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REMOVE THAT PYRAMID!

Studies on the Archaeology and History of Predynastic and Pharaonic Egypt in Honour of Stan Hendrickx

edited by

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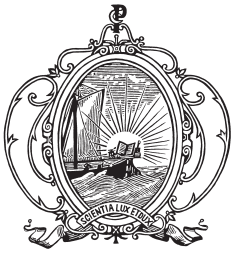

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OBSIDIAN IN EARLY EGYPT: THE PROVENANCE OF A NEW FRAGMENT FROM THE PREDYNASTIC SETTLEMENT AT ELKAB AND THE QUESTION OF POSSIBLE EXCHANGE ROUTES

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Since 2009, the Belgian Archaeological Mission to Elkab of the Royal Museums of Art and History is excavating the remains of a large settlement that has its origin in the Badarian period. During the excavation season of 2012, the distal end of an obsidian flake was found in the early Naqada II horizon of test pit 3. The geochemical analysis of its trace elements indicates that this flake, like other analysed samples from Hierakonpolis and Naqada, originates from obsidian sources in the Ethiopian Afar triangle. The Elkab flake brings additional data to the existing corpus of provenanced obsidian fragments and the discussion on possible exchange routes. Based on the archaeological context, the geographical and chronological distribution of all known obsidian objects, combined with new data emerging from recent and intensive archaeological research in the deserts south and west of the Egyptian Nile Valley, the question of these exchange routes needs to be reconsidered within a broader framework of various simultaneous supply networks. In this paper, we propose to break down the procurement of obsidian in early Egypt in two phases that also highlight some of the socio-economic developments occurring during the Predynastic period and the changes following the formation of the Egyptian state.

Excavated and published by the honouree of this *Festschrift*, the large Naqada III cemetery of Elkab still constitutes one of the best investigated Predynastic sites at Elkab (Hendrickx 1994). Since the excavation of this cemetery in the late 1970's, Elkab's early history has always been, and still is, a key focus point of the Belgian Archaeological Mission to Elkab, not in the least because of the pivotal role Stan has always played as an archaeologist and ceramicist in its research activities and fieldwork. In recent years, the Belgian mission has focussed its research almost exclusively on the early settlement of Elkab. During excavations in 2012, a small obsidian flake was found within the Predynastic part of the settlement area. Although Stan claims that size does matter (Hendrickx *et al*., 2020), we have chosen this humble little object as a subject for this modest contribution in his honour which we trust will be of interest to him.

Fig. 1. Map of the settlement area of Elkab with the location of the different test pits (© Belgian Archaeological Mission to Elkab).

Elkab in the Predynastic period

Already at the end of the 19th century, several late Predynastic tombs were excavated at Elkab by James E. Quibell (1898: 8–11; Hendrickx 1994: 147–148). One group seems to belong to the above-mentioned Naqada III cemetery, but its precise location is not known.[1] Quibell also excavated about twenty heavily plundered tombs that predate this Naqada III necropolis (Quibell 1898: 9). It is not possible to determine a precise location for this group of burials due to the scanty published information, but they should be situated just outside the northern corner of the Late Period 'Great Walls'.[2] Several older Predynastic finds have also been attested. In 1955, Pierre Gilbert discovered in the so-called 'archaic sector', situated at the north-western corner of the temple area and inside the late Old Kingdom enclosure wall, a series of mud brick constructions and silo installations. Based on the archaeological material, they can be dated in the 3rd Dynasty, but several re-used Predynastic objects were also found inside these silos (Hendrickx & Eyckerman 2009: 15–26). These finds came as no surprise since the presence of Predynastic objects in this part of the site was already demonstrated at the beginning of the 20th century by Archibald H. Sayce, Somers Clarke and Frederic W. Green. Between 1901 and 1904, they excavated different locations within the temple zone and the area bordered by the late Old Kingdom enclosure wall, and found several fragments of Predynastic pottery and other artefacts that they considered to be for domestic purposes (Sayce & Clarke 1905: 257–269).[3] Black-topped pottery was also discovered by Jean Capart near the foundation of the northern corner of the temple of Nekhbet (Gilbert 1954: 83).[4] Because of the presence of these late prehistoric objects, the area was further investigated by Pierre Vermeersch and Herman De Meulenaere in 1968–1969 with the specific objective to retrieve the remains of a Predynastic settlement (Vermeersch 1978: 135). More mud brick constructions were uncovered, but, according to the excavators, they were situated in disturbed contexts making it impossible to determine their exact date. However, scattered ceramics of red polished and black-topped pottery (Vermeersch 1978: pl. VI) that can tentatively be dated to the Naqada I or early

[1] According to Quibell, they were found "chiefly inside the fort of El Kab [= the Late Period enclosure wall or so-called 'Great Walls']", cf. Quibell 1898: 9, pl. XXVII. See also Hendrickx 1994: 148, who states that some of these tombs could be dated to the early Old Kingdom.

[2] For a probable location of these tombs, see Hendrickx & Huyge 1989: pl. II, no. 36.

[3] See specifically trenches nos 11 & 13, pits nos 8, 16, 18, 19 & 'D' and 'a' near the "Small Temple". The approximate location of the different pits and trenches is indicated on a plan (fig. 2) on p. 245. The exact location and dimensions of Pit 'D' can be found in: Clarke 1922, pl. VI.

[4] See also the distribution list of objects between the Egyptian Museum, Cairo and the Royal Museums of Art and History (RMAH), Brussels in: FÉRÉ 1954: 107–112. No. 20 is a fragment of a black-topped jar, now in the collection of the RMAH (E.7759).

Naqada II period, confirmed a Predynastic occupation of this part of the site. Moreover, the presence of rippled ware sherds suggested that this occupation may even go back to the Badari Period and the very beginning of the Predynastic (De Meulenaere 1970: 32–34; Vermeersch 1972: 109; 1978: 135–144). Additionally, during the 1955 excavations, an ellipsoid palette (K.242)[5] with an incision on both ends, which is undoubtedly of Badarian vintage, was found within silo N (Hendrickx & Eyckerman 2009: 16, fig. 14, see fig. 2 for the location of silo N). Besides the above-mentioned Naqada III cemetery, the most significant Predynastic finds at Elkab consist of hundreds of rock drawings that cover the rock cliffs of the Wadi Hellal and the wider desert hinterland of Elkab. Based on stylistic grounds, subject matter and their relative chronology (i.e. superimpositions), the vast majority of these can be attributed to the Predynastic period (Huyge 1984; 1995; 1999; 2002).

Although direct archaeological evidence was scanty, these various finds indicated that Elkab was intensively frequented during Predynastic times. Moreover, they also suggested the presence of a Predynastic habitation site located below and in the immediate vicinity of the temples. However, following the observations of De Meulenaere (1970: 33–34; 1975: 1226) and Vermeersch (1978: 8, 144), who estimated that it was unlikely that *in situ* Predynastic settlement remains could be excavated there, this part of the site was not investigated further until 2009 when systematic archaeological research in the settlement area of Elkab began.

The archaeological context

After the discovery in 2009 and 2010 of intact stratified Predynastic settlement remains in a small test pit (TP1) immediately south of the area of the 1955 excavations (Rowland *et al*. 2009: 25–26; Claes *et al*. 2014: 75–77), five additional test pits (TP2–5 & TP9), each measuring 2 × 2 m, were excavated between 2012 and 2016 (Fig. 1). During the excavation of TP3, the distal end of an obsidian flake, numbered as ELK12-F05 (Fig. 2), was found in a thick deposit of aeolian sand, some 10 cm below a floor level (TP3-Lc09), that consisted of a thin layer of hardened grey sandy silt, and was associated with two small hearths (TP3-Lc10 & 11). Based on the ceramics that were found on top of this layer of mud flooring, this horizon dates to the Naqada IIB–C period. Some 30 cm above this level, two fragments of typical Naqada IIIA decorated ware attest to a younger occupation phase, and the upper layers in this test pit can be dated to the Early Dynastic period. Below the floor level, two older occupation horizons could be discerned. The first one (TP3-Lc12) can be attributed to the late Naqada I/early Naqada II period. The lowest horizon

[5] This palette is now kept in the Egyptian Museum in Cairo (JE 89574).

