(up) and schematic drawing overlay (down)



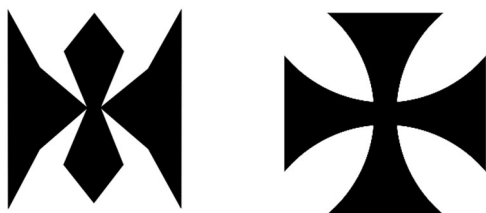
Figure 5.9: Photograph of left geometric box(left), schematic drawing of pattern(middle) and schematic drawing of expected pattern(right)



Geometric patterns as a “Rhombus-cross”

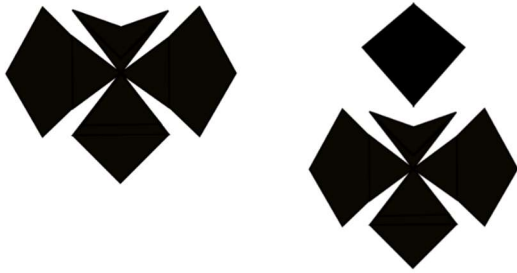
Nonetheless both geometrical patterns have an essential aspect in common. Both patterns can form crosses, with some adjustments. In case of the first H-pattern the rhombuses need only be attached to the middle to produce a four armed pattern, relatively similar to a Greek cross or a cross *pattée*. I do not propose a connection between the two, only similarity in design. The cross *pattée* gave rise to multiple variants such as the Malteser cross.

Figure 5.10: Udruh adjusted geometrical cross(left) and cross *pattée*(right)



The potential cross of object F2251 pertains to the lower section in which three rhombuses are already positioned in a cross pattern. The adjustment relates to the echelon which needs to be partly cut off, after which it is attached to the lower rhombus. Secondly a cross can be formed by attaching the fifth upper rhombus, which would form a Latin cross. This cross possesses one elongated arm, in contrast to the Greek cross, of which all arms are of the same length. Though this Latin cross is flipped vertically, a more uncommon representation of the symbol.

Figure 5.11: Secondary adjusted geometrical cross of Udhruh, as Greek cross(left) and as flipped Latin cross (right)



But the fact that the geometrical patterns can be adjusted to form a cross, resembling a Greek, Latin or *pattée* cross, is not conclusive evidence for symbolic meaning.

Figure 5.12: Basic ansata cross



A closer match can be found to the south-west of Udhruh, in Egypt. As seen in figure 5.12, the *ansata* cross is visually distinct from the other discussed crosses and does not at first sight seem to resemble the geometrical crosses seen in the patterns on the Udhruh blocks. But this cross would, throughout and after late Antiquity, be altered with numerous geometrical designs, adding rectangular, trapezoidal or rhomboidal axes (Spalding-Tracey, 2020, p. 118). The basic design was kept but the shape would vary greatly.

Multiple geometrical variant of the ansata cross can be seen on a stela from 7th to 8th century AD Egypt. The pattern of a capital H with two rhombuses seen at Udhruh corresponds better with the *ansata* cross seen in figure 5.13.

Figure 5.13: Close-up of geometrical ansata cross from Stela with Glorified Ankhs and Crosses(left) and Udhruh pattern from object F3031(right)



Stela with Glorified Ankhs and Crosses. Photographed 2008, Brooklyn Museum, www.brooklynmuseum.org/opencollection/objects/97115

Though this possible match has issues too. The general silhouette is comparable to those found at Udhruh. But the fact that the arms of the cross are connected and that the upper “arm” is circular shaped, makes me hesitant to determine a grand connection. If this is a geometrical “cross”, it has the most resemblance to the cross ansata, when compared to the five main types of crosses: Greek, Latin, Tau, *pattée* and *ansata*.

However it seems far more probable that the geometrical patterns do not serve a symbolic function but are more decorative in nature. Geometric patterns are very common in early Christian ecclesiastical architecture, as the style was already used by the Byzantines. A potential analogy can also be formed with the use of geometrical designs used by the artists and architects in the caliphates from 632 onwards. The geometrical patterns seen in the rectangles between the shell motifs could have been influenced by Islamic art. Jay Bonner (2017, p. 1) states that the ornamental tradition of Islamic art is triadic, employing three design principals, which are: calligraphy, stylised floral motifs and geometry. Geometry is omnipresent in Islamic art and has been describes as a symbol of universal unity (Ardalan & Bakhtiar, 2020, p. 21). The Muslim use of geometric design in ornaments dates back to the emergence of the first caliphate and the early expansion into territories where the art style was already prevalent, especially the Byzantines, Copts and Sassanians. The Muslim conquerors were inheritors as well as progenitors of the geometric tradition (Bonner, 2017, p. 5). Early Islamic geometric patterns started of simplistic and would evolve into highly complex designs.

The design of the geometric ornaments at Udhruh can be defined as low in complexity, as the pattern consists of only two axes. Whereas geometry has a central position in the architecture in mosques, the patterns in the church appear to function more as a filler between the dominant shell motifs and crosses.

The geometrical patterns in Coptic churches in Egypt during early Christianity described by Spalding-Stracey (2020, p. 154) are displayed in more secondary positions, occurring on borders and near other architectural features on walls and floors. This description exactly fits with the placement of those at Udhruh. During the Islamic period in Egypt Christian visual art continued to flourish, with Islamic art experiencing the same trend (Spalding-Stracey, 2020, p. 7; Bonner, 2017, p. 11). This development in Egypt is described as independently from the Islamic overlords, while historical evidence suggest that the Islamic geometrical art was precipitated by the architectural and ornamental traditions of the peoples they had conquered (Bonner, 2017, p. 11; Flood & Necipoğlu, 2017, p. 25).

Inspiration or influence are however difficult to determine. The Muslims were originally inspired by the mosaics of the Byzantines and Copts but soon surpassed them in complexity. This new more complex tradition would influence and produce other styles and designs.

I propose that the church architecture at Udruh is more similar to the development seen in Egypt, where Christians independently produced artistical and architectural designs. No evidence suggests that the ruling caliphates influenced the development or forcefully pushed their artistic tradition on to their subjects. The pragmatic tolerance of the Islamic empires meant that the *dhimmis*, the non-Muslim populace, were expected to pay the *jizia* tax, other than that this group was left to their own devices and traditions (Ye'or, 1985, p. 172).

The Cross patterns

The crosses found on eleven of the fifteen block can be divided dependant on typology and partly on quality. Some surfaces have been damage to such a degree, resulting in a low visibility even with the 3D models, which leads to more a more hypothetical determination of types.

Table 5.4: Categories of crosses in the blocks and amount

Objects with cross	Ringed Greek cross	Plain Greek cross	Flared cross
F2100	✓	×	×
F2239	×	×	✓✓
F2240	×	×	✓✓
F2242	×	×	✓
F2244	×	×	✓✓
F2245	×	×	✓
F2247	×	×	±
F2251	×	×	✓✓
F2376	×	✓✓	×
F3031	✓	×	✓
F3124	×	×	±

*± refers to probable crosses

Ringed Greek cross

The first type of cross can be found on two blocks, object F2100 and F3031. In both cases the cross is convex, while it surrounding surface is reduced, resulting in a curving outwards effect. The cross belongs to the Greek type, consisting of four arms of even length. The cross is encircled, with the cross ends touching the ring in both scenarios.

Figure 5.14: Lit sphere radiant scaling of object F2100(left) and F3031(right)



The measurements of object F2100 consist of the diameter and thus horizontal and vertical axis of the cross which are 117 millimetres, and the circumference of 367 millimetres. The cross on object F3031 is smaller, with a diameter of 95 millimetres and a total circumference of 296 millimetres.

The typology is clearly the same, while the rendition differs somewhat. In object F2100 it appears that surface around the circle holding the cross was reduced, after which the four quadrants were cleared out. Resulting in concave circular quadrant and surrounding surface, and a convex ring and cross. In object F3031 the process must have been different. Located in the shell motif, the ringed cross assumed the place of the inner shell grooves. The craftsmen had worked on four grooves, two on either side of the shell but did not finish with the centre grooves of the shell. Instead the same four quadrants were removed, resulting in a convex Greek cross.

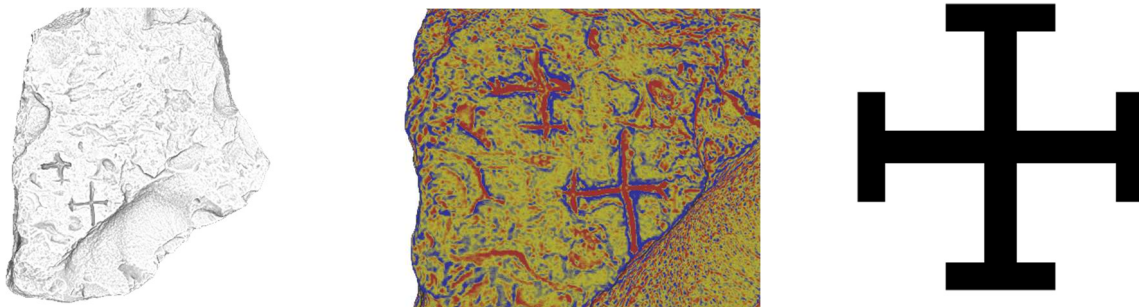
The ring in contrast is not convex, rather it is the same level as the surrounding surface. The combination of cross within the shell motif only occurs ones. This anomaly begs the question if the cross could have been added to the shell motif at a later time. It is however highly improbable, because if the cross was added later, the shell grooves would have had to be removed to produce a new flat surface to then engrave. This would have left a malformed deepened shell, to which the shell of F3031 does not correspond.

The ring around the cross was a decorative and symbolic Christian tradition used from the fourth century onwards. The ring, *nimbus*, *aureole* or *halo* symbolised heavenly glory and universalness and is used to refer to Jesus Christ (Gietmann, 1911).

Plain Greek cross

On object F2376 the crosses are considerably smaller than the other engraved crosses and appear random in placement, lacking a clear connection to overall design. The largest of the two crosslets is 39 millimetres, while the smaller one is 24 millimetres. The type seems to be Greek and very simplistic. However a precise look at the indentation shows small crossbars at a right-angle to the four ends. This new view leads to the determination of the cross *potencée* (Seymour, 1898, p. 364).

Figure 5.15: Crosslets on F2376 in grey shader (left) and colour sphere shader (centre) and cross *potencée* (right)



The cross *potencée* or cross potent was used in Roman coinage from the fifth century onwards and can be found in European Medieval heraldry. The cross is also referred to as the Jerusalem cross, referring to the flag of the City and the Kingdom of Jerusalem (Seymour, 1898, p. 365). This cross however consist of four extra crosslets, which cannot be detected on block F2376.

The flared crosses

Seen in nine out of fifteen blocks, by far the most displayed type, is a flared Greek cross. The arms are narrow at the centre and curve to be broader at the perimeter. This is a variant of the basic cross *pattée*, which is known to be more rectangular. In contrast the cross seen on the block has a circular perimeter. This roundness leads us to the cross *pattée alisée*. As mentioned in chapter two, this variant cross has been in use in churches and monasteries in Egypt and Syria during the fifth to ninth century.

The crosses always appear on the same position and only on the in chapter four defined true blocks. The crosses are displayed on the front surface of the block to both or either sides of the shell lip. Out of the twelve true blocks, nine hold one or more crosses. And crucially, the three elements of which it was not possible to determine a cross, were either damaged in the region where the cross is to be expected or only photographed. For object F2238 and F2266 the original surface has been destroyed, unlike the surface of F2265 which does remain with traces of red pigment. The presence of the pigment on the section where the crosses appear on other blocks alone is insufficient to

determine a cross. However, the fact that three out of four true blocks display this symbol, and the absence of blocks that clearly display a completely empty surface, does lead me to argue that it seems probable that the flared crosses were the third standard part of the normative layout of these blocks.

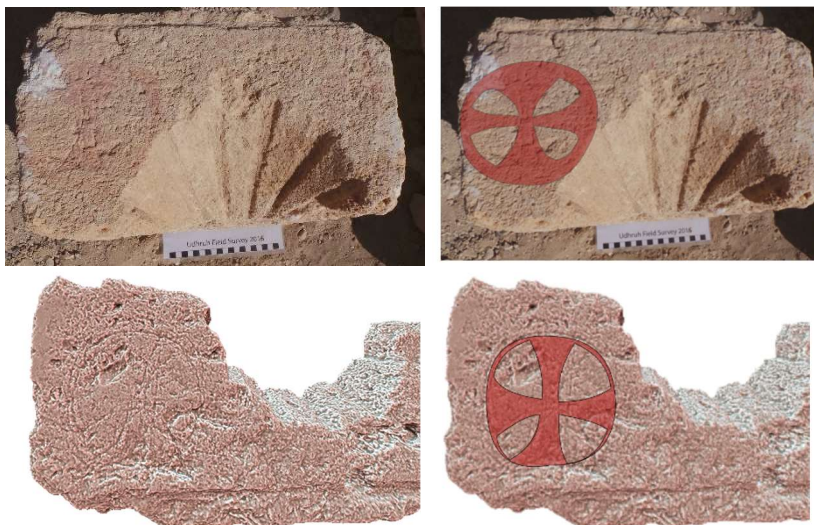
Table 5.5: Flared crosses on the true blocks categorised by engraving and pigment

True blocks	Engraving	Pigment	Amount
F2238			0
F2239	✓		2
F2240	✓		2
F2242	✓		1
F2244	±	✓	2
F2245	✓		1
F2247	✓		2
F2251	✓		2
F2265	±		2
F2266			0
F3031	✓	✓	1
F3124	±	✓	1
Total	16	4	16

The ± symbol concerning objects F2244, F2265 and F3124 signifies that it is unclear. All three objects can only be analysed through photographs, which results in less accurate

Objects F2244 and F2245 have clear crosses, which are identical in placement and design, only differing in method, as one is fully painted and the latter engraved. Both crosses are marked in red seen in the figure 5.16.

Figure 5.16: Flared cross of object F2244 (above) and flared cross of object F2245 (below)



Object F2240 and F3124 are good examples of probable crosses. On the surface of F2240 in between the two shell motifs a clear circle engraving can be identified, and to a lesser extend parts of the vertical arms of the cross. For object F3124, the location in tandem with the circular red pigment traces and circular engraved pattern leads me to the same conclusion of a very probable flared cross.

Figure 5.17: Flared cross of object F2240 (above) and flared cross of object F3124 (below)



In the close-up of object F2247 the engraved lines form a raster within the circle. Objects F2240, F2245 and F3031 display the same pattern. In a double circle, four clear parallel lines are distinguishable, and free-flowing lines marked in red in figure 5.18. Still the pattern is heavily damaged in the middle and lower section, which makes me sceptical concerning the lines that are visible. Other than the circle and raster it is unclear which lines are purposefully produced and which ones are the product of degradation.

Figure 5.18: Close-up of right pattern on object F2247(left), with schematic overlay(middle) and only schematic(right)



Multiple hypothetical patterns can be produced, however I will present two. One based on extrapolation of the observable lines and another based on the similarity to object F2244.

Figure 5.19: Hypothetical pattern 1

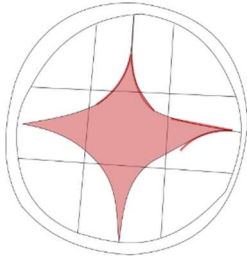
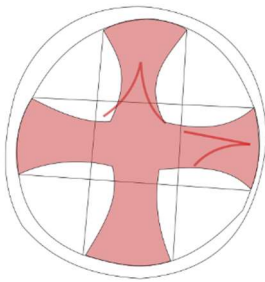


Figure 5.20: Hypothetical pattern 2



Hypothetical pattern 1 is produced by first determining the existing trend, namely the lines that can still be observed and then by continuing this trend. This method is grounded in the assumption that the first lines are not exceptional, but the standard. The product of this method can be seen in figure 5.19 and resembles a four pointed star.

Hypothetical pattern 2 is produced by first aligning the raster pattern and circle with the cross found on object F2244. The eight ends of the raster lines coincide with the ends of the *cross pattée alisée*. Then the cross is replicated in the correct proportion, resulting in the pattern seen in figure 5.20. The two arrow shapes in the upper and right section are completely ignored in this model.

Both models are speculative and I do not propose that either of them has to be correct. Although I do call attention to the fact that the lines forming the two arrow shapes are relatively narrow and shallow in depth, in comparison to the raster and outer circle engravings. This is peculiar because in other raster cross patterns all the engravings are of similar depth. More figures of the raster patterns with the flared cross can be found in appendix C.

Conclusion

The shell motif and geometrical patterns both appear in early Christian context. The geometrical patterns are unlikely crosses as they were used as decoration and corresponds to those found in Christian Egypt. The shell is a well-known symbol in Christianity and in architectural context it is decorative and has symbolic connections to baptism, protection and the virgin Mary. The three types of crosses found at Udhruh belong to the tradition of the Christian faith. The ringed cross completely fits in with the timeline and the region. The symbol is thought to be a composite image of the cross, the *signum* of the victory of Christ over death in combination with the cosmic sphere, represented by the nimbus or halo (Herren & Brown, 2002, p. 199).

What is significant, is the determination of the other two crosses of the *pattée alisée* and *potencée* type. Although also in use during the second half of the first millennium, these types have distinct European medieval ties. There, these crosses only became wide-spread from the first Crusade in 1099 onwards. The Knights Hospitallers and Knights of the Holy Sepulchre, which were established in 1099 and 1119 respectively, both used these crosses (Seymour, 1898, p. 364 and 368). An important notion that should be stated is that only a very small portion of the crusaders were members of the Knight Hospitallers or Knights Sepulchre. They were an elite military organisation and are mentioned to have provided only a few hundred knights to the crusader armies (Riley-Smith, 2012, p. 28). Although they were vital in the conquest and defending of the territories, the main purpose of the orders was the protection of pilgrims and the defence of holy sites and cities. This was mostly carried out from the castles that were gifted to the organisation, five of which were located in Jordan.

So it is evident that the two latter cross symbols could also be connected to later Christian tradition, as it was most prominently displayed during the High Middle Ages in Europe and thus in the Levant during the Abbasid and Fatimid period. Udruh was part of the Kingdom of Jerusalem until the late twelfth century, when the crusaders were defeated by Saladin's armies in 1187. They would remain in the Holy land, although not in the region of Udruh, until they were fully repelled in 1291. This leaves a century in which these symbols could potentially have been added to the church blocks, if the crusaders were responsible for these symbols.

This would also corroborate that the church was operational at this time, because it seems improbable that the crusaders would have carved their symbol into the ruins of a church or a mosque. It appears more likely that the presence of the crusaders meant that they had to be there out of necessity to protect local pilgrims visiting the church. The Knight Hospitallers and Knights of the Sepulchre were not known to leave their fortifications without good reason, in general this only occurred when they participated in battles or defended pilgrims (Riley-Smith, 2012, p. 81-84). The latter seems more logical as no historical sources mention battles in or near Udruh.

Chapter 6 Results

Spatial analysis

The analysis of the objects have resulted in a clear division of eight (likely twelve) true blocks, objects with a standard height, orientation and attribute layout, and three miscellaneous blocks. Further analysis of these true blocks concerning the aspects of surface condition and curvature has led to the determination of probable orientation and location. The blocks were positioned with the geometrical patterns below and the lip of the shell together with additional crosses in front. It is very likely that the blocks were placed semi-suspended at a higher position, namely above 2,5 metres, within a straight wall. The potential original location therefore points towards the wall of the aisles of the core basilica. Of the three other blocks one simple block (F2100), similar in height to the true block, was likely fitted neatly within a straight wall at unknown height. The second block (F2376) was severely damaged, making it difficult to determine its orientation. The absence of curvature does point towards an original location in a straight section of the church. The last miscellaneous block (F2401) was determined to likely be a keystone of an arch. I argued for this as a result of the curved surface and the orientation of the block, based on the polished and inscribed surfaces.

Symbol analysis

A total of twelve blocks featured shell-motifs, always combined with geometrical patterns. Three types of crosses were determined, numbering fifteen cross elements in total. The largest quantity belonged to the cross *pattée alisée* type, with at least eleven, however as discussed this number could be an underestimate. The other two types belong to the ringed Greek cross and cross *potencée*, both occurring twice. The geometrical patterns were focussed on as being a potential cross, which led to the comparison to the cross *ansata*. However not enough evidence enforces this notion. It seems more probable that these patterns were more decorative than symbolic. A possible connection between the geometrical decoration on the blocks and the geometrical patterns from the Islamic world could not be found. The shell in contrast is a powerful Christian symbol, connected to rebirth, baptism, protection, pilgrimage and the Virgin Mary. Early Christians likely appropriated the use of the symbol in architecture from their predecessors, the Romans and Hebrews. All three types of crosses originated in early Christianity, however the cross *pattée* and *potencée* can also be dated to Medieval European heraldry and have strong crusader ties. This prompts the notion that the crusaders could have come in contact with the church of Udruh and added the symbols during the 11th or 12th century.

Chapter 7 Conclusion

This research came about due to a lack of understanding of the architectural ecclesiastical elements found at the church of Udhruh. The problems concerned the uncertain original location and the not yet determined shapes and patterns on the blocks. The ensemble of blocks, first thought to be thirteen in number, eventually added up to fifteen in total. Of these objects, eleven were fully rendered into 3D-models and thirteen were photographed. Concerning the question of function and location, the orientation and position of all but one object of the dataset was determined. The blocks were divided in to true blocks, one simple wall block and one curved archway block. The determination of certainly eight objects of the true block typology, namely a rectangular block with a standard height and the three basic elements. These feature the shell motif, geometrical patterns and flared crosses, which seems to suggest this was a commonality in the ecclesiastical architecture of Udhruh. The patterns and shapes engraved on the blocks were analysed and multiple symbols were determined. Firstly, the most obvious symbol to be discerned was the shell-motif, present on twelve of the blocks. This early Christian symbol can be found in ecclesiastical context and is connected to themes of baptism, rebirth, protection and pilgrimage, and to the Virgin Mary. Secondly three types of Christian crosses were discovered through 3D analysis. The first type is the ringed cross, found on two blocks. One is positioned within a shell-motif and one is unaccompanied on a basic block. This type is wide-spread in early Christianity. The other two crosses belong to the *cross pattée alisée* and *cross protencée* type, which are both used in the region during early Christianity. However both are also linked to the Knightly Orders occupying the region during the Crusader period, or Abbasid and Fatimid periods. This implication has led me to propose that this could be an argument for the notion that the church of Udhruh was most probably still in use during the 11th and 12th century. The third and more enigmatic engravings were the geometrical patterns found on twelve of the blocks, always in combination with the shell-motif. It was hypothesised that these patterns potentially formed a cross symbol or were related to or influenced by Islamic art, in which geometry is a fundamental element. The geometrical cross does not seem plausible, it could be compared to a very stylised *ansata* cross but this seems unlikely. Also no evidence was found to suggest an Islamic influence, whereas an hypothetical independent emergence of the design seems more likely, due to similar contemporary developments in Christian Egypt.

When viewing the spatial analysis critically, one main issue and two secondary questions arise. First of all, due to the relatively small size of the dataset no grand conclusions can be produced. The categorisation of the true blocks for example is very probable, but only concerns eight blocks. These blocks share similarities within the dataset, but their comparison to other blocks is still unknown. Although the relatively high percentage of three-element blocks of standard height does point to a

pattern. Another issue concerns the hypothesis that all engravings would have had to be viewable, which is extremely probable but cannot be determined with absolute certainty. This ties in with the determined potentially later added crosses, the cross *pattée alisée* and *potencée*. These crosses pose a problem. They could have been later additions while the church was in a ruinous state and the blocks were already displaced from their original wall position. This scenario of engraving the detached scattered blocks would make the analysis of probable visible surfaces null and void. Therefore also affecting the determined orientation and original placement. However the pre-dating of the geometrical patterns and shell motif could also be, without disproving the results. Because the addition of crosses could have also occurred while the church was still serviceable and while the blocks were still in position. The craftsmen would have only been able to engrave the surfaces of the blocks which were not fitted in the walls, therefore affirming the orientation analysis.

The period between the construction of the *basilica* of Udhruh in the late fourth century and the conversion of the church to a mosque during the late Ottoman period is understudied and still nebulous. It is certain that the church expanded in multiple phases and that it enjoyed a special political position in the caliphates after 630 AD, as it had been annexed, instead of conquered and acted as a neutral space of political mediation between Islamic faction in a time of civil war. Not much is known about Udhruh and its church during the Crusader period of the Levant, only that Christians were still present after this period. These Christians in Udhruh were responsible for the, in chapter two mentioned, Christian Arabic inscriptions during the late thirteenth or early fourteenth century. This fact provides an argument for continuous use of the church and an enduring Christian identity. The two types of determined “crusader” crosses could further cement this notion.

This thesis has presented answers concerning the architectural ecclesiastical elements of the church of Udhruh. The research of the elements has been divided into two main questions, the first relating to the architecture and the second to the ecclesiastical symbolism. This resulted in new information concerning the probable orientation and original positions of the blocks, and the engraved early Christian symbols. However continuation is needed in the form of subsequent analyses of a larger dataset of 3D-models to fully complete this study.

Summaries

English

Summary

In 2009 during the excavation of Udhruh, a Byzantine church in southern Jordan, an ensemble of fifteen limestone blocks were found, out of situ. They featured symbols, which have yet to be researched. It is important to pin-point the original locations of the blocks as this will enlarge our understanding of the church and because the location of the blocks could also assist in understanding the engraved symbols, which could be other than Christian in nature. The church and attached town maintained an autonomous Christian community while being controlled by multiple Islamic powers for at least six centuries. This raises questions relating to the presupposed tenuous Muslim-Christian relations in the region. The Levant and Middle East as a whole have long been described as historically unstable as a result of religious tension, but the existence of the church provides a counterargument against this notion. The pin-pointing of the location of the blocks has been done through 3D-analysis, in which the surface condition, the orientation and the curvature of the blocks were determined. The symbols have been analysed by method of 3D analysis and a literature study, focussing on early Christian symbolism. The research concludes that the blocks are divided into a more homogeneous group, the “true” blocks, and three miscellaneous blocks. The true blocks have similar dimensions and attributes. Analysis points to an elevated, semi-suspended original location within a straight wall, probably in the aisles or nave of the core basilica, which is the oldest part of the church. Another object displayed clear curvature and was determined to be part of an archway. The symbols on the blocks are without a doubt Christian in nature, but not all early Christian. The geometrical pattern have been determined to likely be decorative, instead of symbolic. Whereas the shell and the crosses hold symbolic meaning. Out of the three types of crosses, two are also linked to the Crusader period. This could provide evidence for the continued use of the church during the Abbasid, Fatimid and Ayyubid periods, an epoch of which still not much is known concerning Udhruh.

Samenvatting

In 2009, tijdens de opgraving van de Byzantijnse kerk van Udhruh, in het zuiden van Jordanië, werd een verzameling van vijftien kalkstenen blokken gevonden, uit hun originele positie. Op het oppervlak van de blokken zijn vormen en patronen te zien, die voorafgaand aan deze studie nog niet onderzocht waren. Het is belangrijk om de originele locaties van deze blokken in de kerk te bepalen, omdat dit de kennis betreffende de complete kerk zal vergroten. Tevens kan de locatie van de blokken ook bijdragen aan het interpreteren van de gegraveerde potentiële symbolen, die mogelijk niet Christelijk van aard zijn. De kerk en het aangrenzende dorp behoorden tot een autonome Christelijke gemeenschap gedurende een periode van tenminste zes eeuwen, waarin ze door meerdere opeenvolgende Islamitische machten werd bestuurd. Dit roept vragen op met betrekking tot de veronderstelde gespannen Moslim-Christelijke relaties in de regio. De Levant en het Midden-Oosten als geheel zijn lange tijd beschreven als historisch instabiel als gevolg van religieuze spanningen, maar het bestaan van deze kerk zou hier een tegenargument voor kunnen presenteren. Het bepalen van de originele locatie van de blokken is gedaan door middel van een 3D-analyse, waarbij de conditie van de oppervlakten, de oriëntatie en de ronde buiging van de blokken zijn vastgesteld. De symbolen zijn geanalyseerd door middel van een 3D-analyse en een literatuur studie, gericht op vroeg Christelijke symboliek. Het onderzoek concludeert dat de blokken zijn verdeeld in een meer homogene groep, de "ware" blokken, en drie meer uiteenlopende blokken. De ware blokken hebben vergelijkbare afmetingen en kenmerken. Analyse wijst op een verhoogde, halfhangende oorspronkelijke locatie binnen een rechte muur, waarschijnlijk in de zijbeuken of het schip van de basiliek, het oudste deel van de kerk. Een ander object vertoont een duidelijke kromming en was zeer waarschijnlijk onderdeel van een boog constructie, mogelijk een sluitsteen. De symbolen op de blokken zijn ongetwijfeld Christelijk van aard, maar niet allemaal vroeg Christelijk. Het is vastgesteld dat de geometrische patronen waarschijnlijk decoratief zijn, in plaats van symbolisch. Terwijl de schelp en de kruizen zeer zeker symbolische betekenissen hebben. Van de drie soorten kruizen zijn er ook twee gekoppeld aan de kruisvaarders periode, namelijk het kruis *pattée alisée* en het kruis *potencée*. Dit zou bewijs kunnen leveren voor het voortgezette gebruik van de kerk tijdens de Abbasidische, Fatimidische en Ayyubidische periodes, een tijdperk waar nog weinig over bekend is met betrekking tot Udhruh.

Résumé

En 2009, lors de la fouille archéologique d'Udhruh, une église byzantine dans le sud de la Jordanie, un ensemble de quinze blocs de calcaire a été retrouvé, depuis leur position d'origine. Des formes et des motifs peuvent être observés à la surface des blocs qui n'avaient pas encore été explorés avant cette étude. Il est important de localiser les emplacements d'origine de ces blocs, car cela augmentera la connaissance de toute l'église et parce que l'emplacement des blocs peut également aider à interpréter les symboles potentiels gravés, qui peuvent ne pas être de nature chrétienne. L'église et le village adjacents ont maintenu une communauté chrétienne autonome pendant une période d'au moins six siècles au cours de laquelle ils ont été gouvernés par plusieurs puissances islamiques successives. Cela soulève des questions sur les relations islamo-chrétiennes supposées fragiles dans la région. Le Levant et le Moyen-Orient dans leur ensemble ont longtemps été décrits comme historiquement instables en raison de tensions religieuses, mais l'existence de cette église fournit un contre-argument. La détermination de l'emplacement d'origine des blocs se fait au moyen d'une analyse 3D, dans laquelle l'état des surfaces, l'orientation et la courbure des blocs ont été déterminés. Les symboles ont été analysés à travers une analyse 3D et une étude de la littérature, en se concentrant sur le symbolisme chrétien primitif. L'étude conclut que les blocs sont divisés en un groupe plus homogène, les "vrais" blocs, et trois blocs plus diversifiés. Les vrais blocs ont des dimensions et des caractéristiques similaires. L'analyse indique un lieu original surélevé, semi-suspendu dans un mur droit, probablement dans les bas-côtés ou la nef de la basilique, la partie la plus ancienne de l'église. Un autre objet présentait une courbure marquée et faisait très probablement partie d'une construction en arc, peut-être une clé de voûte. Les symboles sur les blocs sont sans aucun doute de nature chrétienne, mais tous ne sont pas des premiers chrétiens. Il a été déterminé que les motifs géométriques sont probablement décoratifs, plutôt que symboliquement. Tandis que le coquillage et les croix ont très certainement des significations symboliques. Parmi les trois types de croix, deux sont également liés à la période des Croisés. Cela pourrait fournir la preuve de l'utilisation continue de l'église pendant les périodes abbassides, fatimides et ayyoubides, une époque dont on sait peu de choses concernant Udhruh.

Bibliography

- Abudanah, F. (2004). The archaeological survey for the region of Udhruh 2003, preliminary report. *Annual of the Department of Antiquities of Jordan*, 48, pp. 51-69.
- Abudanah, F. (2006). The water supply systems in the region of Udhruh. *Studies in the History and Archaeology of Jordan*, 9, pp. 485-496.
- Abudanah, F. (2006). Settlement Patterns and Military Organisation in the Region of Udhruh (southern Jordan) in the Roman and Byzantine Periods, Unpublished PhD-thesis Newcastle upon Tyne University, Newcastle upon Tyne.
- Ardalan, N. & Bakhtiar, L. (2000). *The Sense of Unity: The Sufi Tradition in Persian Architecture*. Kazi Publications.
- Bacharach, J. L. (1993). Muḥammad b. Ṭughdj. In Bosworth, C. E., van Donzel, E., Heinrichs, W. P. & Pellat, C. (eds.). *The Encyclopaedia of Islam*, New Edition, Volume VII: Mif–Naz. pp. 411-412. Brill.
- Ball, W. (2016). *Rome in the East : the transformation of an empire* (Second edition). Routledge, Taylor & Francis Group. <https://doi.org/10.4324/9780203023228>
- Basan, O. A. (2010). The Great Seljuqs. London: Routledge. <https://doi.org/10.4324/9780203849231>
- Al-Bashaireh, K., Abudanah, F., & Driessen, M. (2020). Provenance analysis of marble ecclesiastical elements from the extra-mural Byzantine church of Udhruh (South Jordan). *Archaeological and Anthropological Sciences*, 12(1). pp. 1-13. <https://doi.org/10.1007/s12520-019-00975-5>
- Benson, G.W. (2013). *The Cross: Its History and Symbolism*. Dover Publications.
- Britt, K. C. (2019). Early Christian Mosaics in Context. In D. K. Pettegrew, W. R. Caraher & T. W. Davis (Eds.), *The Oxford Handbook of Early Christian Archaeology*. pp. 275–295. Oxford University Press.. <https://doi.org/10.1093/oxfordhb/9780199369041.013.16>
- Brown, P. (1999). Images as a Substitute for Writing. In E. Chrysos & I. Woods (Eds), *East and West: Modes of Communication: Proceedings of the First Plenary Conference at Merida*, pp. 15-35. Brill
- Brunnow R. E. & Domaszewski, A. (1909). *Die Provincia Arabia*. Strasbourg Trübner.
- Bonner, J. (2017). *Islamic Geometric Patterns: Their Historical Development and Traditional Methods of Construction*. Springer.
- Clark, G. (2004). *Christianity and Roman society*. Cambridge University Press.
- Costen, M. (1993). The Pilgrimage to Santiago de Compostela in Medieval Europe. In: Reader, I., Walter, T. (eds) *Pilgrimage in Popular Culture*. Palgrave Macmillan. https://doi.org/10.1007/978-1-349-12637-8_6
- Cramp, J. M. (2000). *Baptist History: From the Foundation of the Christian Church to the Close of the Eighteenth Century*. The Baptist Standard Bearer.
- Daftary, F. (2007). The Fāṭimid period until 487/1094: Dawla and da'wa. In *The Isma'ilis: Their History and Doctrines*. pp. 137-237. Cambridge University Press. <https://doi.org/10.1017/CBO9780511497551.007>.

- Donati, J. C. (2014). The City in the Greek and Roman World. In Marconi, C. (Eds), *The Oxford Handbook of Greek and Roman Art and Architecture (online ed.)*, Oxford University Press, p. 268–293. [doi:10.1093/oxfordhb/9780199783304.013.011](https://doi.org/10.1093/oxfordhb/9780199783304.013.011)
- Donner, F. M. (2010). *Muhammad and the Believers, at the Origins of Islam*. Harvard University Press.
- Dreyer, Elizabeth. (2000). *The Cross in Christian Tradition: From Paul to Bonaventure*. Paulist Press.
- Diessen M. & Abudanah F. (2015). The Udhruh Archaeological Project – the 2011-2012 Field Survey. In: Vagalinski L., Sharankov, N. (Ed.) *Limes XXII Proceedings of the 22nd International Congress of Roman Frontier Studies, Ruse, Bulgaria, September 2012*. no. Bulletin of the National Archaeological Institute Sofia: Bulgarian Academy of Sciences.
- Diessen, M. & Abudanah, F. (2018). A new early Christian inscription from the church of Udhruh (South Jordan). In Kars, M., Oosten, R. V., Roxburgh, M. A., & Verhoeven, A. (Eds). *Rural Riches & royal rags?: Studies on medieval and modern archaeology, presented to Frans Theuws*. pp. 184-187. SPA-Uitgevers.
- Diessen, M. & Abudanah, F. (2018). The Udhruh region: A green desert in the hinterland of ancient Petra. In Y. Zhuang & M. Altaweel, *Water Societies and Technologies from the Past and Present*. Pp. 127-156. UCL Press.
- Dunbabin, K. (1999). *Mosaics of the Greek and Roman World*. Cambridge University Press.
- Eco, U. (1976). *A Theory of Semiotics*. Indiana University Press.
- Egan, E. (2004). *Peace Be with You: Justified Warfare or the Way of Nonviolence*. Wipf and Stock publishers.
- El-Hibri, T. (2021) *Abbasid Caliphate: A History*. Cambridge University Press.
- Esler, P.F. (2001). *The Early Christian World (Vol 2)*. Taylor & Francis.
- Fiema, Z. (2002). Late-antique Petra and its Hinterland during the Byzantine Period. In J. H. Humphrey (ed.), *The Roman and the byzantine near east. Some Recent Archaeological Research*. Journal of Roman Archaeology Supplementary, Series 49. pp. 191–252.
- Flood, F. B., & Necipoğlu, G. (2017). *A companion to Islamic art and architecture*. John Wiley & Sons Inc.
- Frösén J (2004). Archaeological information from the Petra papyri. *Study History Archaeology Jordan*, 8. pp. 141-144.
- Gabra, G. & Eaton-Krauss, M. (2006). *The Treasures of Coptic Art in the Coptic Museum and Churches of Old Cairo*. The American University in Cairo Press.
- Hachlili, R. (2013). *Ancient Synagogues - Archaeology and Art; New Discoveries and Current Research*. Brill.
- Hamilton, J. A. (1933). *Byzantine architecture and decoration*. London Batsford.
- Hansen, M. F. (2015). *The Spolia Churches of Rome*. Aarhus University Press.
- Hawting, G. R. (2000). *The First Dynasty of Islam: the Umayyad Caliphate AD 661-750*. 2nd ed. Routledge.