Fig. 2. Obsidian flake ELK12-F05 (© Belgian Archaeological Mission to Elkab).

(TP3-Lc13 & 14), situated at the base of the aeolian sand and the top of the alluvial Nile deposits, can be dated to the Badarian. Moreover, the chronological attribution of the lowest horizon is confirmed by a radiocarbon date of 4350 Cal BC (Claes *et al*. 2014: 77–85).

The chronological sequence of the different occupation horizons in TP3 shows that Elkab was continuously inhabited throughout the 4th and early 3rd millennium BC from at least the Middle Predynastic and perhaps already from Badarian times onwards. Important to note is that not all the test pits show the same sequence of occupation horizons. Badarian pottery has only been found in TP1 and TP3, and archaeological material from the Naqada III period has only been clearly attested in pits 3 and 9. This seemingly indicates that the location of the Predynastic settlement of Elkab may have shifted over time, but one should also take into account the limited size of the excavated test pits.

Besides large amounts of pottery, the late Naqada I/early Naqada II horizon in which the obsidian flake ELK12-F05 was found also yielded substantial amounts of lithic artefacts. They were predominantly made out of local flint that is abundantly available and easily accessible in the gravel deposits of the nearby Wadi Hellal. Besides typical Predynastic tools such as notches, borers, or denticulates, the tool kit of this horizon is dominated by burins. Altogether, 44 burins as well as 128 burins spalls (including primary and re-sharpening spalls) were counted in TP3-Lc12.[6] Such a high amount of a specific tool

[6] The preliminary report published in 2014 (see Claes *et al*. 2014: 85) mentions 28 burins and 70 burin spalls, but these numbers were based on an incomplete analysis of the excavated material. In the meantime, a complete attribute analysis of the lithic artefacts from TP3 has been executed by Karin Kindermann, and the numbers mentioned here can be considered as final.

category can only be explained as functional, and points to the presence of a specialised activity area in the immediate vicinity of the test pit (see also Kindermann, this volume). The presence of the ELK12-F05 fragment suggests that obsidian was probably also knapped in this workshop and that obsidian tools were produced or modified locally.

The aeolian sand layer TP3-Lc12 is more than 1.5 m thick and, as stated above, ranges in date from the late Naqada I to the early Naqada II period. Since the obsidian flake was found in the upper layers of this locus, an early Naqada II date seems likely. No other obsidian fragment has ever been found in the archaeological record of Elkab before the First Intermediate Period or Middle Kingdom, nor have any other exotic raw materials, such as turquoise or lapis lazuli.[7] With the exception of a few obsidian pieces from Nubia, the Elkab fragment, together with those found at Hierakonpolis, appear to be the southernmost examples ever reported from Predynastic contexts in the Egyptian Nile Valley. Moreover, it is also one of the oldest that has ever been found in Egypt (see Catalogue) and hints at Elkab's involvement in long distance contacts at a very early stage in Egyptian history.

Geochemical analyses of obsidian flake ELK12-F05

Obsidian is a natural volcanic silica-rich glass, formed from a magmatic material that has cooled too quickly to allow for crystal formation. This specific rock does not occur in Egypt where Cenozoic and Quaternary volcanic activity generated basalt flows, mostly in Northern Egypt (Meneisy 1990). However, obsidian occurs widely in the Near East and on both shores of the southern Red Sea.

[7] Quibell mentions a string of beads made of carnelian, gold foil, small discs of gold and lapis lazuli that was found in tomb 264 which is located inside the Great Walls, close to its eastern entrance gate (Quibell 1898: 14, see pl. XXIV for the location of this tomb). The date of this tomb has been the subject of much debate. According to Quibell, tomb 264 dates to the 12th Dynasty (Quibell 1898: 14) while Sayce & Clarke (1905: 248) propose a slightly older date (10th or 11th Dynasty). Based on parallels with the pottery from the early Old Kingdom tombs at Reqâqnah, Garstang (1904: 40–41) dates this tomb to the 2nd or 3rd Dynasty. Again, based on the pottery, Seidlmayer (1990: 371–372) believes that a date in the late Old Kingdom can be attributed to this tomb. A re-analysis of the pottery, completed with the archaeological material deriving from additional excavations in this cemetery by the Belgian mission in 1968–1969, indicates an 11th Dynasty date for most of the tombs in this burial ground (Schotte 2011: 110). Yet, older tombs for which a date in the Old Kingdom can be accepted were also present in the same burial ground (Quibell 1898: 6, 10, 18–20, pls V.5, XX.28 & 30, XXIV; Sayce & Clarke 1905: 251–252, fig. 3; see also Kaplony 1981: 97–98, 146, pls 32.2, 51.3 for the cylinder seals bearing the names of pharaohs Userkaf and Menkaura that were also found in this part of the cemetery), but a date in the First Intermediate Period or early Middle Kingdom seems most likely for tomb 264.

Analytical procedure

The obsidian flake ELK12-F05 has been analysed for its trace elements. Laser ablation LA-ICP-MS measurements were performed at the Earth Sciences Department of the Royal Museum for Central Africa (Tervuren, Belgium). A New-Wave UP-193 FX fast excimer (193 nm) laser coupled with a Thermo Scientific X-Series2 quadrupole ICP-MS was used. The laser was run at 40 Hz with 75 µm spot size during 40 seconds ablation time. He-gas at a flow rate of 0.65 l/min was flushed into the ablation cell and was mixed after the cell with Ar carrier gas at a flow rate of 0.70 l/min. The LA-ICP-MS operating conditions were optimised to have low oxides and double-charge levels. ^{29}Si (expressed as % SiO_2) was used as the internal standard for correcting instrumental drift and ablation rate. The 3 NIST 610-612-614 glass standards were used as external standards for the calibrations. The accuracy was better than 10 % and the precision was below 10 % RSD. The results are listed in Table 1.

Results and preliminary discussion

Previous trace element analyses, using the same analytical method, have shown that in Lower Egypt, Predynastic and Early Dynastic obsidian raw material was obtained from Near Eastern subduction-type volcanoes, with Th/Ta ratios typically ≥ 5. In Upper Egypt, the material rather came from intraplate Ethiopian/Yemeni volcanoes, with Th/Ta ratios ≤ 5 (Bavay *et al*. 2000; 2004). Extensive research on obsidian sources confirms that the Th/Ta ratio is generally high for Turkish and Armenian volcanoes (Chataigner & Gratuze 2014; Robin *et al*. 2016) while it is usually lower than 2 in Ethiopian and Yemeni volcanoes (Barca *et al*. 2012; Khalidi *et al*. 2010). A recent study further confirmed the Ethiopian origin for obsidian artefacts from Upper Egypt and tentatively identified trade routes for the procurement and supply of Ethiopian raw material towards these sites (Giménez *et al*. 2015).[8]

The Elkab flake brings additional data to the existing corpus, allowing the discussion of the southern origin of obsidian materials to be refined. The geochemical characteristics of the ELK12-F05 sample are very similar to other analysed samples from Hierakonpolis and Naqada (Table 2): the Th/Ta ratio has been used in previous papers (Bavay *et al*. 2000; 2004) while the Zn/Zr ratio has been recently proposed as a useful discriminating tool (Giménez *et al*. 2015).

[8] After the 4th millennium, obsidian may have come also from the Yemini sources. According to a new analysis of six obsidian fragments found at the Middle Kingdom harbour site of Mersa/Wadi Gawasis, at least one could originate from Yemen while four other samples indicate an Eritrean/Ethiopian source (Lucarini *et al*. 2020).

Furthermore, the patterns of rare-earth elements (hereafter REE) in obsidian samples from Upper Egyptian sites are quite similar overall, with a gentle slope ($6 < La_N/Yb_N < 10$) and a moderately marked negative Eu anomaly ($0.2 < Eu/Eu^* < 0.4$) (Fig. 3). In contrast, Near Eastern obsidians usually display flatter slopes ($3 < La_N/Yb_N < 8$) and a more marked negative Eu anomaly ($Eu/Eu^* < 0.1$).