- Herren, M. W. & Brown, S. A. (2002). *Christ in Celtic Christianity: Britain and Ireland from the fifth to the tenth century*. The Boydell Press.
- Hulme, F. E. (1908). *The History, Principles and Practice of Symbolism in Christian Art*. Swan Sonnenschein & Co.
- Ibrahim, R. R. (2002). *The battle of yarmuk: An assessment of the immediate factors behind the Islamic conquests*. ProQuest Dissertations Publishing.
- Jensen, R.M. (2000). *Understanding Ealy Christian Art*. Routledge.
- Jensen, R. M. (2010). *Living water images, symbols, and settings of early Christian baptism*. Brill.
- Jensen, R. M. (2017). *The Cross: History, Art and Controversy*. Harvard University Press.
- Jones, E. (1948). *The Theory of Symbolism. Papers on Psycho-Analysis*. 5th edition. Bailliere, Tindall and Cox.
- Kannelopoulos, C. (1996). Petra, Ridge Church in *ACOR Newsletter*, Volume 8.1, summer. <https://publications.acorjordan.org/wp-content/uploads/acor-newsletter-vol-8-1.pdf>
- Kennedy, D. & Falahat, H. (2015). *Castra Legionis VI Ferratae: a building inscription for the legionary fortress at Udruh near Petra*. Cambridge University Press.
- Killick, A. (1987). Udhruh and the Trade Route through Southern Jordan. *Studies in History and Archaeology of Jordan* 3. pp. 173-179.
- Krautheimer, R. (1986). *Early Christian and Byzantine Architecture* (4th ed. / [rev. by R. Krautheimer and S. Ćurčić]). Yale University Press.
- Lane-Poole, S. (1906). *Saladin and the Fall of the Kingdom of Jerusalem, Heroes of the Nations*.
- Lichtenberger, A. & Raja, R. (2018). FROM SYNAGOGUE TO CHURCH: The Appropriation of the Synagogue of Gerasa/Jerash under Justinian. *Jahrbuch Für Antike Und Christentum*, 61.
- Lock, G. (2003). *Using computers in archaeology: towards virtual pasts*. Routledge.
- Locke, P. (2006). *The Routledge Companion to the Crusades*. Routledge.
- Jones, E. (1948). *The Theory of Symbolism. Papers on Psycho-Analysis*. 5th edition. Bailliere, Tindall and Cox.
- Masalha, N. (2018). *Palestine: A Four Thousand Year History*. Bloomsbury publishing.
- Marcovich, M. (1996). From Ishtar to Aphrodite. *The Journal of Aesthetic Education*, 30(2) <https://doi.org/10.2307/3333191>
- Michel, A. (2001). *Les églises d'époque byzantine et Umayyade en Jordanie (Ve-VIIIe siècles). Typologie architecturale et aménagements liturgiques*. Brepols publishers.
- Milburn, R. (1988). *Early Christian art and architecture*. Aldershot Scholar Press.
- Moshe, G. (1997). *A History of Palestine, 634-1099*. Cambridge University Press.
- Nasarat, M., Abudanah, F. & Naimat, S. (2012). *Agriculture in sixth-century Petra and its hinterland, the evidence from the Petra papyri*. *Arabian Archaeology and Epigraphy*, V23.

- Peirce, C. S. (1982). *The Writings of Charles S. Peirce: A Chronological Edition*. Volumes 1-6 and 8. Eds. Peirce Edition Project. Indiana University Press.
- Prentice, W. K. (1906). Magical Formulae on Lintels of the Christian Period in Syria. *American Journal of Archaeology*, 10(2). <https://doi.org/10.2307/496990>
- Riley-Smith, J. (2012). *The Knights Hospitaller in the Levant, c.1070–1309*. Palgrave Macmillan. <https://doi.org/10.1057/9781137264756>
- Al-Salameen, Z., Falahat, H., Naimat, S. & Abudana F. (2011). New Arabic-Christian inscriptions from Udhruh, southern Jordan. In *Arabian Archaeology and Epigraphy*, Vol 22, Issue 2. John Wiley & Sons. <https://doi.org/10.1111/j.1600-0471.2011.00336.x>
- Saussure de, F. ([1916] 1983). *Course in General Linguistics* (trans. Roy Harris). Duckworth London.
- Schaff, P. (1998). *History of the Christian Church. Vol. 2: Ante-Nicene Christianity. A.D. 100–325*. Christian Classics Ethereal Library.
- Seymour, W. W. (1898). *The cross in tradition, history, and art*. G. P. Putnam's sons.
- Shahid, I. (1995). *Byzantium and the Arabs in the Sixth Century*, vol.1, Dumbarton Oaks.
- Spalding-Stracey, G. (2020). *The Cross in the Visual Culture of Late Antique Egypt*. Boston BRILL.
- Steffler, A. W. (2002). *Symbols of the Christian Faith*. Wm. B. Eerdmans Publishing.
- Taylor, J. (2001). *Petra and the lost kingdom of the Nabataeans*. Tauris.
- Dell'Unto, N., & Landeschi, G. (2022). *Archaeological 3D GIS* (1st ed.). Routledge. <https://doi.org/10.4324/9781003034131>
- Al-Wāqidī, M. 1966. al-Mağāzī. (3 volumes). Alam al-Kutb.
- Welch, K. (2003). A new view of the origins of the Basilica: The Atrium Regium, Graecostasis, and Roman diplomacy. *Journal of Roman Archaeology*, Volume 16. doi:10.1017/S1047759400012976
- Ye'or, B. (1985). *The Dhimmi: Jews and Christians Under Islam*. Fairleigh Dickinson University Press.

Websites:

- Geology.com <https://geology.com/rocks/coquina.shtml>
- Ministry of Health of Jordan. (2000). [Jordan National Stepwise Survey \(STEPS\) for Noncommunicable Disease Risk Factors 2019](http://www.emro.who.int/jor/jordan-news/results-of-jordan-national-stepwise-survey-steps-of-noncommunicable-diseases-and-their-risk-factors-2019.html) (PDF on <http://www.emro.who.int/jor/jordan-news/results-of-jordan-national-stepwise-survey-steps-of-noncommunicable-diseases-and-their-risk-factors-2019.html>)
- Gietmann, G. (1911). *Nimbus*. In *The Catholic Encyclopedia*. Volume 11. Robert Appleton Company. Retrieved May 21, 2022 from New Advent: <http://www.newadvent.org/cathen/11080b.htm>
- UniversiteitLeiden.nl www.universiteitleiden.nl/en/research/research-projects/archaeology/udhruh-archaeological-project

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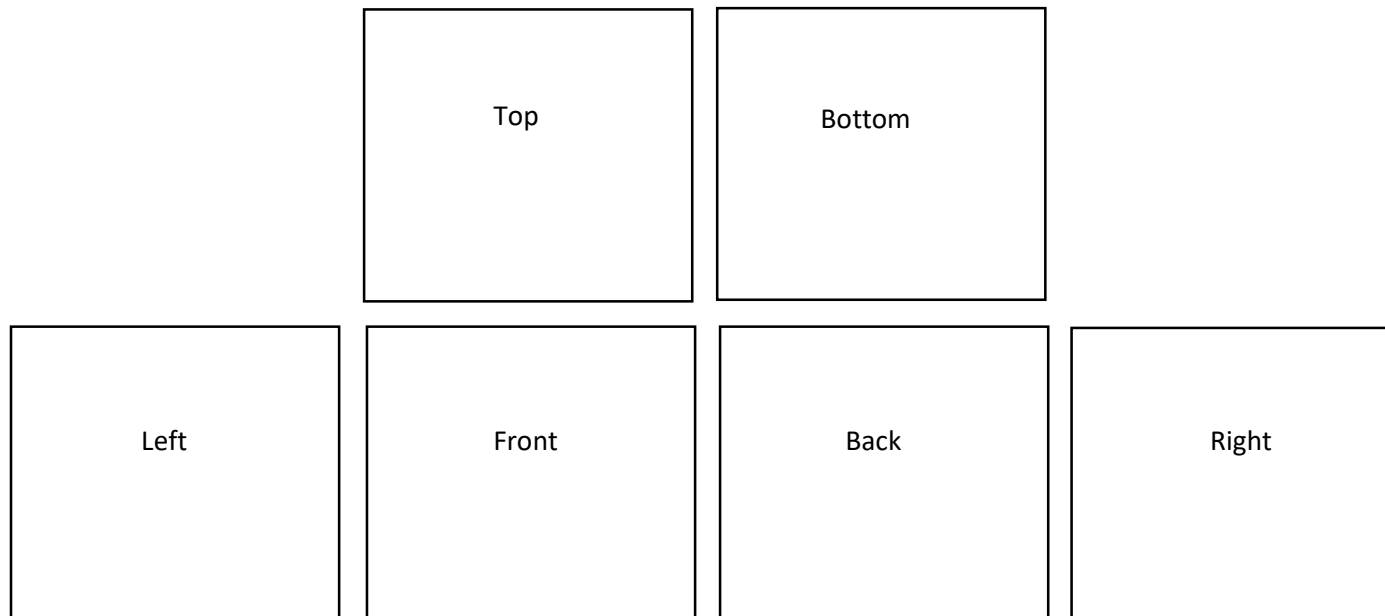
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Appendix A: Surface condition

All 3D-rendered objects are presented in an orthographic view from all six sides. The presentation of the blocks is not based on the proposed original orientation. The top view in these pictures is probably the bottom view in the original position of the blocks. The format of the six surfaces is presented below:



Below the front view a scaling bar is placed. Every black or white section represents 50 millimetres.



250 mm



50 mm

F2100



F2238



F2239



F2240



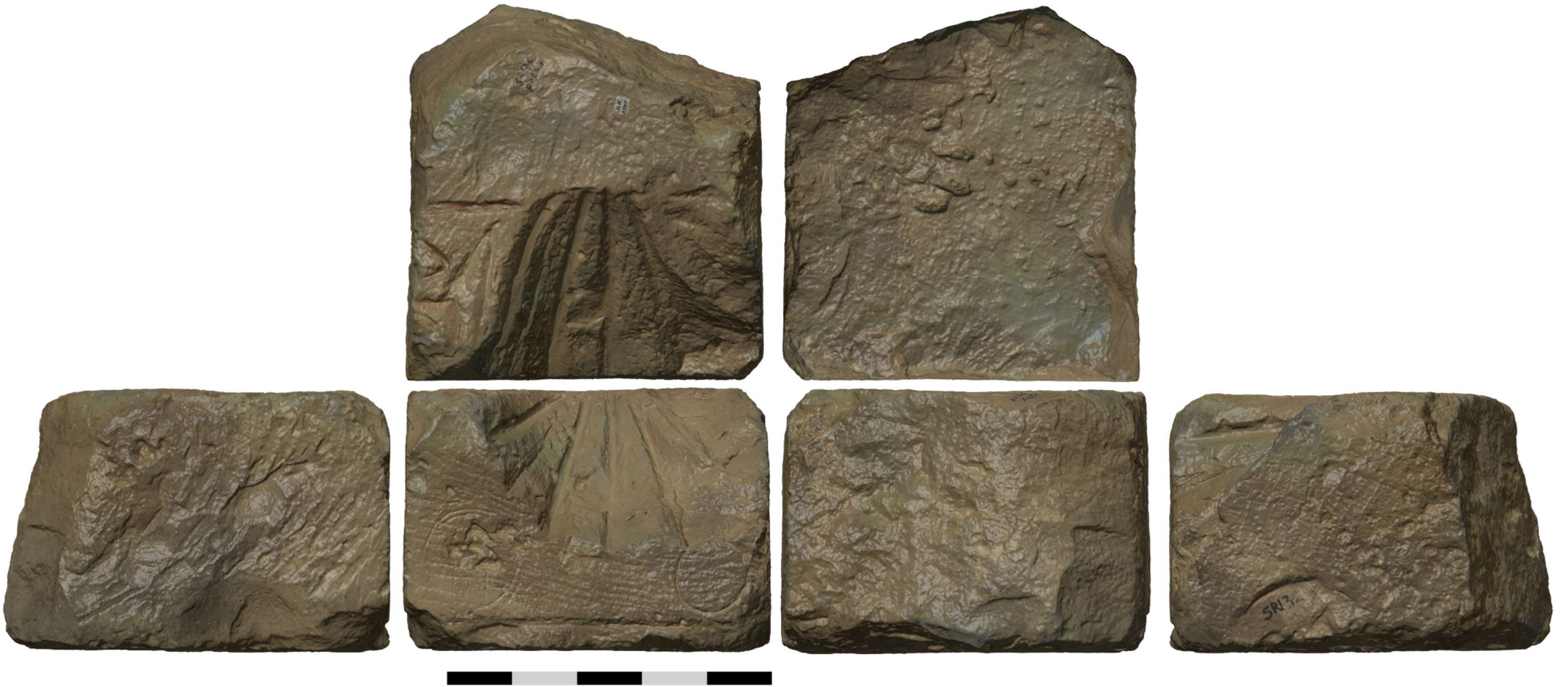
F2242



F2245



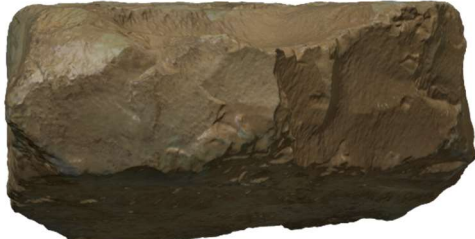
F2247



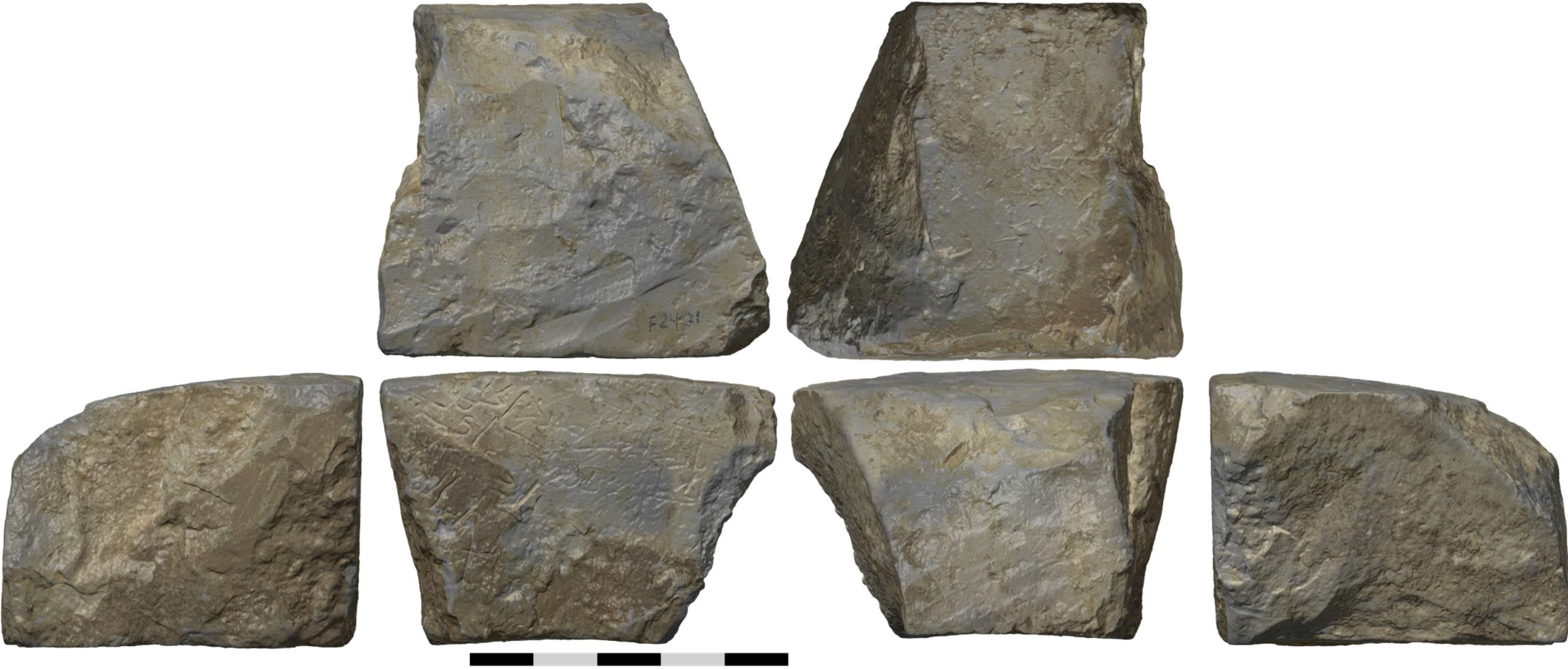
F2251



F2376



F2401



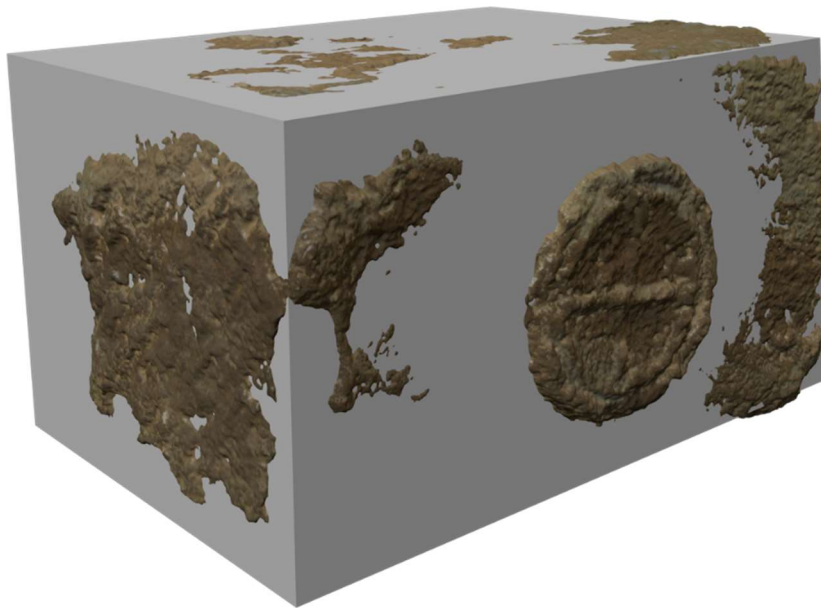
F3031



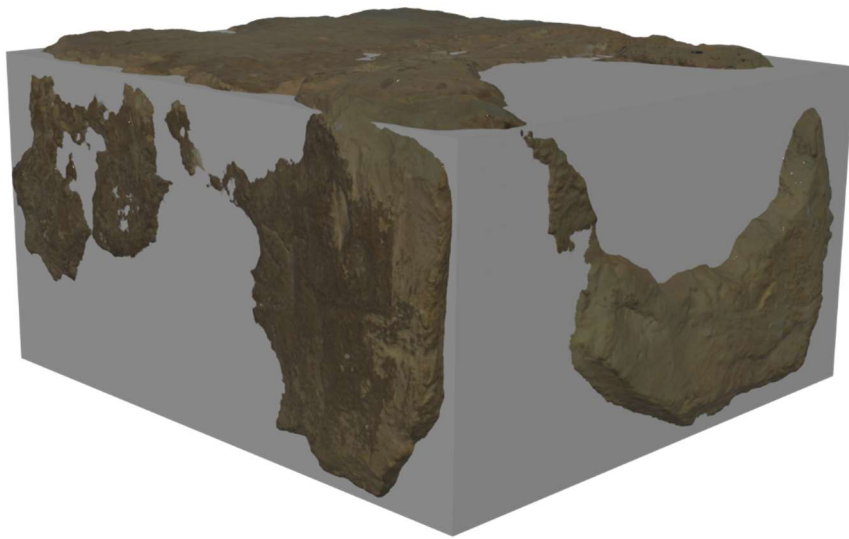
Appendix B: Curvature hugboxes

Curvature in the six surfaces can be discerned by placing a rectangular box within the boundaries of the blocks. This “hugbox” will make all protruding sections visible. If the protruding surface on any given side is concentrated in one area, instead of being equally distributed, the side is likely curved. Although this determined curvature could also be the result of damage, which would produce the same unequal distributed surface.