The Th/Ta vs. Th/U plot shown in Fig. 4 illustrates the affinity between: 1) the Yemen-Afar sources and obsidian artefacts from Upper Egypt, including the Elkab flake ELK12-F05 (cluster "a" in Fig. 4); 2) the Near Eastern obsidian sources and the Buto bladelet core (cluster "b" in Fig. 4).

The REE pattern of the Elkab flake is plotted against potential obsidian sources, from volcanoes in Yemen and in the Ethiopian Afar region (Fig. 5). Though the patterns of the geological sources are quite similar due to a common intraplate setting, it nonetheless seems that the Elkab sample fits closer to the Afar samples for all the proxies used in this study: Th/Ta and Zn/Zr ratios (as taken from Negash *et al*. 2011), REE patterns and Eu anomaly.

This new analysis of the Elkab flake confirms the overall southern origin of the obsidian used in Upper Egyptian sites. It appears that the source of the material has to be found in mainland Africa, most likely in the Afar triangle (see also Giménez *et al*. 2015). These results provide additional information to

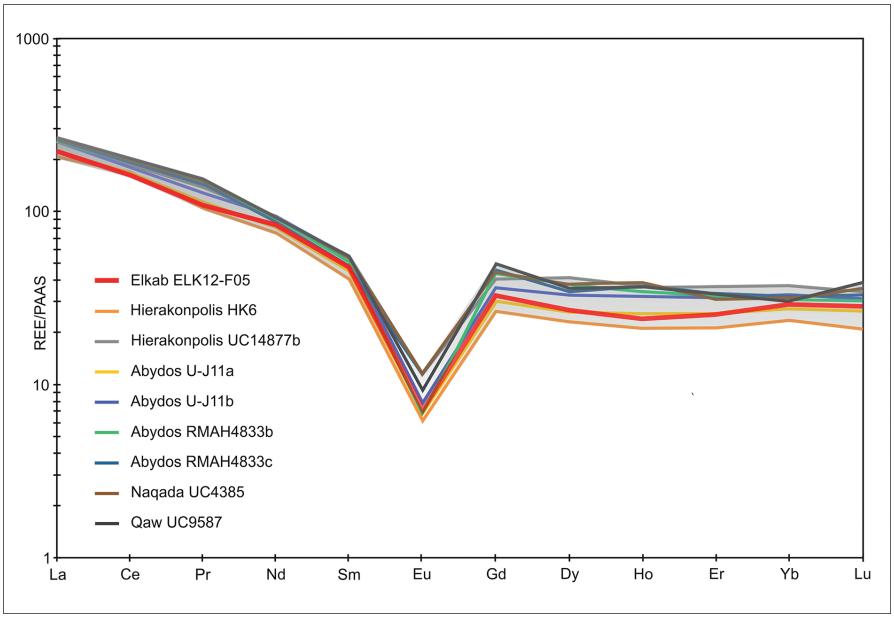


Fig. 3. PAAS-normalised (Taylor & McLennan 1985) rare-earth elements (REE) patterns for Upper Egypt obsidian artefacts: data from Bavay *et al*. 2000; 2004 and this study, sample ELK12-F05 shown in red.

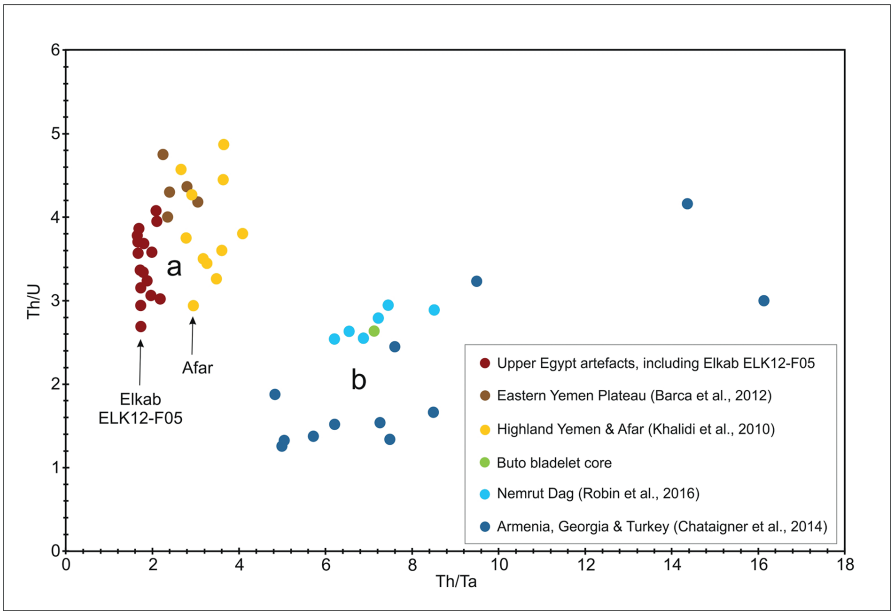


Fig. 4. Th/U vs Th/Ta plot showing two clusters of values: (a) high Th/U values and low Th/Ta values for artefacts from Upper Egypt and Yemeni-Ethiopian obsidian sources; (b) low- to intermediate Th/U values and high Th/Ta values for the Buto bladelet core and Near-Eastern obsidian sources.

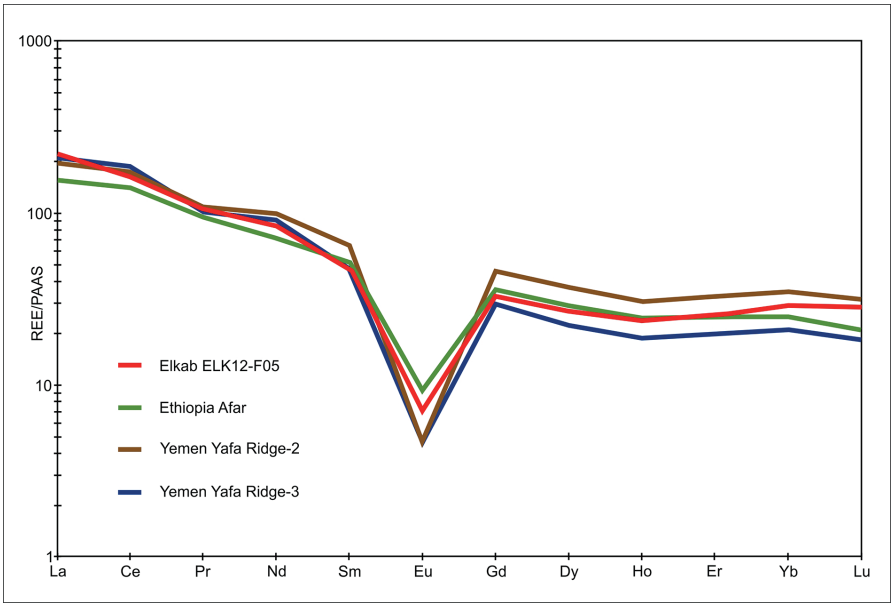


Fig. 5. PAAS-normalised (Taylor & McLennan 1985) REE patterns for ELK12-F05 and likely obsidian sources, in Yemen and—still more comparable—in the Afar (Ethiopia).

our current knowledge regarding the possible exchange routes of the raw material to Upper Egypt, which will be discussed below.

Obsidian exchange routes during the Predynastic and Early Dynastic periods – A review of the evidence

In scientific studies relating to cross-cultural contacts over long distances in prehistoric times, the importance of obsidian was acknowledged very early on (Cauvin 1998a: 10). The first attempts to identify the sources of obsidian found in Egypt date back to the first half of the 20th century (Wainwright 1927; Lucas 1942; 1947) and were followed by several other studies in the subsequent decades (Cann & Renfrew 1964; Renfrew *et al*. 1966; van den Brink 1989; Pernicka 1996; Bavay *et al*. 2000; 2004; Giménez *et al*. 2015).

It is now generally accepted that in late prehistoric times, the procurement of obsidian followed a pattern of successive exchanges that C. Renfrew defined in his pioneering work as 'down-the-line' (Renfrew 1975: 41–48). According to this model, the quantity of the 'traded' items becomes less abundant as the distance to the source area increases. As such, the rarity of obsidian in Egypt is explained, among other factors, by the remoteness of Egypt from the main geological sources. Obviously, this question should be considered on a case-by-case basis to take into account the complexity of human behaviour and the specific local socio-economic and cultural properties of the different communities or groups involved (Cauvin 1998b: 259–260, 267–268; Takamiya 1994).

The East African origin of the Elkab sample seems to confirm the now well-established pattern of obsidian distribution in the Egyptian Nile Valley during pre-pharaonic times (Bavay *et al*. 2000: 17–19; 2004: 614–615). However, this seemingly logical pattern may be biased by the small number of analysed samples originating from Lower Egypt and needs therefore to be considered with caution until more data become available. Indeed, from all the analysed samples, only three were found in Lower Egypt: a knife fragment from Tell el-Iswid (see Catalogue, no. 6; van den Brink 1989; Pernicka 1996), a bladelet core from Buto (see Catalogue, no. 2; Bavay *et al*. 2004) and a fragment of a flake from Gerzeh (see Catalogue, no. 7; Cann & Renfrew 1964: 124, 129, 133).

Until today, it remains unclear how obsidian entered the Egyptian Nile Valley. Previous studies primarily focus on two possible routes, the Red Sea and the Eastern Desert, on the one hand, and overland routes through the Sinai on the other (Tutundžić 1989; Zarins 1989; 1996; Mark 1997). However, based on new data emerging from recent and intensive archaeological research in the deserts south and west of the Egyptian Nile Valley, it is worthwhile to reconsider the question of these routes within a broader framework of various simultaneous supply networks. Recent studies showed indeed that the deserts played

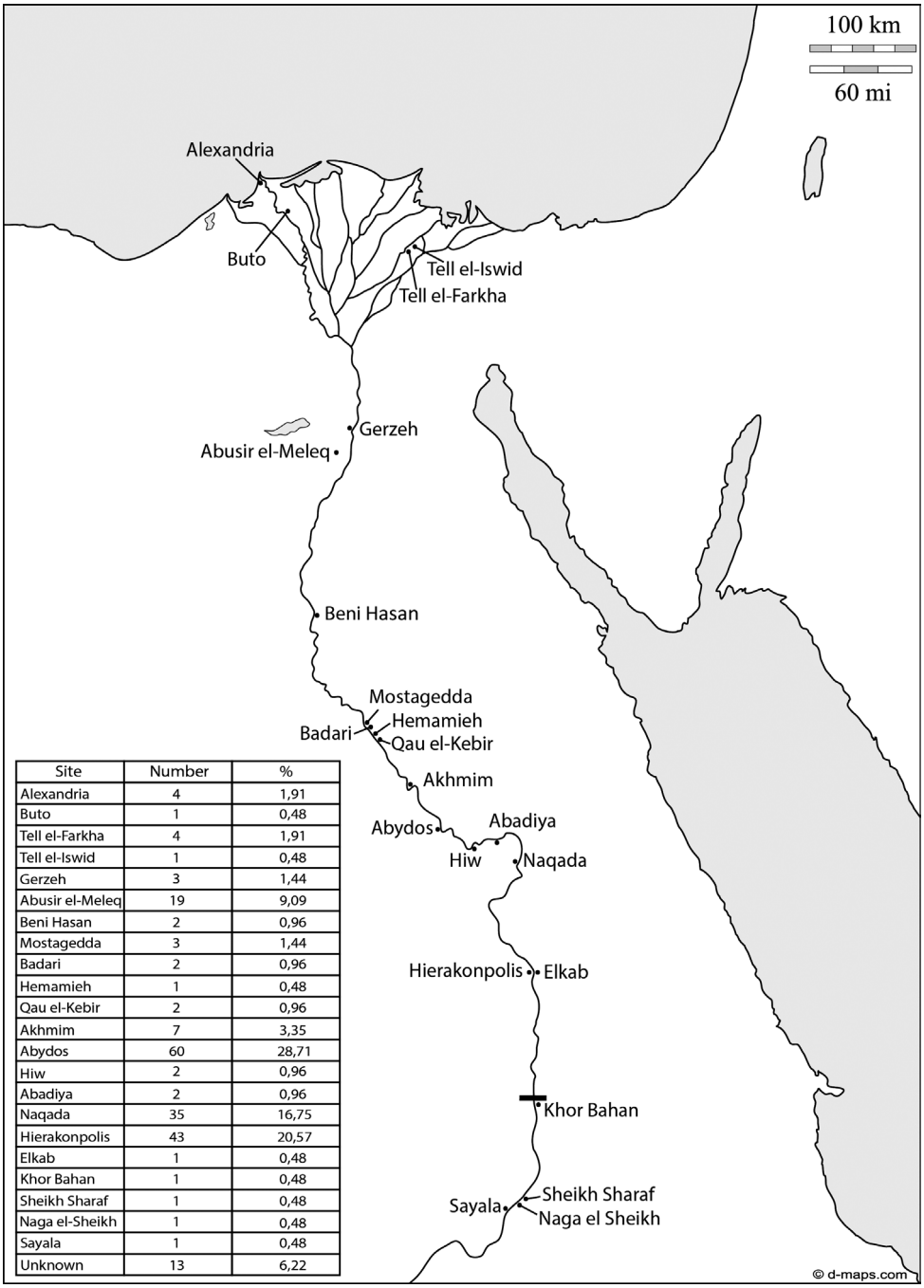
a crucial role in connecting Egypt with its southern neighbours (Riemer *et al*. 2013) and that these remote areas were regularly crossed by groups of different cultural affinities during the 5th and 4th millennium BC.

Because of its rareness, exotic origins and peculiar aspect, the Naqadans probably considered obsidian as an exclusive and prestigious material. Although some rare examples were discovered in settlement areas (see Catalogue, nos 2, 4, 6, 81, 82, 94, 111), it is primarily found in wealthy funerary contexts. Along with lapis lazuli, which is known in Egypt since the Naqada IIC period (Payne 1968; Bavay 1997: 81–82; Aston *et al*. 2000: 39–40; Hendrickx & Bavay 2002: 61–66, tab. 3.3), the presence of obsidian in the archaeological record illustrates the progressive stratification of Naqadan society (Bavay 2000; Bavay *et al*. 2000: 18–19; 2004: 614–615). Based on the rarity of obsidian in Predynastic and Early Dynastic contexts,[9] it has been suggested that its procurement was most probably the result of indirect and occasional contacts rather than through a regular and well-organised exchange system (Bavay *et al*. 2000: 18–19). However, the chronological and geographical distribution of obsidian in Egypt during the 4th millennium BC indeed allows for a more nuanced analysis (Fig. 6).

By the very end of Naqada II and during Naqada III, obsidian was almost exclusively found in centres of power such as Abydos, Naqada and Hierakonpolis.[10] Moreover, the first kings and their elites managed to obtain fragments large enough to manufacture bottles, vases, bowls and plates (see Catalogue, nos 35, 37, 39, 48–51, 53, 56, 57, 61–64, 66, 67, 69–71, 73, 87–93). Thus, even though the overall quantity of obsidian did not particularly increase in comparison with earlier times, the size and quality of the pieces obviously did. On this basis, the procurement of obsidian in early Egypt can be broken down in at least two phases: a first one, from Naqada IC–IIA to Naqada IIC–D, with indirect and irregular procurement; and a second one from Naqada IIIA onwards. The latter phase is characterised by the integration of Egypt into already developed exchange networks, the active search for prestigious goods by powerful and competitive elites, the development of navigation along the Mediterranean coast and, ultimately, the formation of the incipient Egyptian state.

[9] At least 209 fragments of obsidian (see Catalogue) and at least 130 attestations of lapis lazuli (Hendrickx & Bavay 2002: tab. 3.3; Vanhulle 2011) have been documented while more than 15.000 tombs are known for the 4th millennium BC (Hendrickx & van den Brink 2002: 346, tab. 23.1).

[10] A notable exception is the site of Abusir el-Meleq where no less than 19 obsidian objects have been attested, while only a handful of fragments have been found at the other sites (see Catalogue and Fig. 6).