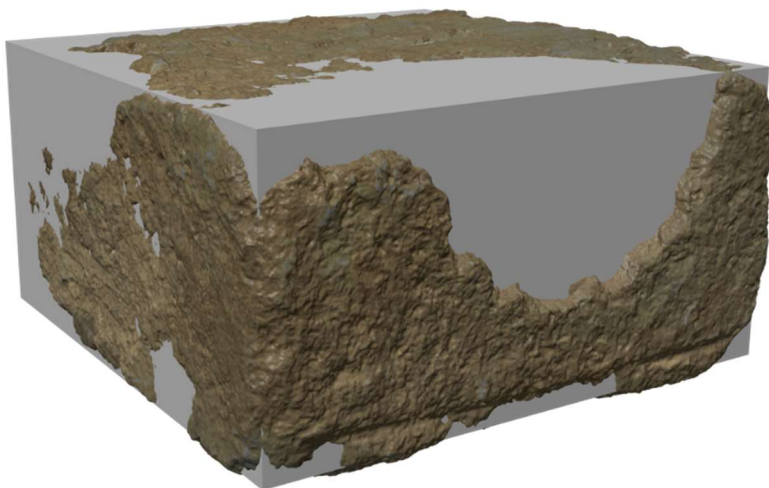
F2100



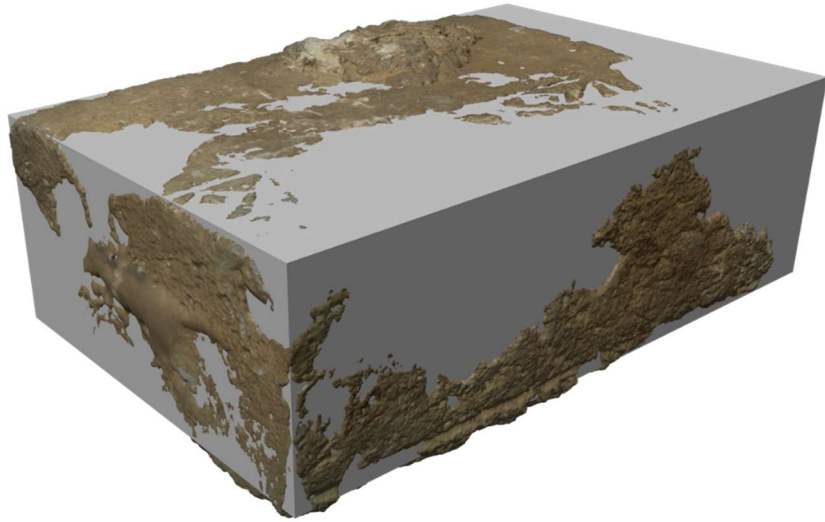
F2238



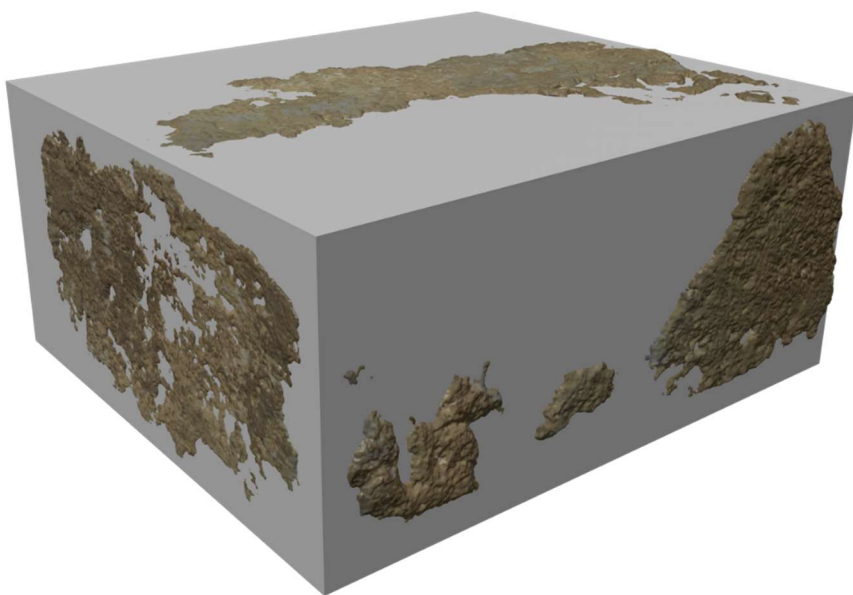
F2239



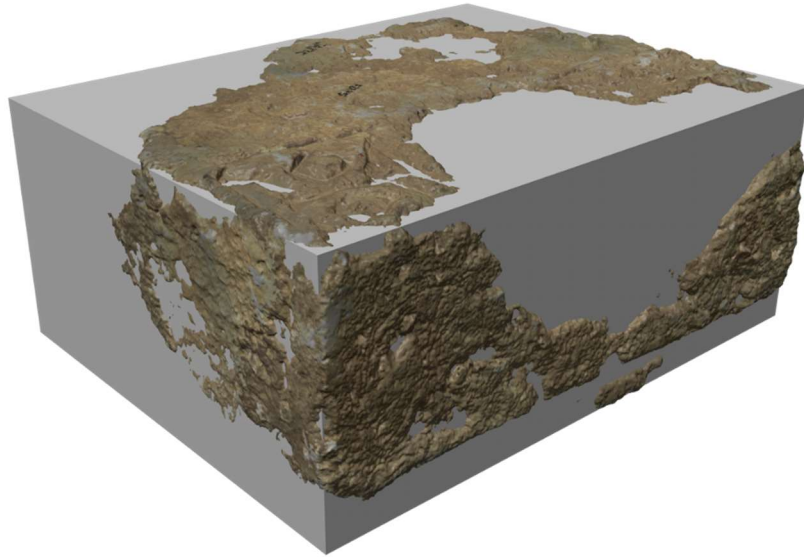
F2240



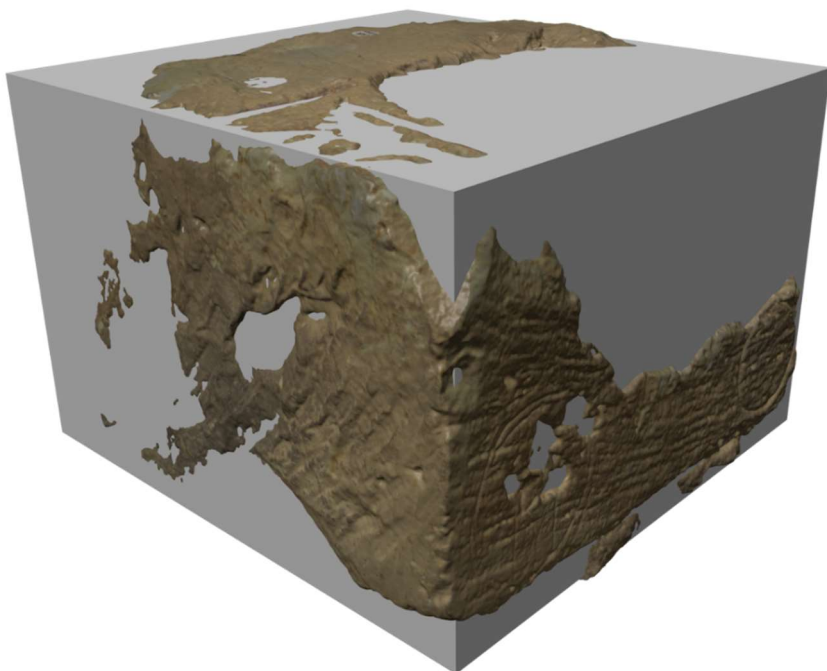
F2242



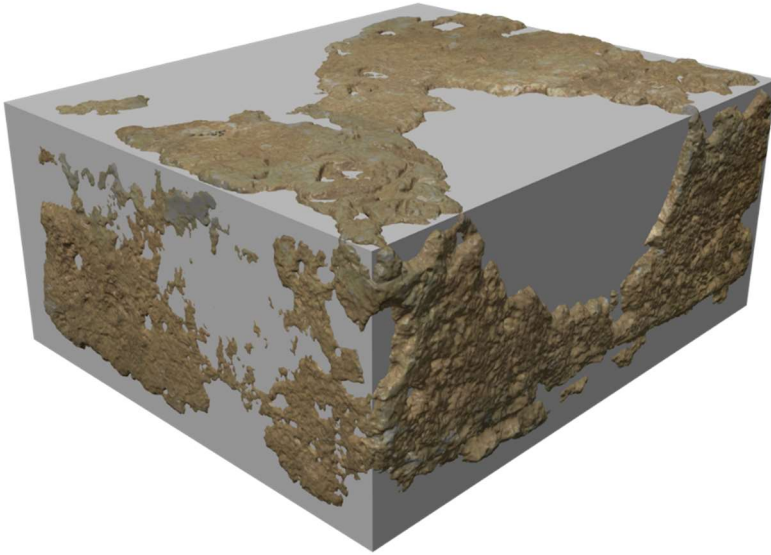
F2245



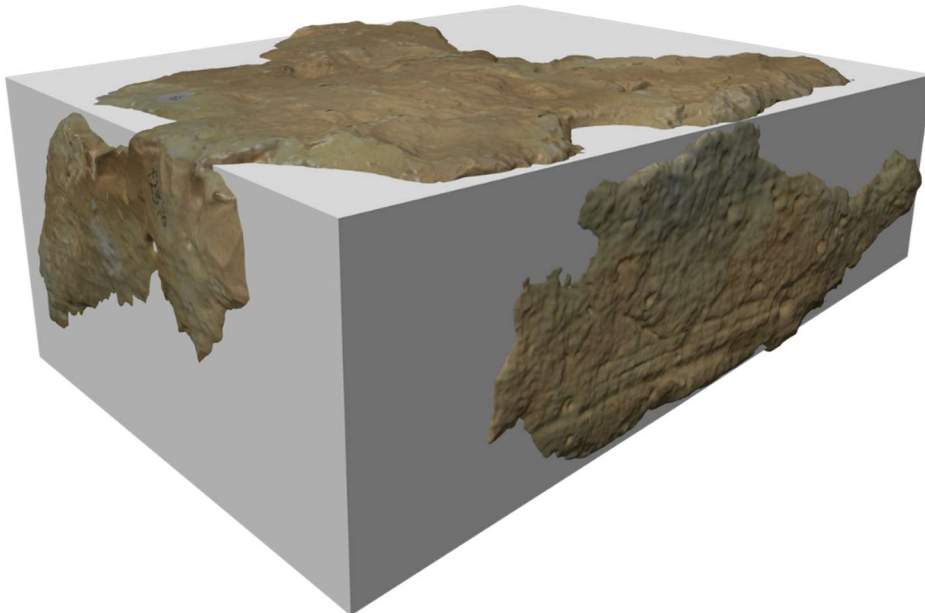
F2247



F2251



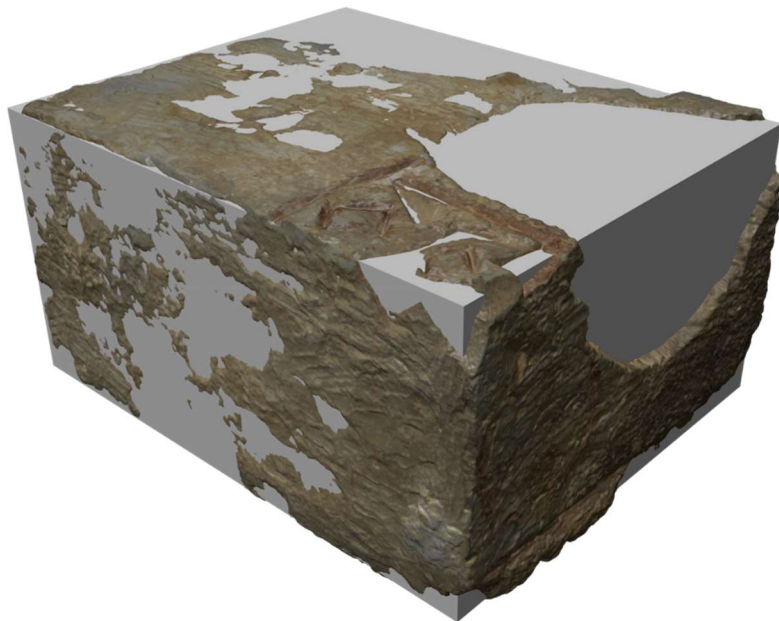
F2376



F2401



F3031



Appendix C: Symbols on surfaces

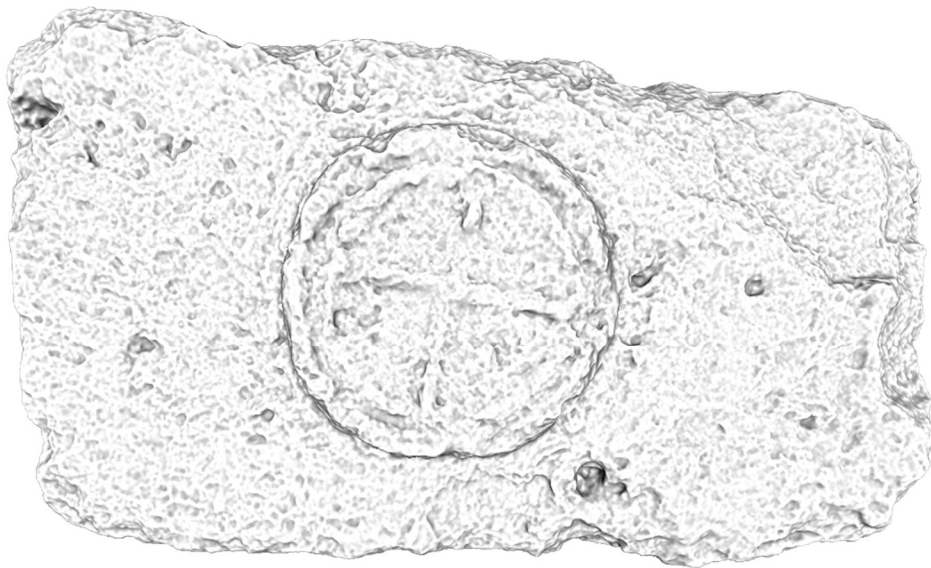
The appendix consists of two parts. Firstly, the surface featuring the symbols is presented using the 3D-programme *Meshlab*. Four distinct renders of the objects are shown, enabling the discerning of symbols. These renders consist of the objects' original state and three radiance scaling renders:

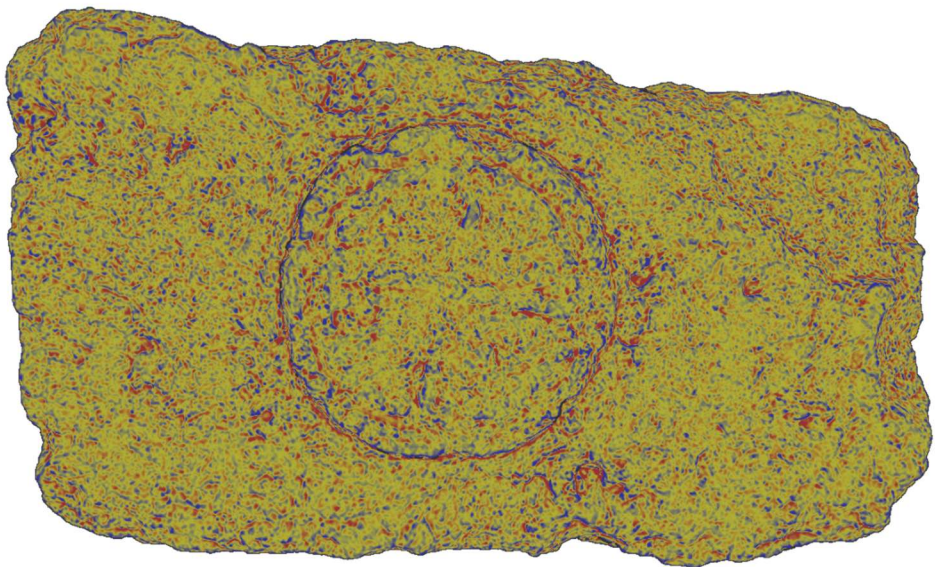
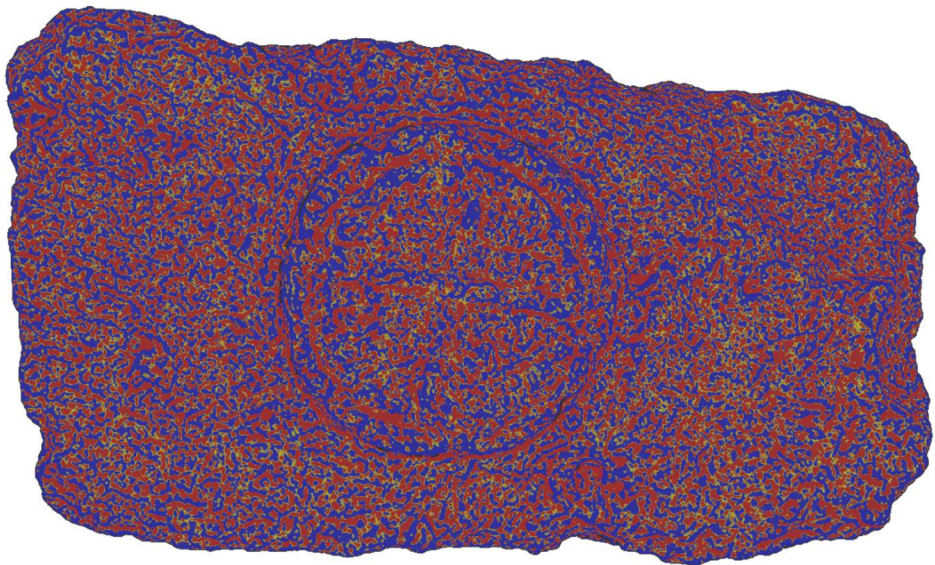
1. Lambertian Radiance scaling, a rendering in which the object is diffusely shaded
2. Lit Sphere radiance scaling, the lighting environment and reflective properties are encoded into a spherical image
3. Colored Descriptor, two colours display the convexities and concavities of the object

In the second part of the appendix, I make use of the illustrator programme *InkScape*. The shapes and patterns visible in the photographs of the objects are overlaid with a marker. This procedure produces three views: the original photograph, the photograph with overlaid marking and the marking without the background.