Site	Number	%
Alexandria	4	1,91
Buto	1	0,48
Tell el-Farkha	4	1,91
Tell el-Iswid	1	0,48
Gerzeh	3	1,44
Abusir el-Meleq	19	9,09
Beni Hasan	2	0,96
Mostagedda	3	1,44
Badari	2	0,96
Hemamieh	1	0,48
Qau el-Kebir	2	0,96
Akhmim	7	3,35
Abydos	60	28,71
Hiw	2	0,96
Abadiya	2	0,96
Naqada	35	16,75
Hierakonpolis	43	20,57
Elkab	1	0,48
Khor Bahan	1	0,48
Sheikh Sharaf	1	0,48
Naga el-Sheikh	1	0,48
Sayala	1	0,48
Unknown	13	6,22

Fig. 6. Map and overview of Pre- and Early Dynastic sites in Egypt and Nubia where obsidian has been found.

Phase 1: Naqada IC–IIA to IIC–D

Obsidian is extremely rare in the Egyptian Nile Valley prior to the Naqada II period with only three possible attestations currently documented (Abadiya and Hierakonpolis; see Catalogue nos 76, 94, 95)[11]. Their dating has been established from their archaeological context and should be considered with caution. As far as we know, the Naqadans did not expand south of Armant before Naqada IC (Gatto 2009: 127; 2014: 111). The procurement of East African obsidian by the Naqadans seems thus unlikely before the very end of the Naqada I period.

Because obsidian was already exchanged between Ethiopia and Yemen during the 6th millennium BC (Francaviglia 1996; Inizan & Francaviglia 2002: 18; Khalidi 2007; 2009; Khalidi *et al*. 2010; 2012; 2013), a maritime route into Egypt involving the Red Sea and the crossing of the Eastern Desert seems plausible, although almost impossible to prove (Kantor 1965: 11–14; Zarins 1989; 1996; Bavay *et al*. 2000: 18).[12] The use of the Red Sea cannot entirely be ruled out but remains a matter of speculation. Maritime expeditions are expensive, require a high level of social and political organisation and would imply the existence of a complex exchange network along the African shores of the Red Sea during the second half of the 4th millennium BC. Obviously, from this perspective, obsidian would only be one of several categories of exotic goods and raw materials intended for exchange. It is also well known that navigating the northern half of the Red Sea was difficult and dangerous during most of the year (Facey 2004; Fabre 2005: 36; Boivin *et al*. 2009: 254–255; Boivin & Fuller 2009: 118; Cooper 2014: 173–182, fig. 11.3–4). Moreover, the degree of nautical development achieved in the Naqada III period most likely only allowed navigation on a limited and seasonal basis.[13] So far there is no archaeological evidence that supports the existence of such a maritime

[11] Brunton also mentions very small ring beads, made out of a hard black stone "looking like obsidian", that were found in tomb 547, which is dated to the Badarian (Brunton 1937: 51; see Catalogue no. 21).

[12] The Ethiopian and Yemeni shores lie around 100 km apart (Khalidi 2009: 281) and the archipels of Farasān and Dahlak served as intermediates in these exchanges. We are thus facing a very different geographical situation, that cannot be compared with navigating the Red Sea up to for instance the Wadi Hammamat which is situated more than 1000 km to the north.

[13] Reed boats coated with bitumen were used in an exchange network connecting the Persian Gulf with the Arabian Peninsula during the 6th millennium BC (Carter 2002; 2006; 2010; Carter & Crawford 2010). The first undeniable attestations of a sail, which signifies a major step in nautical development, appear as early as the Naqada IIIA period, like for instance on the decorated jar BM E35324, bearing the depiction of a wooden boat with a sail (Huyge & Darnell 2010). Moreover, the discovery at Wadi el-Jarf of highly advanced vessels, dating to the reign of Khufu (Tallet 2013), illustrates that maritime technology already knew a relatively long history of development by the beginning of the Old Kingdom. However, when Egyptians started building their own sea-going vessels still remains a matter of speculation (Meeks 1997).

route connecting Egypt to the southern parts of the Red Sea during the 4th millennium BC.

The maritime hypothesis has been recently dismissed in favour of a land and/or fluvial route involving the A-Group (Giménez *et al*. 2015: 356–359). It is, however, important to note that the interaction and exchange of goods in Predynastic times between the Naqadans and the A-Group seem not to have extended south of the Dakka/Sayala region (Edwards 2004: 72). Despite intensive surveys and excavations, only four fragments of obsidian have so far been reported from sites in Lower Nubia (see Catalogue nos 112–115). Its virtual absence in Nubia, and more significantly also in Elephantine, raises doubts as to obsidian entering Egypt from Ethiopia through the Nile Valley (Bavay *et al*. 2000: 17–18; Roy 2011: 264).

Considering the lack of evidence for a maritime route from Upper Egypt to the southern parts of the Red Sea in Predynastic times, and its virtual absence at sites along the Nile Valley between the Ethiopian sources and the Elkab/Hierakonpolis region, we tentatively suggest that obsidian must have reached the Upper Egyptian Nile Valley primarily by routes through the desert. However, the fact that not a single obsidian fragment has yet been discovered in the Western Desert could hint at the fact that the desert groups interacting with the Nile Valley made no functional use of this raw material. This does not exclude, however, that they realised its exchange value for the Naqadan elites. What Egyptians exchanged for obsidian remains a matter of discussion.

The role of the Western Desert as a "highway" for goods and people, and its impact on the cultural development of the Nile Valley has long been underestimated. Indeed, intensive research conducted in the Sahara since the 1970's (for an excellent overview and a current state of research, see: Riemer *et al*. 2013, with further references) showed that mobile groups occupied the desert from the onset of the Holocene. The cemeteries at Gebel Ramlah, dated to the mid-5th millennium BC, share strong similarities with other cemeteries in Sudanese Nubia (Kobusiewicz *et al*. 2010: 251–253). The funerary materials, which include turquoise from the Sinai, sub-Saharan ivory, and also shells and mica from the Red Sea Mountains (Kobusiewicz *et al*. 2010: 256), testify to regular contacts between the Sahara and both the Nile Valley and East Africa (Wendorf & Schild 2004: 24–25). Like it is the case for the Eastern Desert, the presence of rock art also confirms that the Naqadans used the wadis of the Western Desert (Hendrickx & Friedman 2002: 17–19; 2003; Darnell 2002; 2009; 2011; 2013) and penetrated west as far as the oases of the central Western Desert (Hope 1999; 2002; Ikram 2009; Hendrickx *et al*. 2009; Lucarini & Mariotti 2014; see also: Rossi & Ikram 2018: 330–331). Transit camps have also been discovered in, for instance, the Laqiya area, some 400 km to the south-west of the Second Cataract, and at Bir Sahara, where ceramics belonging to the A-Group/Naqada III period have been found (Gatto 2001–2002;

Lange 2003; Riemer 2013: 80–81; Riemer *et al*. 2013: 177–179). Clayton rings, used by human groups navigating the desert (Riemer & Kuper 2000; Riemer 2004; 2013: 81), have been found regularly at such sites in the Western Desert, but also in the Eastern Desert and Israel (Braun & van den Brink 2008: 652; Riemer 2013: 82, fig. 4). All of this allows for a better understanding of the human occupation of the desert and the intercultural contacts that took place there, and strongly advocate for the use of the Sahara by groups of both Nubian and Egyptian affiliation.

The route by which obsidian reached Lower Egypt is somewhat easier to apprehend. Contacts between the Lower Egyptian cultures and the Levant are indeed well attested: Palestinian copper from Wadi Feinan and Timna made its way to the Delta along with some categories of Levantine ceramics and lithic technologies (Mączyńska 2013; 2014: 185–190). The development of sites such as Minshat Abu Omar and Tell el-Farkha in the eastern Delta, is another testimony in favour of an overland route through the Sinai.[14] Obsidian from Anatolia reached Lower Egypt most probably through these networks, although in such small quantities that its procurement could very well have been accidental. The circulation of goods by boat along the Mediterranean coast is also a possibility, although undocumented before the Early Bronze Age I/ Naqada IIC–IIIA (Ward 1963; 1964; Marcus 2002).

Despite Egypt's growing means and increased regional power, the 'down-the-line' model may explain why obsidian objects have not been found in larger quantities and on a more widespread scale. However, studies focussing on the exchange of commodities between Egypt and Nubia indicate that the 'down-the-line' model is not corroborated by the archaeological data since the decline of available goods appears to be linear and not exponential. During the Naqada III period, a more direct exchange pattern seems to be in place in which local A-Group chiefs acted as middlemen for direct reciprocal transactions with Naqadan merchants (Takamiya 2004: 57). Contacts with the region of the Second Cataract, where local populations may have acted as "intermediaries with areas further south", have also been suggested (Edwards 2004: 72–73; Takamiya 1994). Within this framework, the Naqadans were able to obtain or procure exotic products such as ivory, ebony, ostrich eggs or feathers and it would seem reasonable to expect the presence of obsidian among these exotic goods. Its virtual absence in Lower Nubia, however, especially in sites such as Qustul and Sayala (Williams 1986), is conspicuously striking and could in our opinion suggest that it was not transported into Egypt through the Nubian Nile Valley.

[14] Recent research conducted in the area of the military road, known as the 'Ways of Horus', confirms that this "route was regularly used from the middle of the 4th millennium" (Hoffmeier & Moshier 2013: 507).

Phase 2: Naqada IIIA–IIIC2

The progressive stratification of Naqadan society reaches its apex during the Naqada III period. The HK6 Elite Cemetery in Hierakonpolis (Friedman 2010) and Cemetery U in Abydos (Hartung 2001) offer explicit examples of the need (or greed?) of the leaders for exceptional and valuable products in order to display their status and power. HK6 tomb 11 (Adams 2000) and the famous tomb U-j (Dreyer 2011), among other examples, testify to the power and influence of these rulers to gain access to foreign exchange networks. The procurement of obsidian is not incidental anymore since large chunks of raw material were then manufactured into high-quality vessels by professional craftsmen. However, the overall quantity of obsidian that reached Egypt remains limited.

The apparent elimination of the A-Group in Lower Nubia during the 1st Dynasty (Gatto 2019: 278–284), the progressive incorporation of the deserts into the political spheres of influence of Naqadan rulers and, ultimately, of the centralised Egyptian State[15] (Darnell 2013: 785–789), undoubtedly had an impact on the existing modes of exchange between Egypt and its southern neighbours. Informal and irregular contacts with nomadic populations in the Western Desert could be controlled more easily by the new administration and obsidian could be procured by better structured networks.

It is remarkably striking that this volcanic glass, as also lapis lazuli, has not yet been found in the Memphite necropolis. Whether this material was exclusively intended for the royal families of the first Egyptian dynasties is difficult to prove, but it seems that the amount of available obsidian was probably not high enough to share it with the high members of the administration. The absence of obsidian in Early Dynastic cultic deposits is another interesting observation and seems to indicate that it was not attached with any particular sacred power nor that it was used during the performance of rituals.[16] Its provenance raises a number of questions as well. Following the foundation of

[15] In our opinion, such an assumption can be advanced on the basis of the appearance of official rock art engravings, made by professional artists and depicting a clear royal iconography, that were commissioned from the Naqada IIIA period onwards by the first kings of the incipient Egyptian state to seize or affirm royal (ritual) control over remote areas (Darnell 2009). Among these engravings are famous examples such as the tableaus found at Gebel Sheikh Suleiman (Somaglino & Tallet 2014) and the Nag el-Hamdulab compositions (Hendrickx *et al*. 2012a–b), as well as the recently discovered engravings in the southern Sinai Peninsula (Tallet 2015).

[16] The general find context of some of the obsidian fragments can be defined as 'ritual/ceremonial' but this does not necessarily mean that they were indeed used for the performance of rituals. Notable exceptions are a number of obsidian *peseshkaf* knifes (see Catalogue, nos 4, 26–30, 45). These objects are known to have been used, from the Old Kingdom onwards, by the priest during the ritual of the Opening of the Mouth. They are usually made out of flint or, sometimes, in black stones such as steatite and black jasper (Massoulard 1936: 154–157; Coqueugniot 1998: 355).

Memphis as the new capital of the unified Egyptian state, as well as the influx and procurement of wood, metal, oil and wine from the Levant, an Anatolian origin of Early Dynastic obsidian objects would seem more logical and would suggest that most foreign products arrived in Egypt from the north. However, it is important to acknowledge the fact that the analysis of several obsidian samples from a well-dated 1st Dynasty context in Abydos (see Catalogue nos 48, 71; Bavay 2000: 9–11) confirms their Ethiopian origin. This clearly illustrates that simplistic schemes alone will not allow us to completely understand how rare and exotic materials like obsidian found their way into Egyptian society.

In Lower Egypt, the situation did not drastically change during the Naqada III period. The existence of a maritime route connecting Byblos with the Delta in the Early Bronze Age I is now no longer contested, especially since the discovery of several anchorage sites from that period along the Syro-Palestinian coast (Gophna 2002; Sharvit *et al*. 2002). Moreover, following the abandonment of the Egyptian colonies in the Levant around Naqada IIIC, imported goods from the Near East, such as lapis lazuli and cedar, were transported by sea (Prag 1986; Stager 2001; Hikade 2012: 836). This sea route even could have surpassed the traditional land route through actual Gaza and the Sinai (Wilkinson 1999: 160–162). The use of cedar in the construction of the royal tombs at Umm el-Qaab, but also the two ivory labels of Aha mentioning the transport of Levantine oil by boat (Spencer 1980: 64.3; O'Connor 1987: 33–34; Jiménez-Serrano 2002: 60; Tallet 2015: 26, fig. 57), are more testimony of the existence of a complex exchange network in the Mediterranean by the end of the 4th millennium BC. The discovery of a stone vase bearing the name of Khasekhemwy in Byblos should also be mentioned (Dunand 1937: pl. 39, no. 1115; 1939: 26), but the fact that it was an isolated find, lacking a solid archaeological context, prevents it from being a robust argument for the existence of an exchange network.

Like lapis lazuli, obsidian disappears from the archaeological record between the 2nd and the 4th Dynasty (Bavay 1997; Aston *et al*. 2000: 47). The reasons behind this sudden disappearance are difficult to evaluate. However poorly understood, it seems that the political and perhaps also social turmoil that took place during the 2nd Dynasty (Dodson 1996; Wilkinson 1999: 82–94) resulted in the withdrawal of Egypt from the exchange networks in which it was involved. The abandonment of the colonies in the Levant in the second half of the 1st Dynasty (De Miroschedji 2002: 45–47; Braun 2011: 119–120; Mumford 2014: 71–72) could also have impacted the procurement of obsidian. The 3rd millennium BC saw the development of new networks in the Mediterranean and the domination of powerful states in the Nile Valley and the Near East. The situation was thus far more complex than before and no direct comparisons can be drawn.

Conclusion

Based on our analysis of the available data, it seems plausible to state that most of the obsidian originating from Ethiopia, reached Egypt through the deserts and that its procurement, for which Nubian-related desert nomadic groups acted as middle-men, was largely incidental prior to the Naqada III period. From the onset of the latter period, the situation seems to change and the procurement of obsidian appears no longer to be incidental as a result of the political and socio-economic changes that lie at the foundation of the progressive formation of the Egyptian state. The development of a maritime exchange route along the Mediterranean shores, but also of sites such as Tell el-Farkha and Minshat Abu Omar in the western Delta as well as the Egyptian presence in the Levant, testifies to the focus of the new centralised administration on exchange networks concentrated in the north of Egypt. In the course of the 1st Dynasty, the Egyptian rulers tried to consolidate the official borders of their land. In doing so, they abandoned their colonies in the Levant and pushed back the A-Group beyond the Second Cataract while at the same time, they also tried to regulate the access and movement of goods and people through the deserts. Although this does not imply that obsidian originating from Ethiopia was no longer brought into Egypt—as shown by the provenance of some fragments from tomb U-j, the tomb of Djer and three other fragments from an undetermined tomb from Umm el-Qaab (Bavay *et al*. 2000: 9–11)—we nevertheless consider it more likely that the Near East gradually becomes the predominant source of obsidian from the Naqada III period.