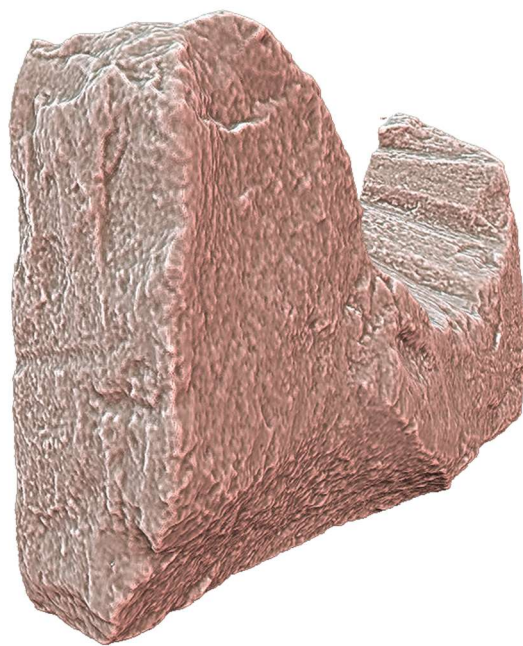
Appendix C: part 1

F2100

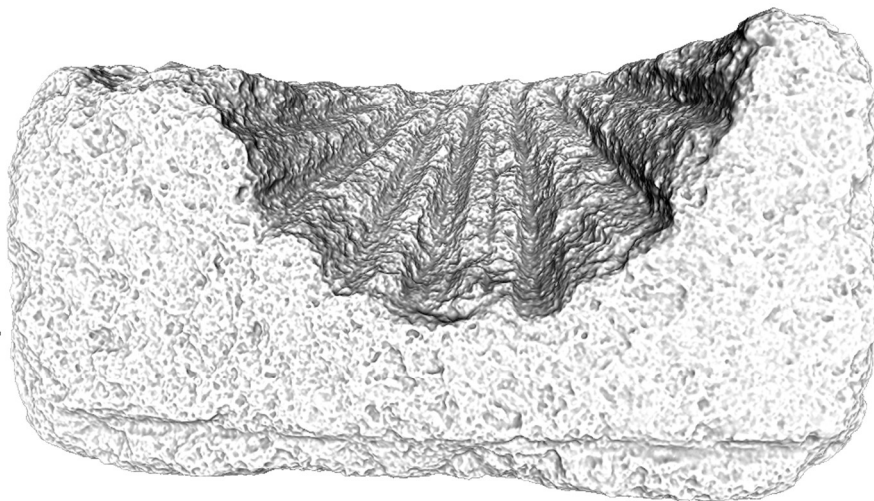


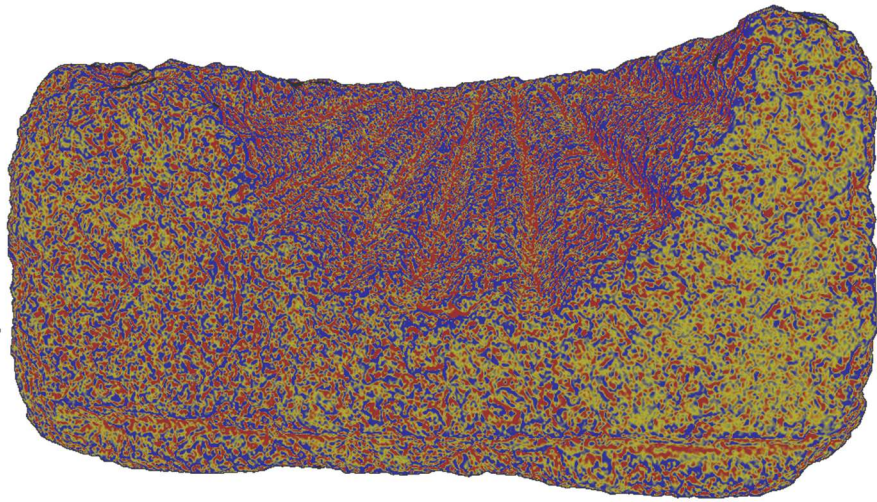
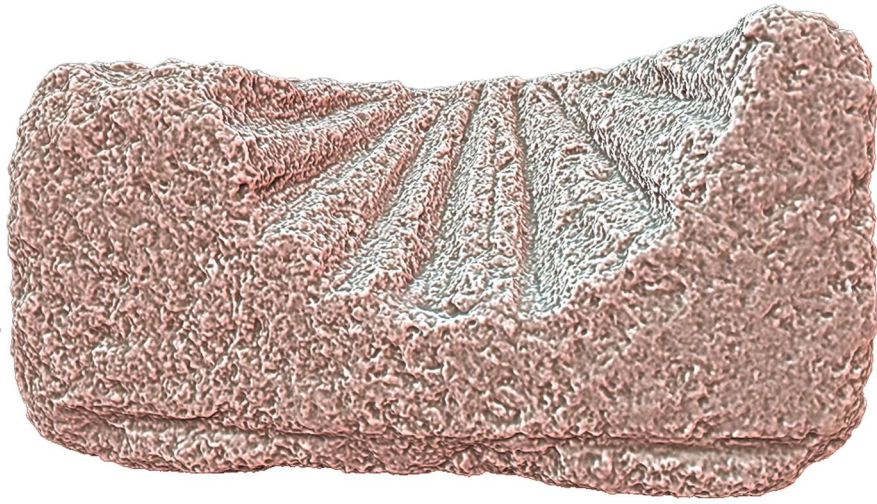


F2238

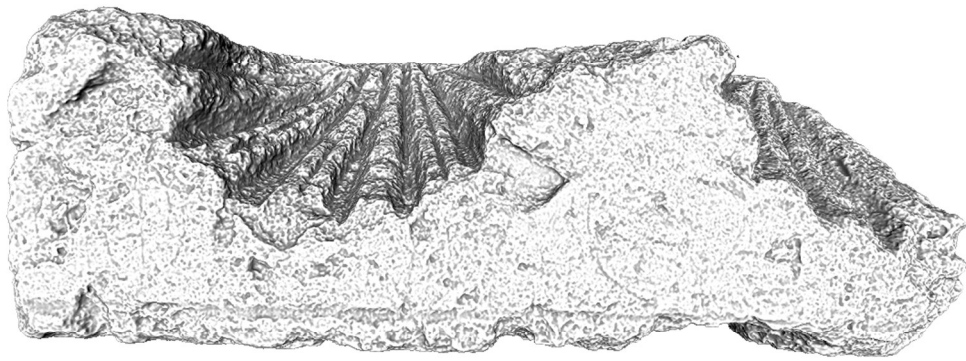


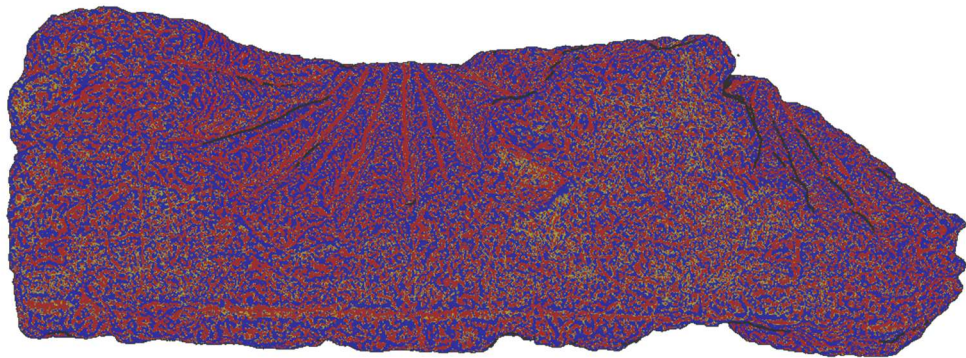
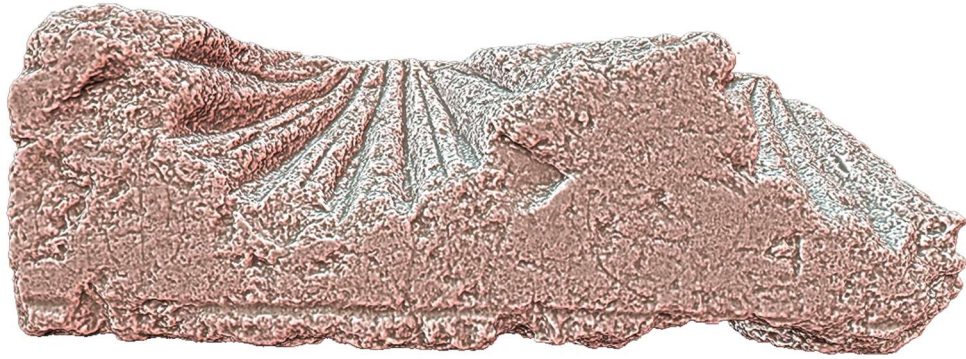
F2239



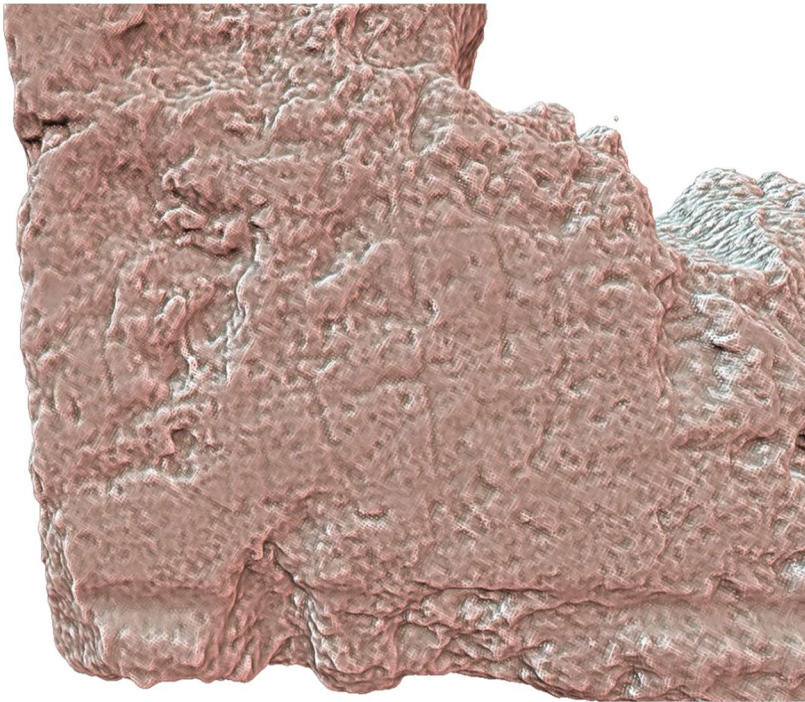


F2240

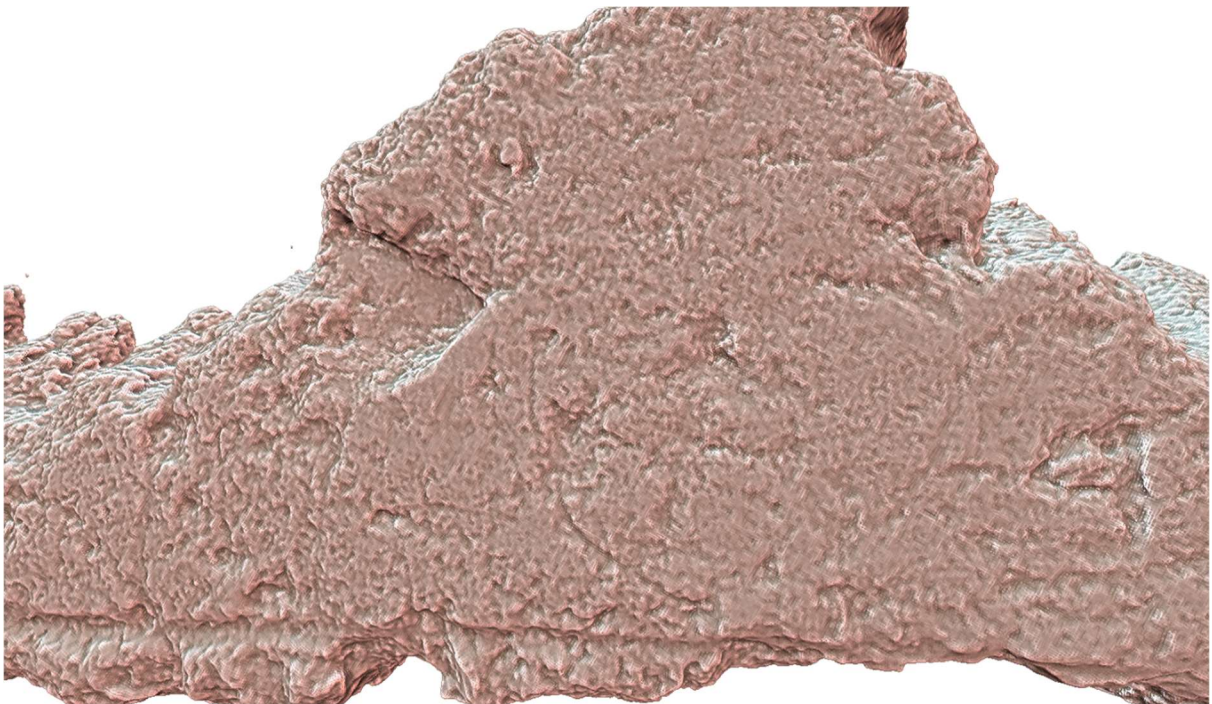




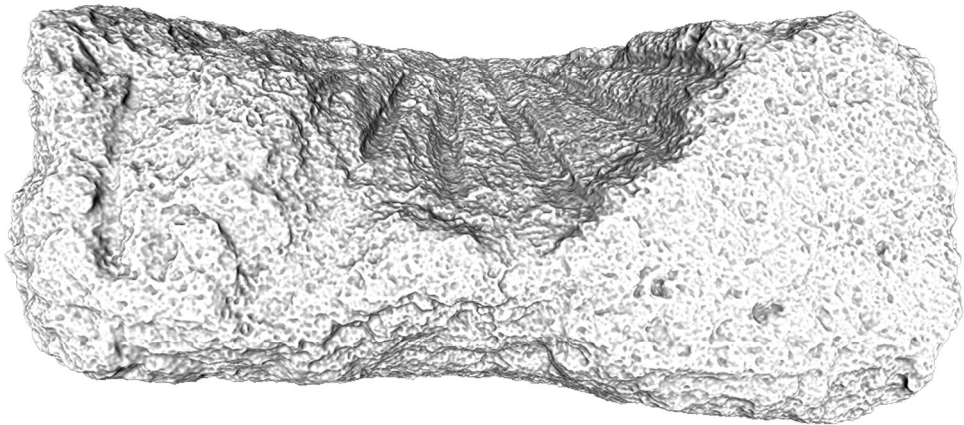
Left cross

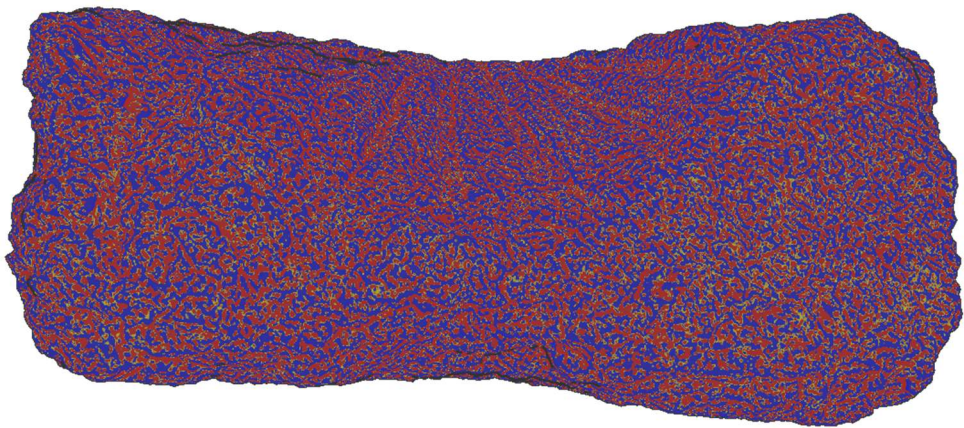
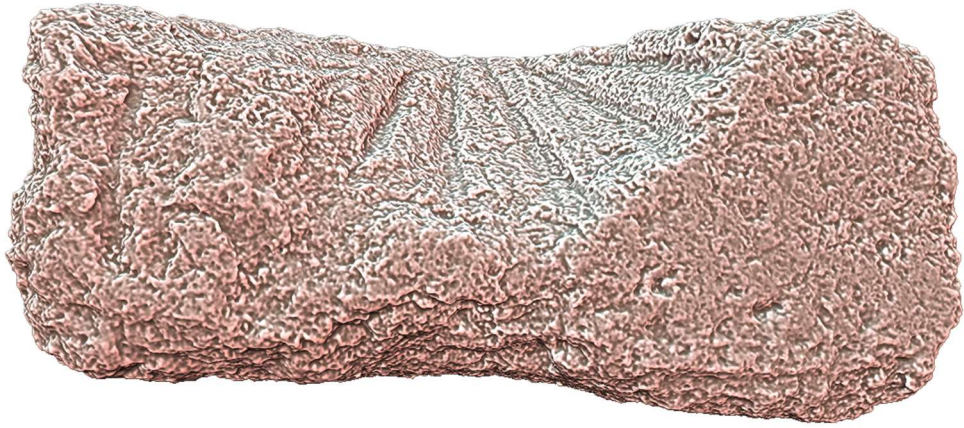


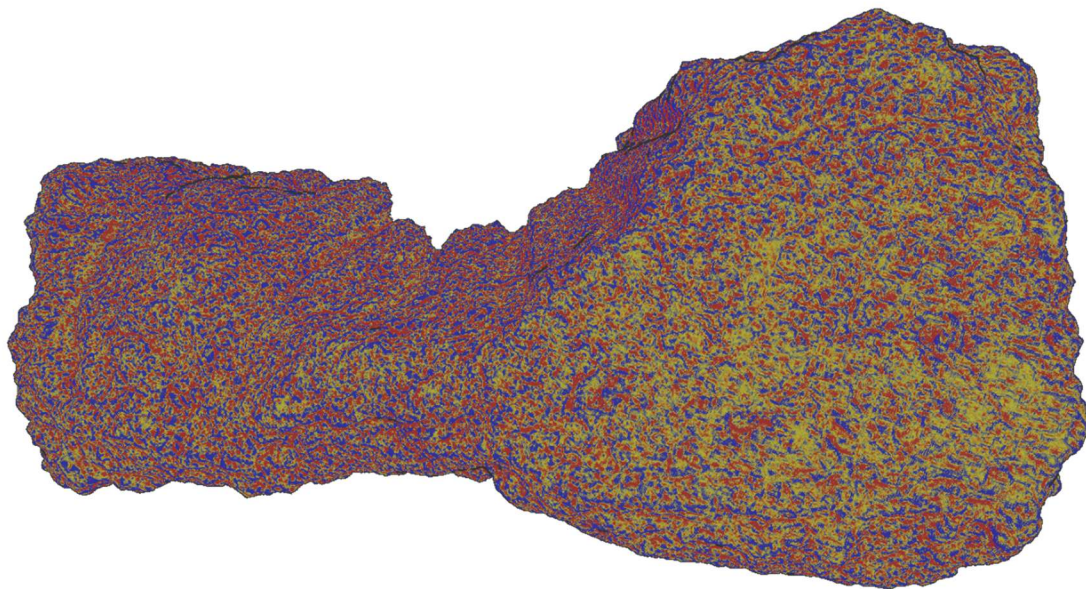
Middle cross



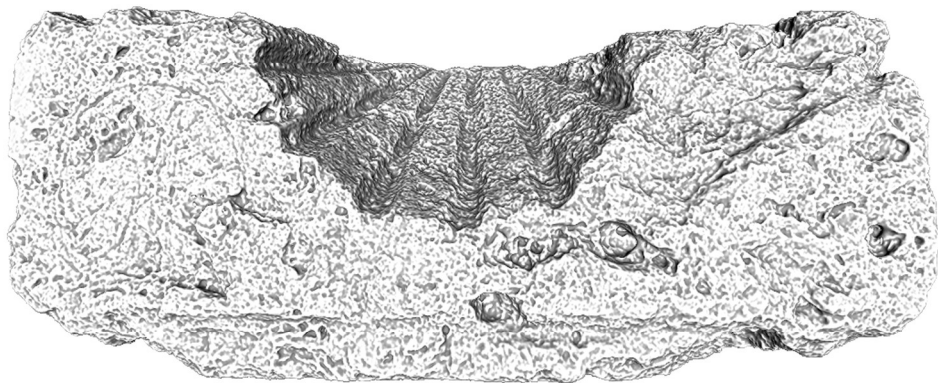
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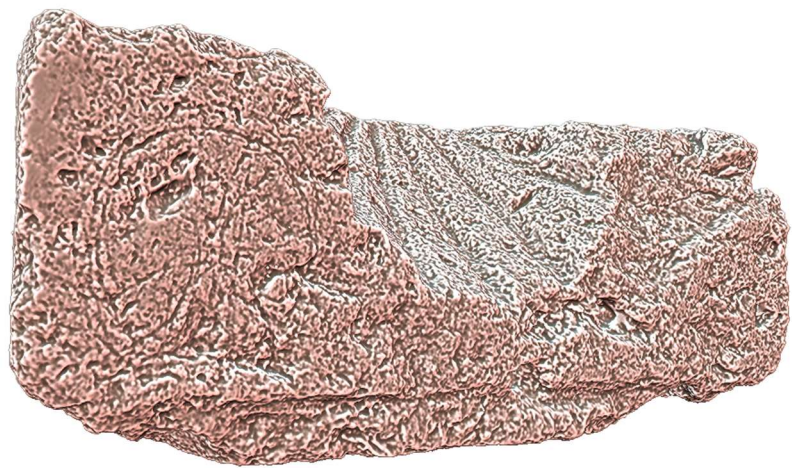
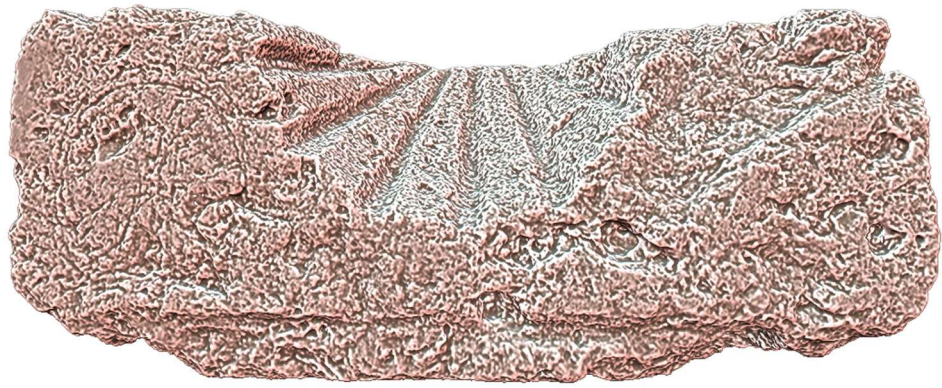