This two-phased approach of obsidian procurement highlights some of the socio-economic developments occurring during the Predynastic period and the changes following the formation of the Egyptian state. Prior to the 1st Dynasty, the Egyptian territory was occupied by a patchwork of different socio-political entities that gradually developed into centres of power with borders that fluctuated between these "areas of influence". Ultimately, the centralised Egyptian state with official borders emerged. Interactions between the Nile Valley and the neighbouring deserts were probably established on a regular basis and facilitated by the fact that the Western Desert was still, during most of the 4th millennium BC, far less arid and inhospitable than it is today. It is thus reasonable to believe that the Nile Valley and the deserts were, to some extent, vast open corridors of communication and that the Naqadans favoured interaction with these neighbouring cultural groups in the desert and Lower Nubia instead of developing contacts with the Near East and the Red Sea for their obsidian procurement.

While the actions of the first kings before the reign of Narmer and the political unification of Egypt remain largely unknown, the content of tomb U-j (Dreyer 2011) as well as the rock inscriptions mentioning Iry-Hor and,

possibly, Sekhen/Ka in the South-Sinai Peninsula (Tallet 2015: 10, 12, pls 7–8, 10), are perfect examples of the desire of these early rulers to expand and consolidate the Egyptian economic relations with the Near East. The Egyptian colonies in the Levant are another good example of this political strategy during the Naqada IIIA–B period (De Miroschedji 2002). However, from the 1st Dynasty onwards, relations underwent a radical change. As the limits of what was to become the Egyptian territory needed to be defined, the first kings and the developing new central administration focussed on the consolidation of their borders. This led to the progressive withdrawal and abandonment of the Levantine colonies and probably also explains the expeditions that were organised to eradicate the threat arising in Lower Nubia (Gatto 2019: 278–284). The appearance of official rock engravings, such as those in the southern Sinai (Tallet 2015), Wadi el-Humur (Ibrahim & Tallet 2008) or Gebel Sheikh Suleiman (Somaglino & Tallet 2014), combined with the apparent drop in the number of rock engravings in the Eastern Desert during the Naqada IIIC period,[17] suggests that the central Egyptian state tried to regulate access to these regions. There are good reasons to believe that the deserts probably became some sort of 'buffer zones' which made reciprocal contacts and exchange less easy. Moreover, the elaboration of state borders also resulted in the notion of defining every foreigner as a potential threat or enemy of Egypt that the pharaoh must subjugate in order to avert chaos and maintain Maat. These elements, in combination with the foundation of Memphis as the new capital, suggest that, from the mid-1st Dynasty onwards, most of the exotic goods may have entered Egypt through the Mediterranean and the eastern Delta. Occasional contacts with foreign groups in the desert passed beyond the needs of the centralised and powerful Egyptian administration. From this perspective, it would be interesting to analyse additional obsidian samples, especially those from Naqada III contexts of Umm el-Qaab and Naqada, in order to ascertain the source area of the stone. If an African origin is obviously to be expected, a larger influx of obsidian of Near Eastern provenance would not be so surprising after all.

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[17] During the 1st Dynasty, the amount of rock engravings seems indeed to be less abundant in comparison to previous times. When present, it looks as if they are concentrated in specific areas and sometimes even modified already existing images. However, this observation, resulting from a recent doctoral research (Vanhulle 2016), remains to be confirmed by more in-depth analysis.

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Bibliography

ADAMS, B., 1974a. *Ancient Hierakonpolis*. Warminster.

ADAMS, B., 1974b. *Ancient Hierakonpolis: Supplement*. Modern Egyptology Series. Warminster.

ADAMS, B., 1995. *Ancient Nekhen: Garstang in the city of Hierakonpolis*. Egyptian Studies Association Publication 3. New Malden.

ADAMS, B., 1996a. Elite graves at Hierakonpolis [in:] SPENCER, J. (ed.), *Aspects of early Egypt*. London: 1–15.

ADAMS, B., 1996b. Imports and imitations in Predynastic funerary contexts at Hierakonpolis [in:] KRZYŻANIAK, L.; KROEPER, K. & KOBUSIEWICZ, M. (eds), *Interregional contacts in the later prehistory of Northeastern Africa*. SAA 5. Poznań: 133–143.

ADAMS, B., 1998. Something very special down in the Elite Cemetery. *Nekhen News* 10: 3–4.

ADAMS, B., 1999. Discovery of a Predynastic elephant burial at Hierakonpolis. *Archaeology International* 2: 46–50.

ADAMS, B., 2000. *Excavations in the Locality 6 Cemetery at Hierakonpolis 1979–1985*. Egyptian Studies Association Publication 4; BAR. International Series 903. Oxford.

ADAMS, B. & FRIEDMAN, R.F., 1992. Imports and influences in the Predynastic and Protodynastic settlement and funerary assemblages at Hierakonpolis [in:] VAN DEN BRINK, E.C.M. (ed.), *The Nile Delta in transition: 4th. –3rd. millennium B.C. Proceedings of the Seminar held in Cairo, 21.–24. October 1990, at the Netherlands Institute of Archaeology and Arabic Studies*. Tel Aviv: 317–338.

[ASHMOLEAN REPORT], 1900. Egypt: Relics from the royal tombs of the first dynasties at Abydos. *Ashmolean Museum and University Galleries. Report of the Keeper of the Ashmolean Museum for the Year 1900*: 2–5.

ASTON, B.G.; HARRELL, J.A. & SHAW, I., 2000. Stone [in:] NICHOLSON, P.T. & SHAW, I. (eds), *Ancient Egyptian materials and technology*. Cambridge: 5–77.

BAINES, J., 2010, Aesthetic culture and the emergence of writing in Egypt during Naqada III. *Archéo-Nil* 20: 134–149.

BAUMGARTEL, E.J., 1970. *Petrie's Naqada excavation: A supplement*. London.

BARCA, D.; LUCARINI, G. & FEDELE, F.G., 2012. The provenance of obsidian artefacts from the Wādī Ath-Thayyilah 3 Neolithic site (Eastern Yemen Plateau) by LA-ICP-MS. *Archaeometry* 54(4): 603–622.

BAVAY, L., 1997. Matière première et commerce à longue distance : Le lapis-lazuli et l'Égypte prédynastique. *Archéo-Nil* 7 : 79–100.

BAVAY, L., 2000. La pierre et le pouvoir dans l'Égypte prépharaonique et des premières dynasties [in:] KARLSHAUSEN, C. & DE PUTTER, T. (eds), *Pierres égyptiennes… Chefs-d'œuvre pour l'éternité*. Mons: 63–67.

BAVAY, L.; DE PUTTER, T.; ADAMS, B.; NAVEZ, J. & ANDRÉ, L., 2000. The origin of obsidian in Predynastic and Early Dynastic Upper Egypt. *MDAIK* 56: 5–20.

BAVAY, L.; FALTINGS, D.; ANDRÉ, L. & DE PUTTER, T., 2004. A bladelet core from Tell el-Fara'in-Buto and the origin of obsidian in the Buto-Maadi culture of Lower Egypt [in]: HENDRICKX, S.; FRIEDMAN, R.F.; CIAŁOWICZ, K.M. & CHŁODNICKI, M. (eds), *Egypt at its Origins: Studies in memory of Barbara Adams. Proceedings of the International Conference "Origin of the State. Predynastic and Early Dynastic Egypt", Kraków, 28th August–1st September 2002*. OLA 138. Leuven: 608–619.

BIETAK, M. & ENGELMAYER, R., 1963. *Eine Frühdynastische Abri-Siedlung mit Felsbildern aus Sayala-Nubien*. Österreichische Akademie der Wissenschaften. Philosophisch-Historische Klasse. Denkschriften 82; BÖN 1. Vienna.

BLEIBERG, E., 2008. *To live forever: Egyptian treasures from the Brooklyn Museum*. Brooklyn.

BOIVIN, N.; BLENCH, R. & FULLER, D.Q., 2009. Archaeological, linguistic and historical sources on ancient seafaring: A multidisciplinary approach to the study of early maritime contact and exchange in the Arabian peninsula [in:] PETRAGLIA, M.D. & ROSE, J.I. (eds), *The evolution of human populations in Arabia: Paleoenvironments, prehistory and genetics*. Vertebrate Paleobiology and Paleoanthropology. Dordrecht: 251–278.