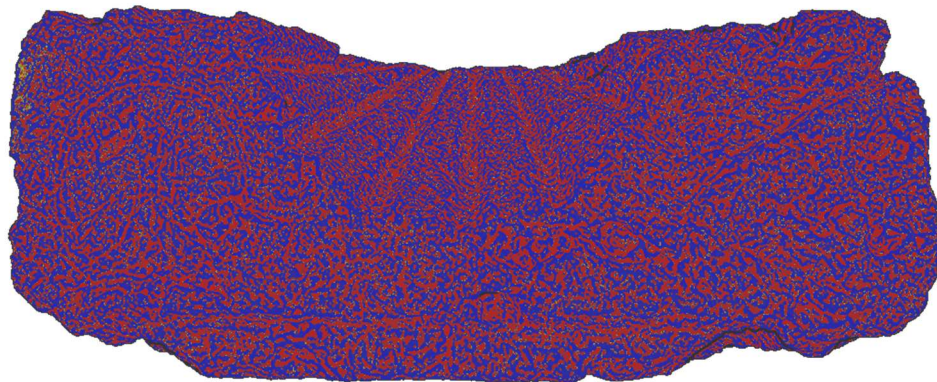
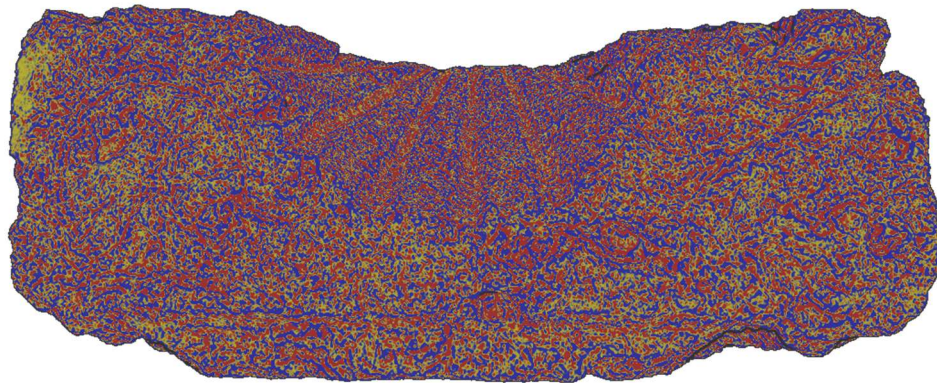




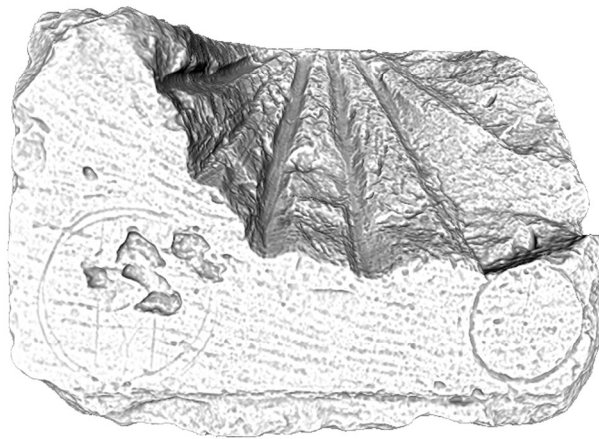
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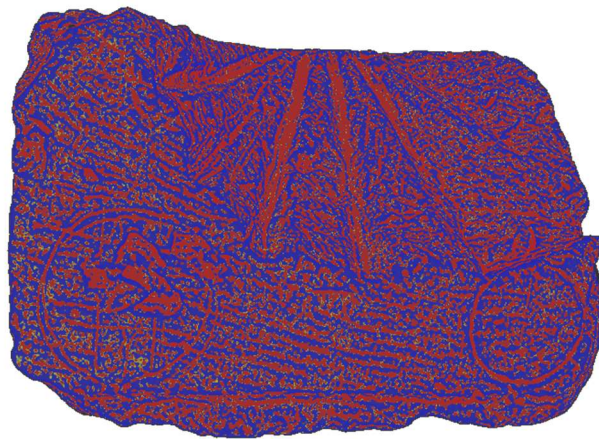


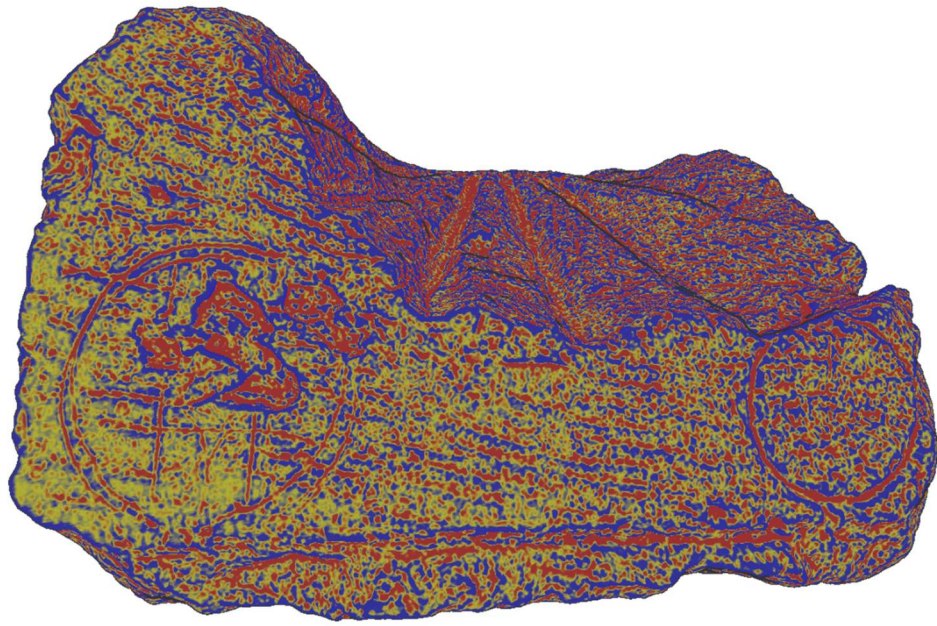




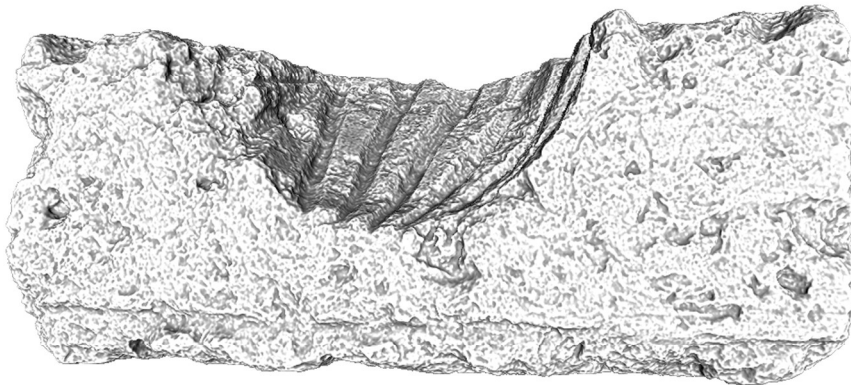
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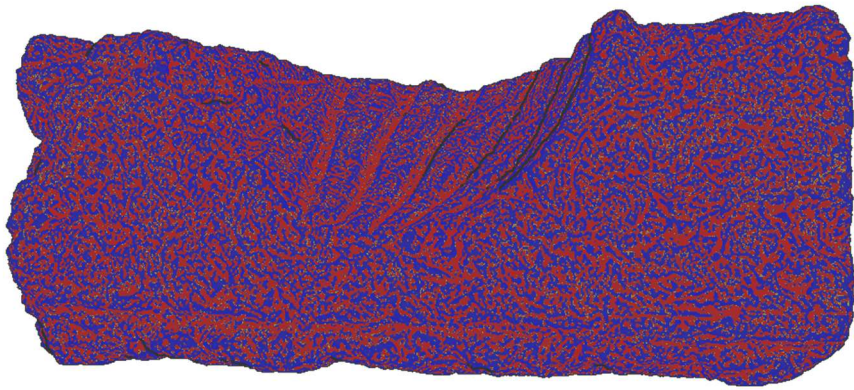
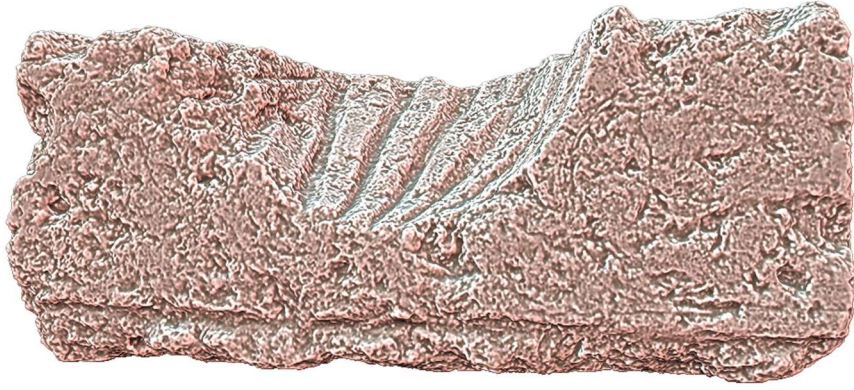




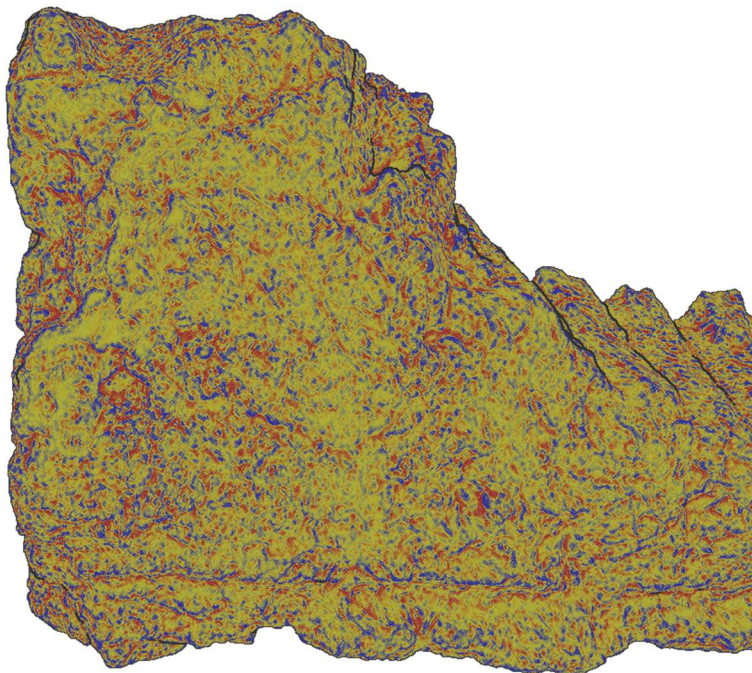
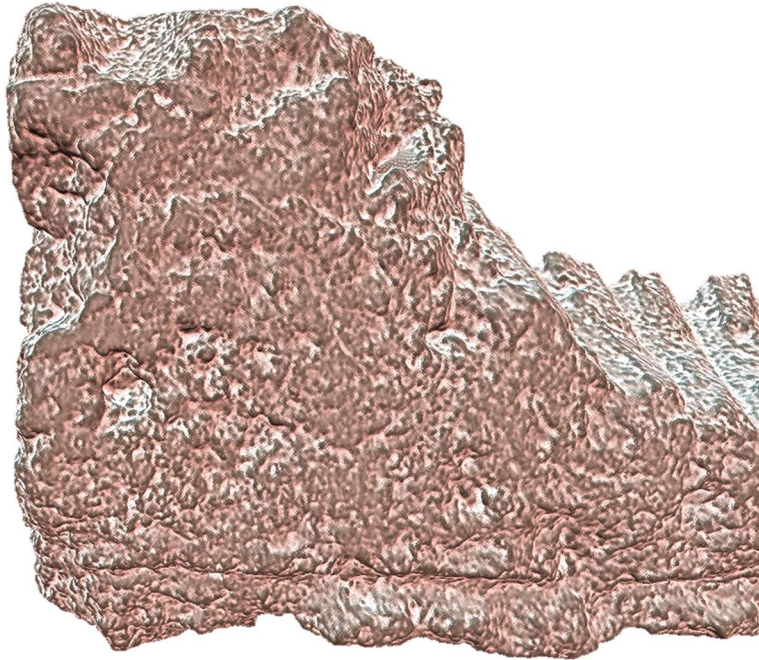


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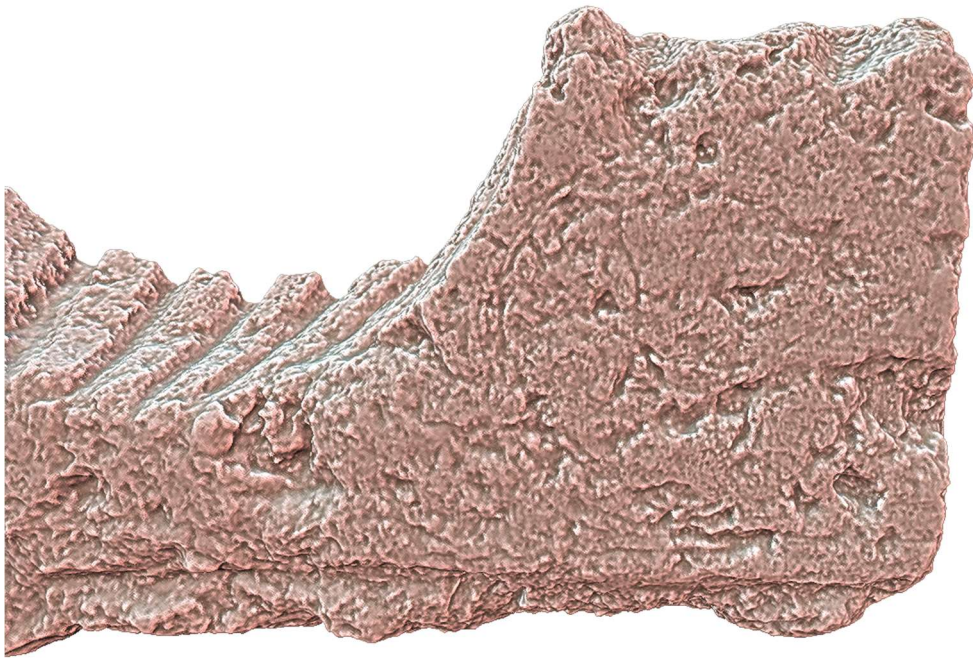




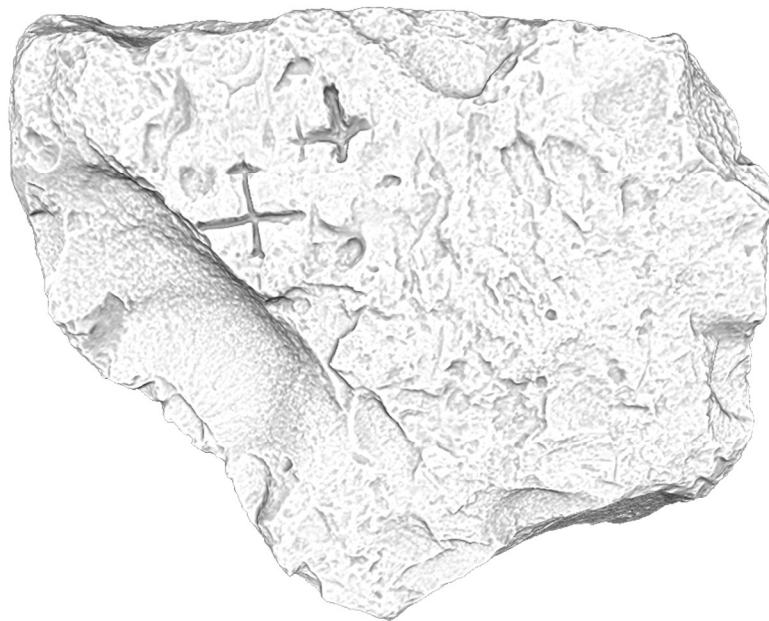
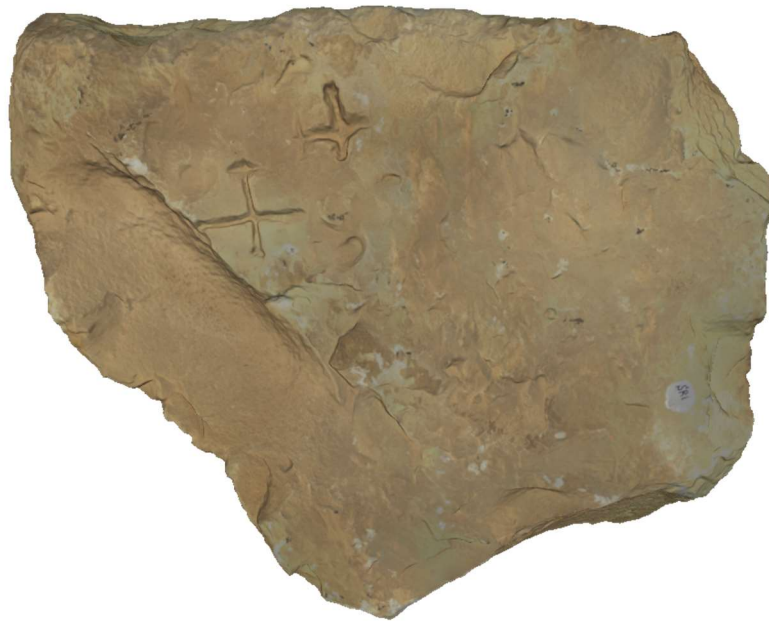
Left cross

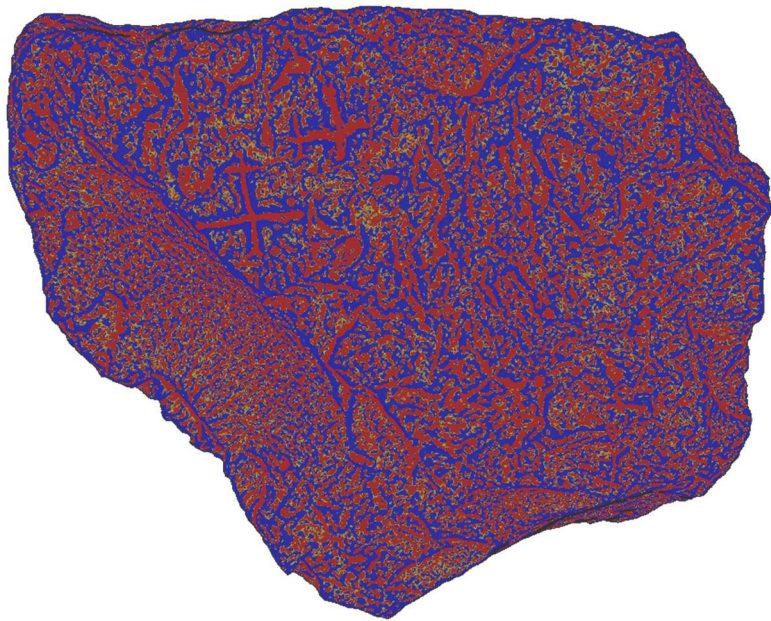
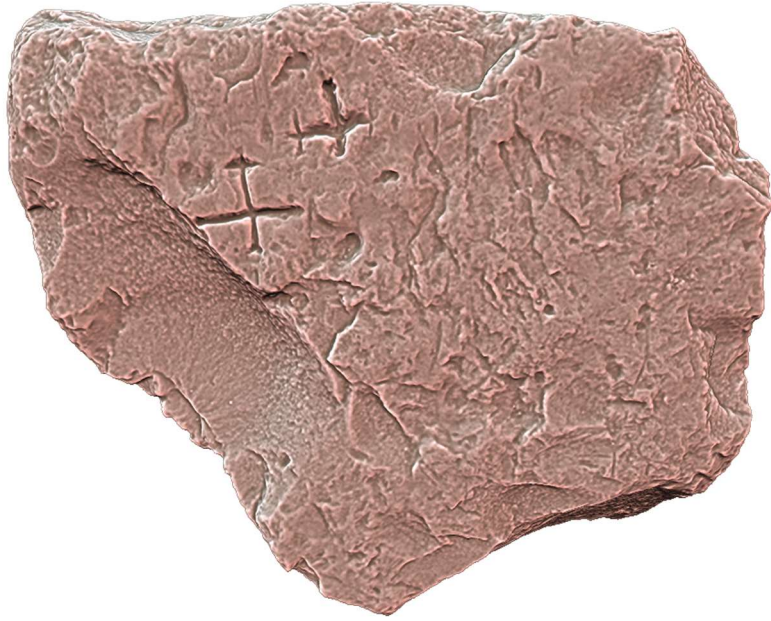


Right cross

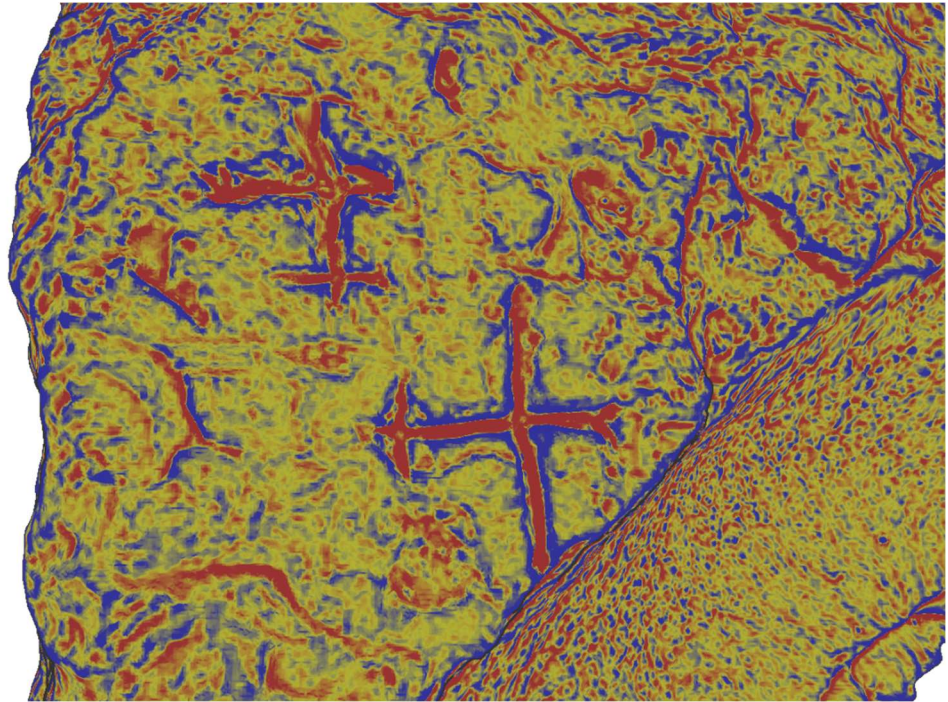


F2376

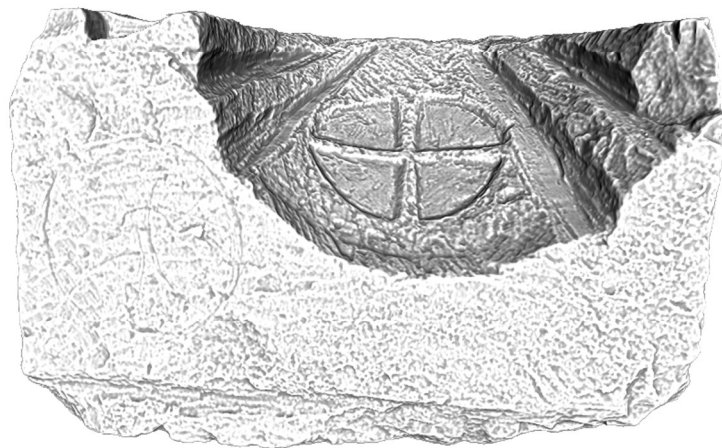


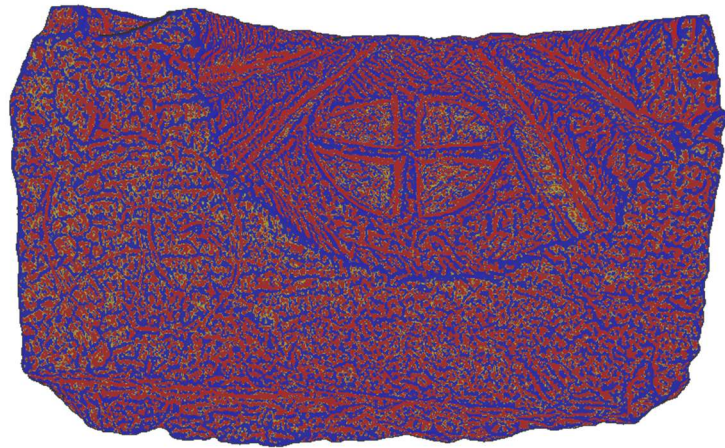
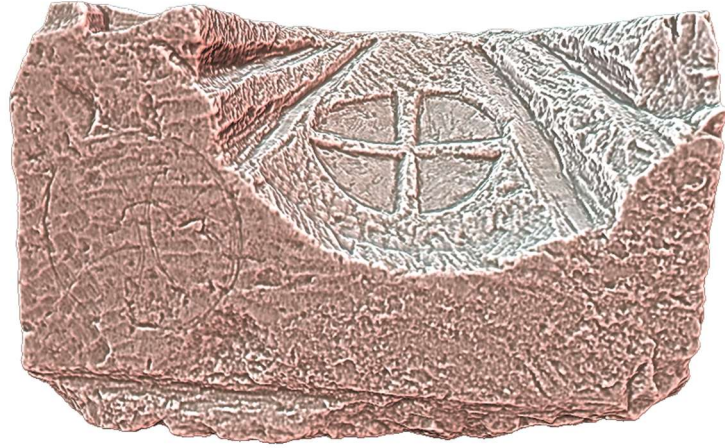


Close-up two crosslets



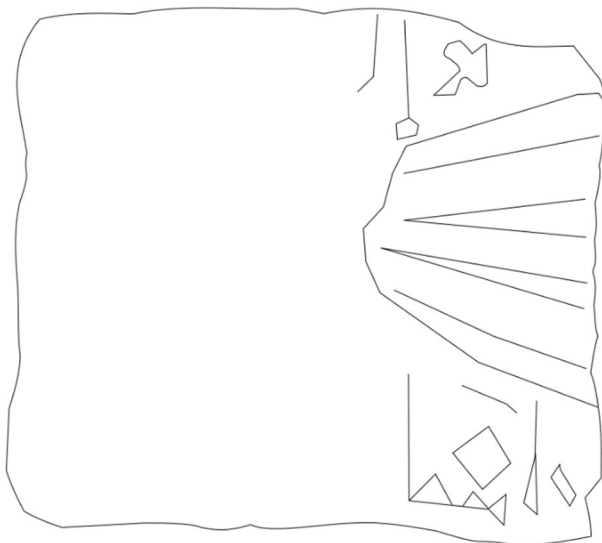
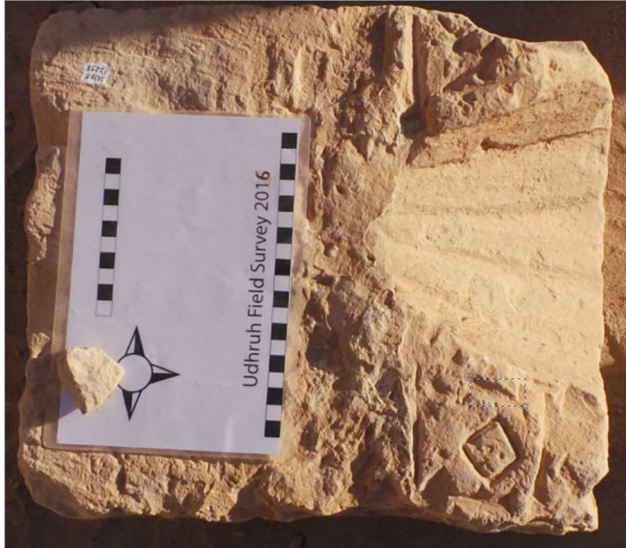
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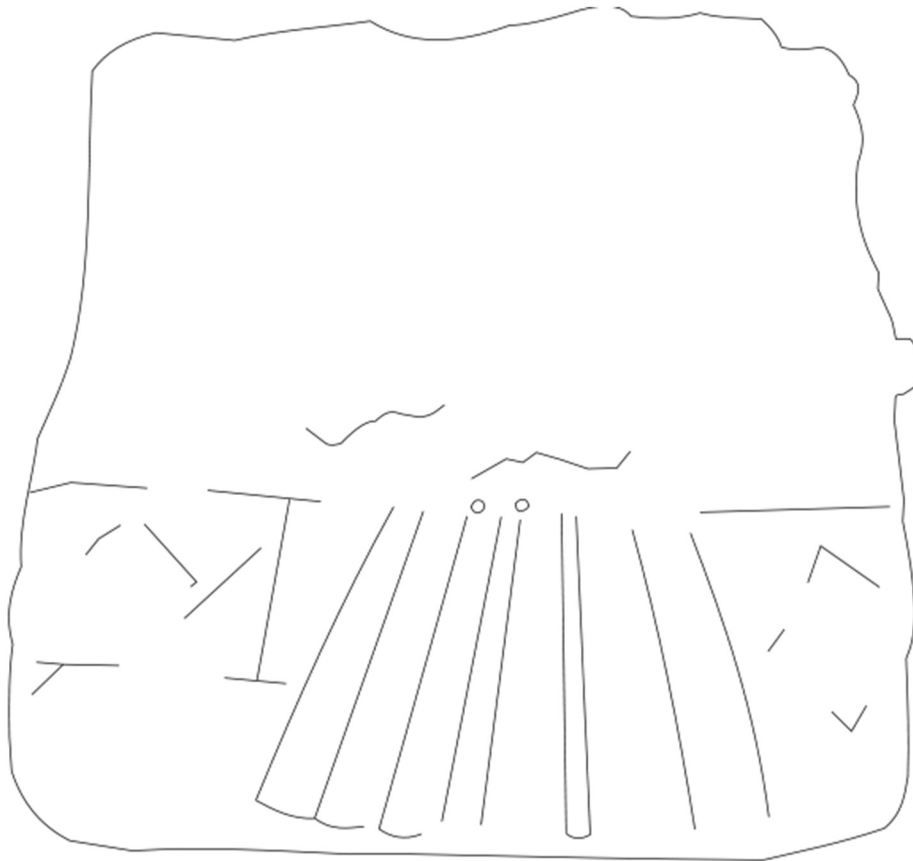


Appendix C: part 2

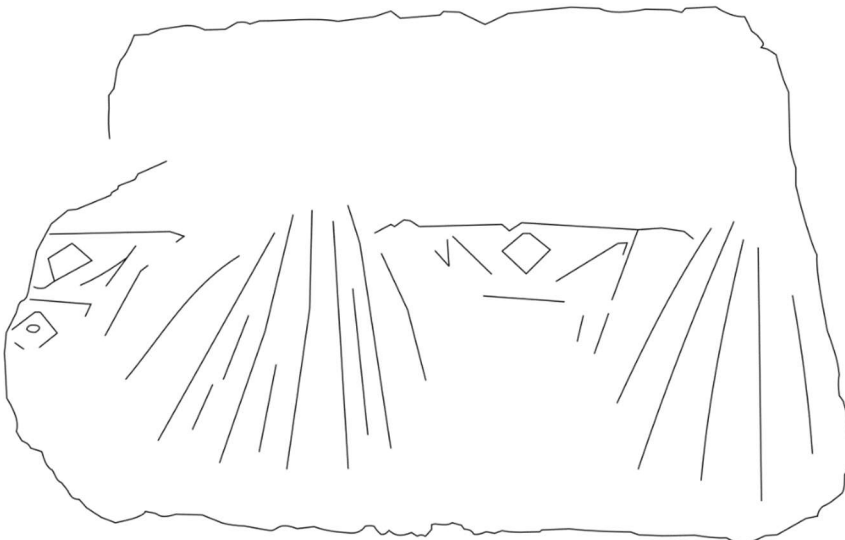
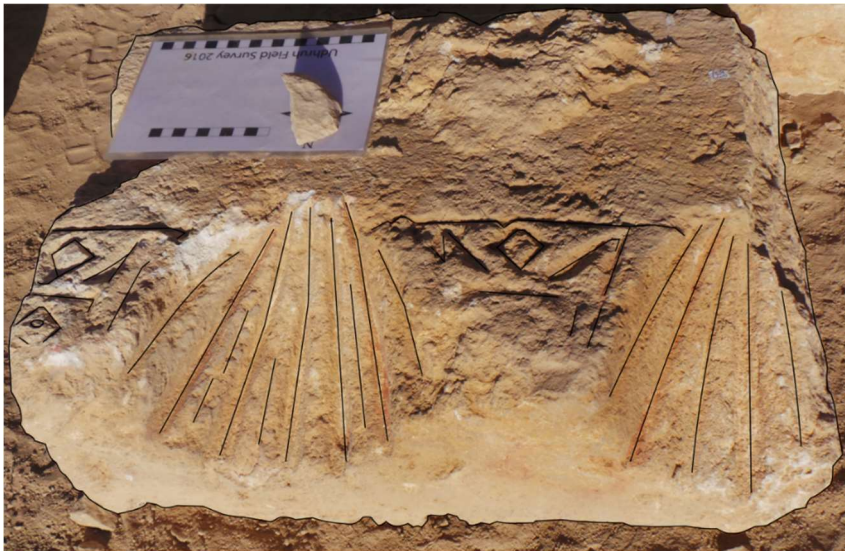
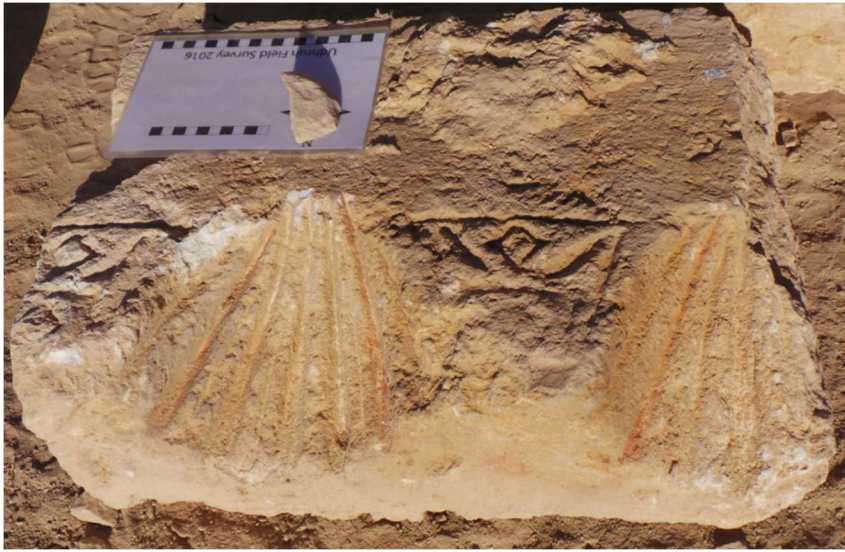
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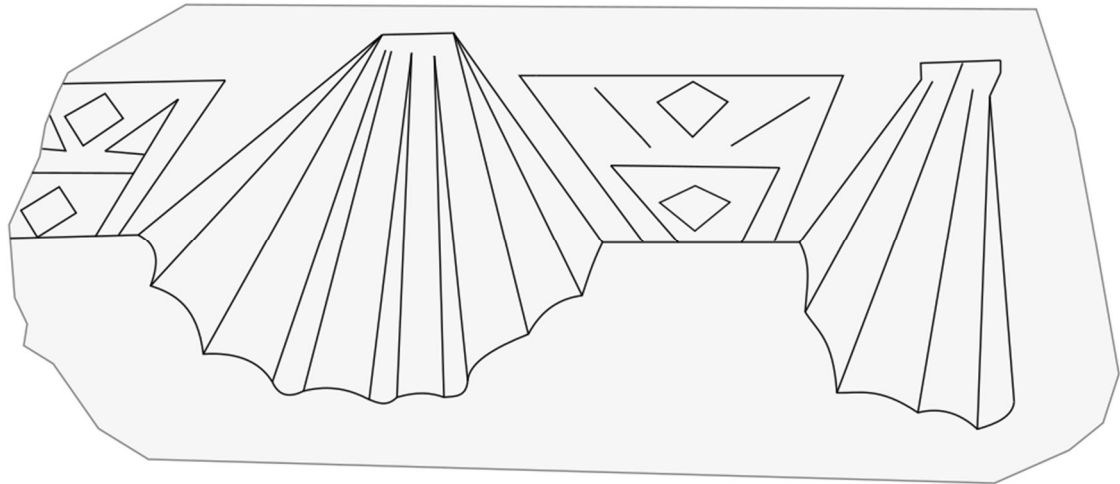


F2239



F2240

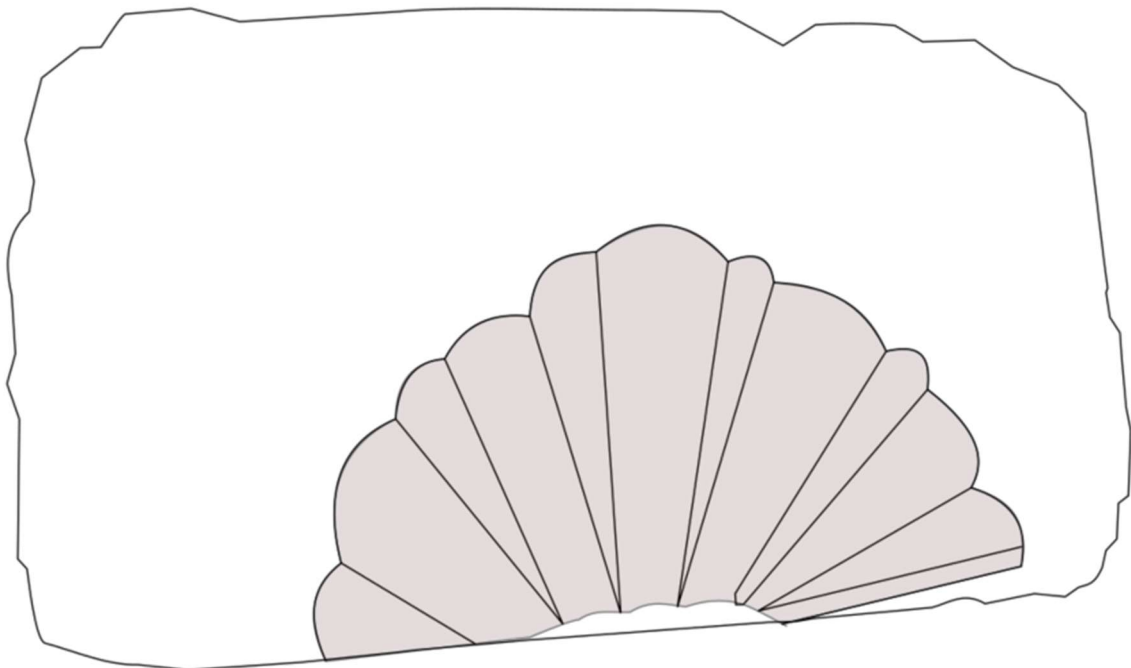
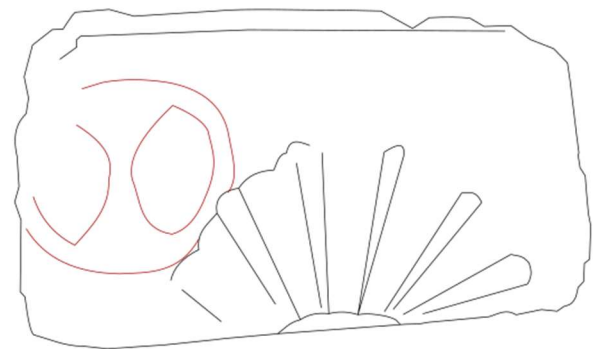
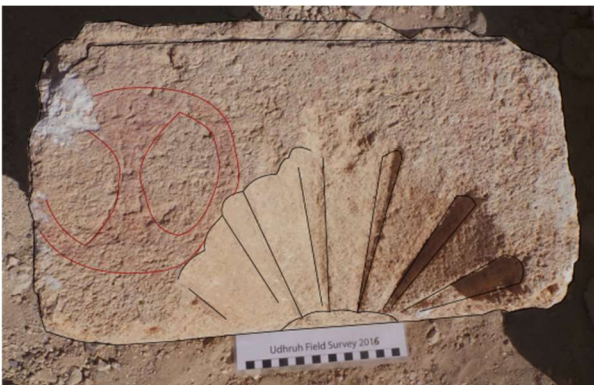


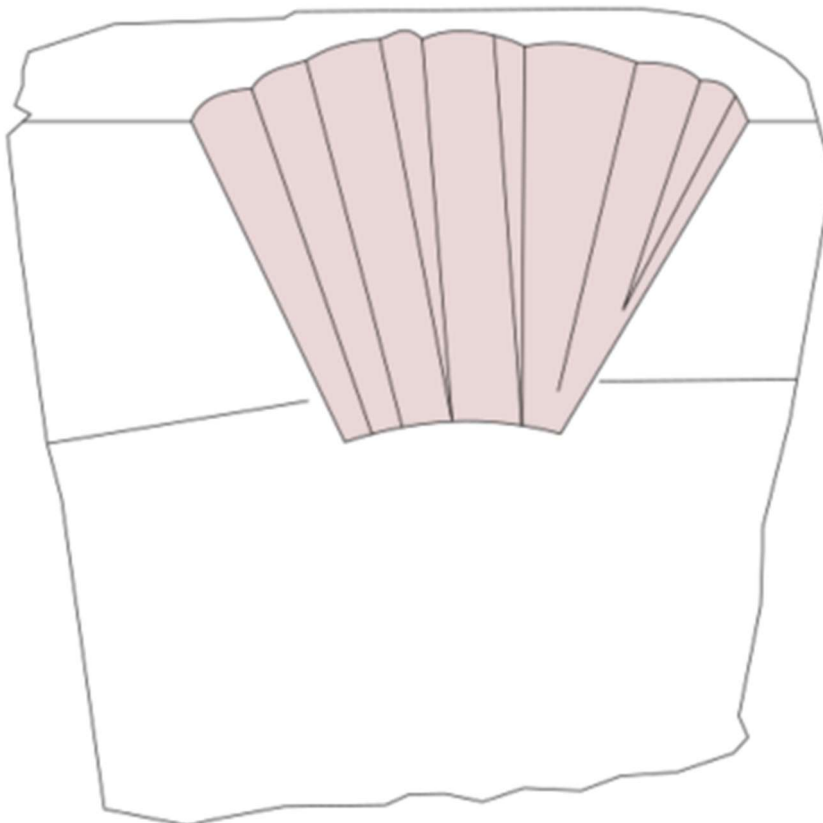


F2242

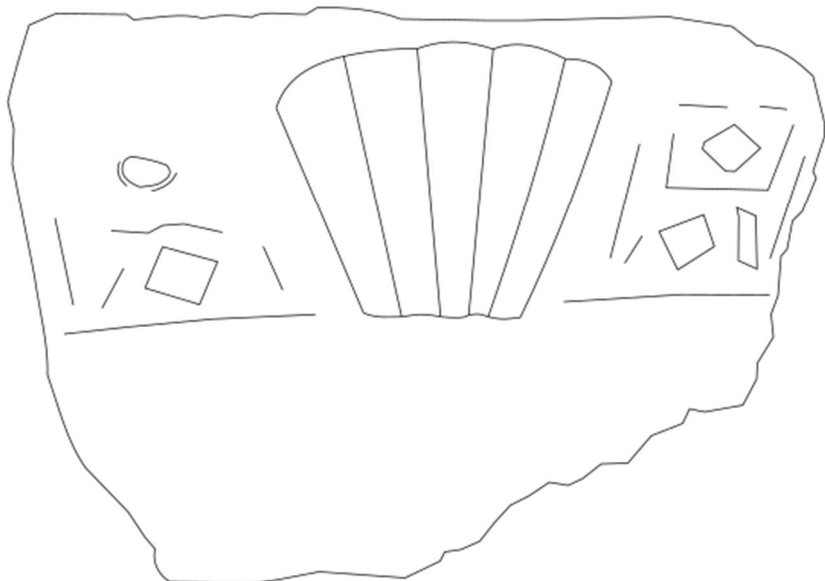


F2244



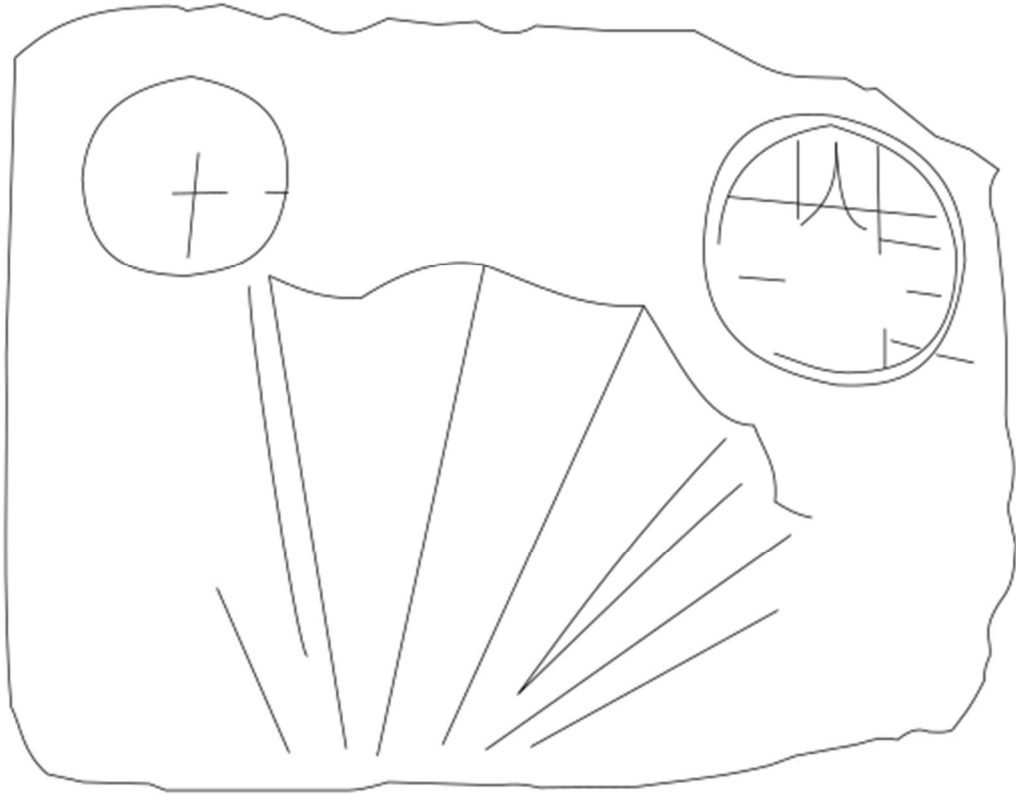


F2245

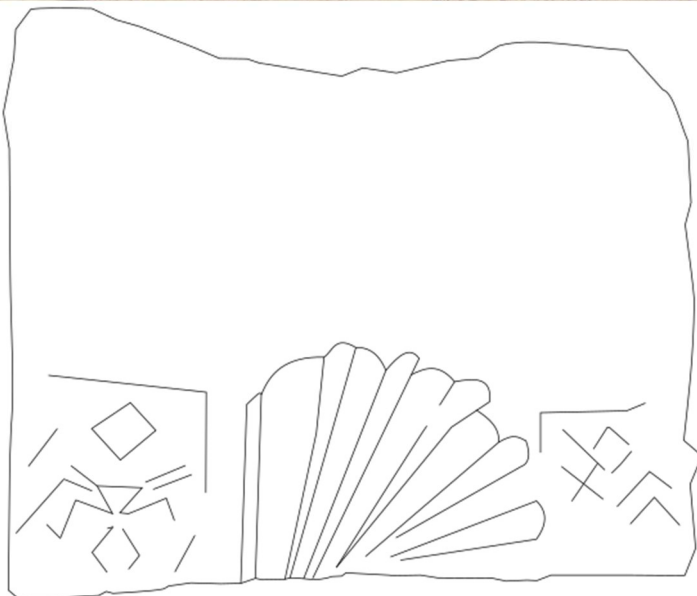
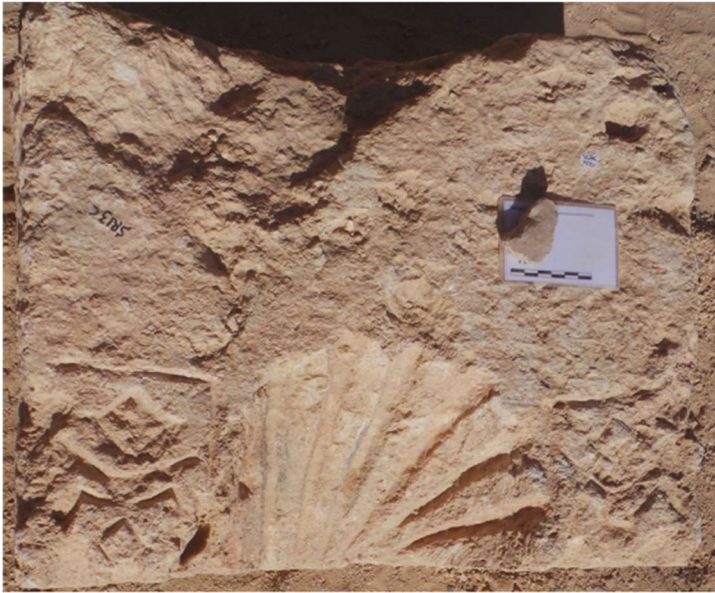


F2247



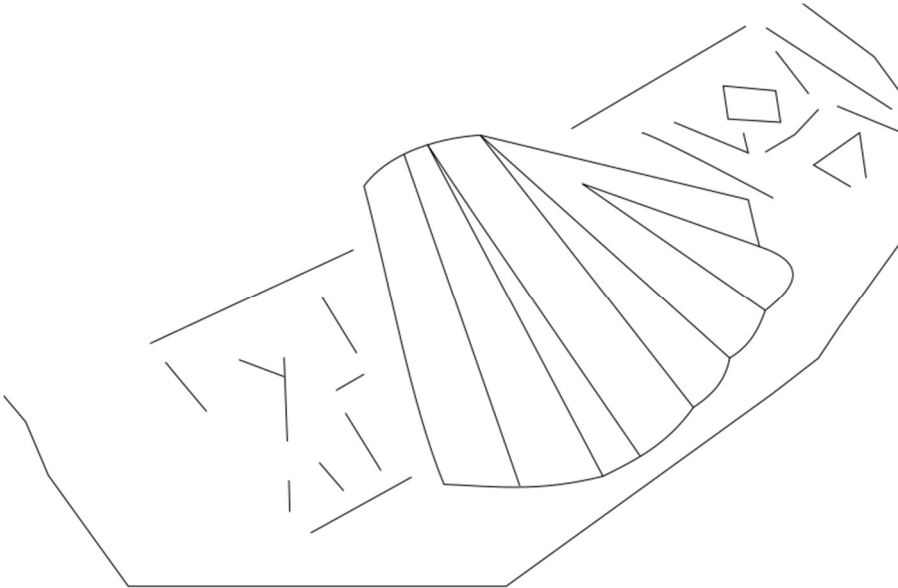


F2251





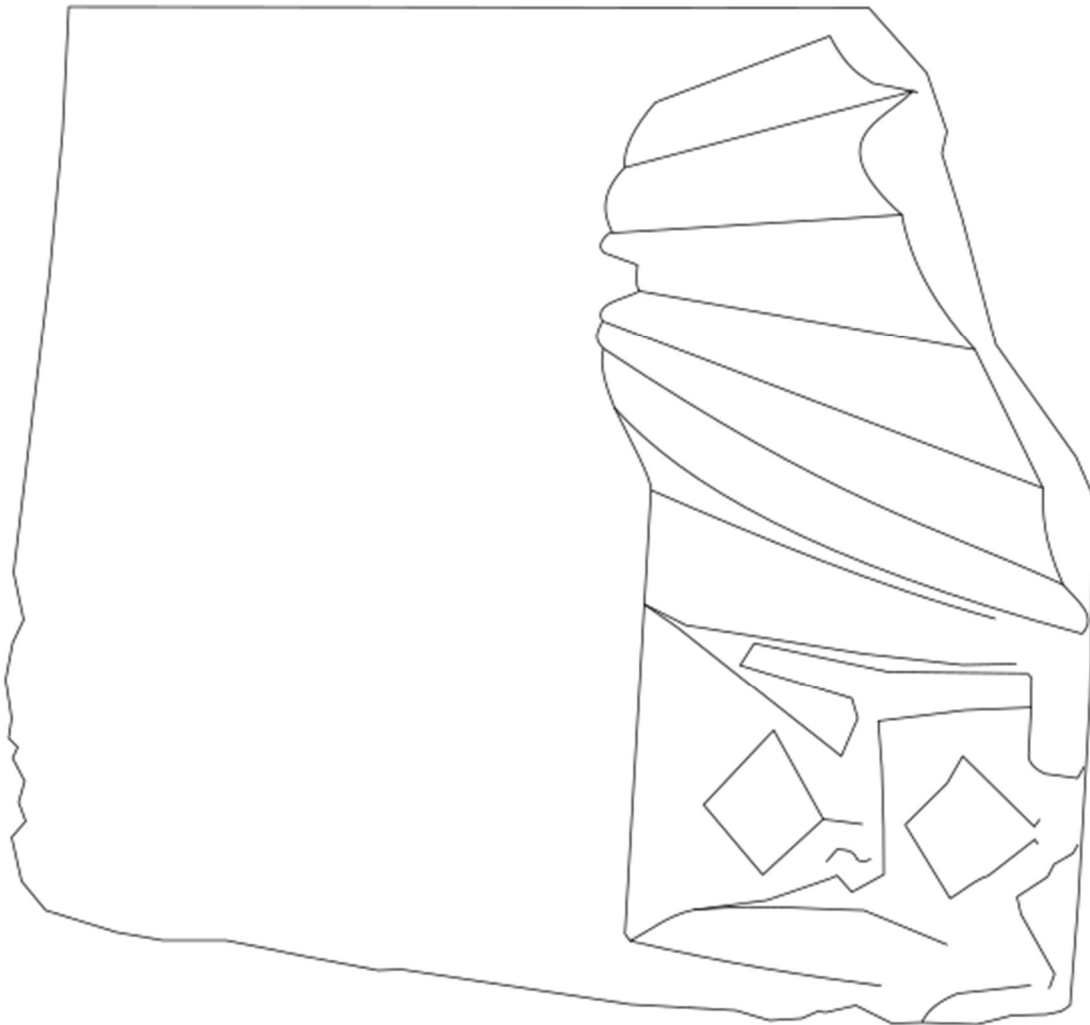
F2265





F2266

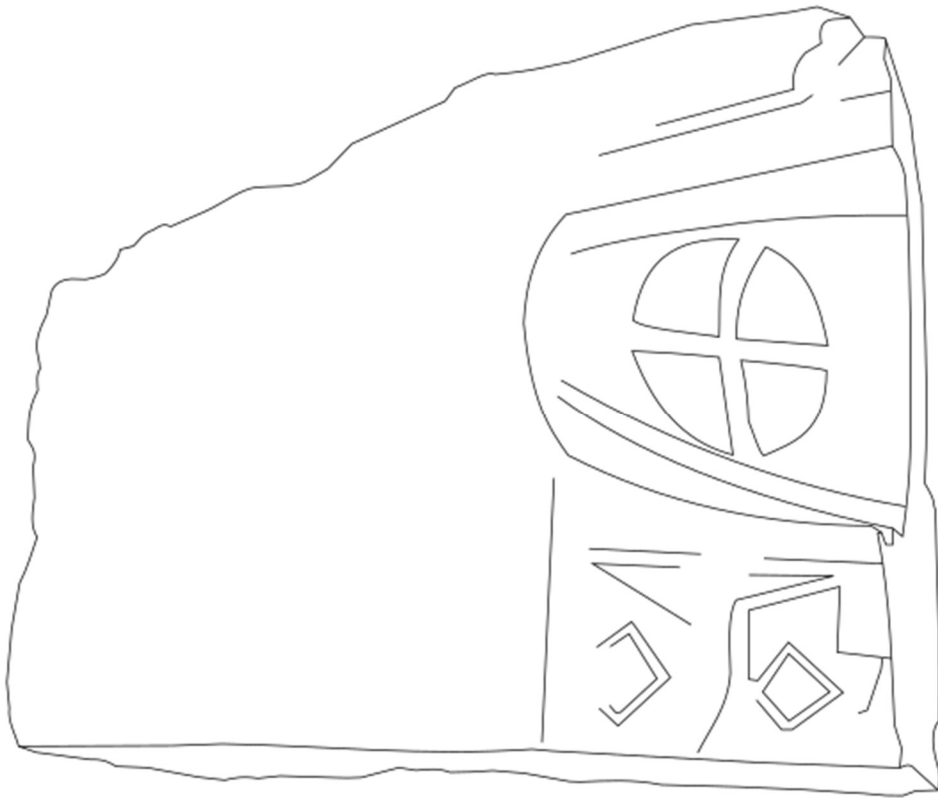






F3031





F3124