BOIVIN, N. & FULLER, D.Q., 2009. Shell middens, ships and seeds: Exploring coastal subsistence, maritime trade and the dispersal of domesticates in and around the ancient Arabian peninsula. *JWP* 22(2): 113–180.

BRAUN, E., 2011. Early interaction between peoples of the Nile Valley and the Southern Levant [in:] TEETER, E. (ed.), *Before the pyramids: The origins of Egyptian civilization*. OIMP 33. Chicago: 105–122.

BRAUN, E. & VAN DEN BRINK, E.C.M., 2008. Appraising South-Levantine-Egyptian interaction: Recent discoveries from Israel and Egypt [in:] MIDANT-REYNES, B. & TRISTANT, Y. (eds); ROWLAND, J. & HENDRICKX, S. (coll.), *Egypt at its Origins 2. Proceedings of the International Conference "Origin of the State. Predynastic and Early Dynastic Egypt", Toulouse (France), 5th–8th September 2005*. OLA 172. Leuven: 644–688.

BRUNTON, G., 1937. *Mostagedda and the Tasian culture*. British Museum Expedition to Middle Egypt. London.

BRUNTON, G. & CATON-THOMPSON, G., 1928. *The Badarian civilisation and Predynastic remains near Badari*. BSAE/ERA 46. London.

CANN, J.R. & RENFREW, C., 1964. The characterization of obsidian and its application to the Mediterranean region. *Proceedings of the Prehistoric Society. N.S.* 30: 111–133.

CARTER, R., 2002. The Neolithic origins of seafaring in the Arabian Gulf. *Archaeology International* 6: 44–47.

CARTER, R., 2006. Boat remains and maritime trade in the Persian Gulf during the sixth and fifth millennia BC. *Antiquity* 80(307): 52–63.

CARTER, R.A., 2010. The social and environmental context of Neolithic seafaring in the Persian Gulf [in:] ANDERSON, A.; BARRETT, J.H. & BOYLE, K.V. (eds), *The global origins and development of seafaring*. Cambridge: 191–202.

CARTER, R. & CRAWFORD, H., 2010. *Maritime interactions in the Arabian Neolithic: Evidence from H3, As-Sabiyah, an Ubaid-Related Site in Kuwait*. American School of Prehistoric Research Monographs Series 8. Leiden.

CAUVIN, M.-C., 1998a. L'obsidienne au Proche et Moyen Orient : Présentation et historique [in:] CAUVIN, M.-C.; GOURGAUD, A.; GRATUZE, B.; ARNAUD, N.; POUPEAU, G.; POIDEVIN, J.-L. & CHATAIGNER, C. (eds), *L'obsidienne au Proche et*

Moyen Orient : Du volcan à l'outil. BAR. International Series 738. Oxford: 7–11.

CAUVIN, M.-C., 1998b. L'obsidienne : Données récentes provenant de sites-habitats néolithiques [in:] CAUVIN, M.-C.; GOURGAUD, A.; GRATUZE, B.; ARNAUD, N.; POUPEAU, G.; POIDEVIN, J.-L. & CHATAIGNER, C. (eds), *L'obsidienne au Proche et Moyen Orient : Du volcan à l'outil*. BAR. International Series 738. Oxford: 259–271.

CHATAIGNIER, C. & GRATUZE, B., 2014. New data on the exploitation of obsidian in the Southern Caucasus (Armenia, Georgia) and Eastern Turkey, part 1: Source characterization. *Archaeometry* 56(1): 25–47.

CHŁODNICKI, M. & CIAŁOWICZ, K.M., 2002. Polish excavations at Tell el-Farkha (Ghazala) in the Nile Delta: Preliminary report 1998–2001. *Archeologia. Rocznik Instytutu Archeologii i Etnologii Polskiej Akademii Nauk* 53: 63–119.

CHŁODNICKI, M. & CIAŁOWICZ, K.M., 2013. Polish excavations at Tell el-Farkha (Ghazala) in the Nile Delta: Preliminary report 2011–2013. *Archeologia. Rocznik Instytutu Archeologii i Etnologii Polskiej Akademii Nauk* 64: 99–140.

CHŁODNICKI, M. & CIAŁOWICZ, K.M., 2015. Tell el-Farkha excavations, 2012–2013. *PAM* 24(1): 173–197.

CLAES, W.; HENDRICKX, S.; DEVILLERS, A.; HART, E.; KINDERMANN, K.; DE DAPPER, M.; IKRAM, S.; STORMS, G.; SWERTS, C. & HUYGE, D., 2014. From the early Old Kingdom to the Badarian: Preliminary report on the 2012 excavation campaign in the settlement area of Elkab [in:] MĄCZYŃSKA, A. (ed.), *The Nile Delta as a centre of cultural interactions between Upper Egypt and the Southern Levant in the 4th millennium BC*. SAA 13. Poznań: 77–85.

CLAES, W. & HUYGE, D., 2016. Finds from Elkab: Revealing the origins of the settlement. *EA* 49: 38–42.

CLAES, W. & HUYGE, D., 2017. La zone d'habitat d'Elkab : À la recherche des origines de l'urbanisation en Égypte ancienne. *Science Connection* 55: 44–48.

CLARKE, S., 1922. El-Kâb and its temples. *JEA* 8: 16–40.

COQUEUGNIOT, É., 1998. L'obsidienne en Méditerranée orientale aux époques post-Néolithiques [in:] CAUVIN, M.-C.; GOURGAUD, A.; GRATUZE, B.; ARNAUD, N.; POUPEAU, G.; POIDEVIN, J.-L. & CHATAIGNER, C. (eds), *L'obsidienne au Proche et Moyen Orient : Du volcan à l'outil*. BAR. International Series 738. Oxford: 351–361.

COOPER, J.P., 2014. *The medieval Nile: Route, navigation, and landscape in Islamic Egypt*. Cairo.

DARNELL, J.C., 2002. *Theban Desert Road Survey in the Egyptian Western Desert 1: Gebel Tjauti rock inscriptions 1–45 and Wadi el-Ḥôl rock inscriptions 1–45*. OIP 119. Chicago.

DARNELL, J.C., 2009. Iconographic attraction, iconographic syntax, and tableaux of royal ritual power in the Pre- and Proto-Dynastic rock inscriptions of the Theban Western Desert. *Archéo-Nil* 19: 83–107.

DARNELL, J.C., 2011. The Wadi of the Horus Qa-a: A tableau of royal ritual power in the Theban Western Desert [in:] FRIEDMAN, R.F. & FISKE, P.N. (eds), *Egypt at its Origins 3. Proceedings of the Third International Conference "Origin of the State. Predynastic and Early Dynastic Egypt", London, 27th July–1st August 2008*. OLA 205. Leuven: 1151–1193.

DARNELL, J.C., 2013. *Theban Desert Road Survey 2: The rock shrine of Pahu, Gebel Akhenaton, and other rock inscriptions from the Western hinterland of Qamûla*. Yale Egyptological Publications 1. New Haven CT.

DE MEULENAERE, H., 1970. Elkab 1966–1969 : Le secteur archaïque. *CdÉ* 45(89): 19–44.

DE MEULENAERE, H., 1975. Elkab [in:] *LdÄ I*: 1225–1227.

DE MIROSCHEDJI, P., 2002. The socio-political dynamics of Egyptian-Canaanite interaction in the Early Bronze Age [in:] VAN DEN BRINK, E.C.M. & LEVY, T.E. (eds), *Egypt and the Levant: Interrelations from the 4th through the early 3rd millennium BCE*. New Approaches to Anthropological Archaeology. London: 39–57.

DE MORGAN, J., 1897. *Recherches sur les origines de l'Égypte : Ethnographie préhistorique et tombeau royal de Négadah*. Paris.

DODSON, A., 1996. The mysterious 2nd Dynasty. *KMT* 7(2): 19–31.

DREYER, G., 1992. Recent discoveries at Abydos Cemetery U [in:] VAN DEN BRINK, E.C.M. (ed.), *The Nile Delta in transition: 4th.–3rd. millennium B.C. Proceedings of the Seminar held in Cairo, 21.–24. October 1990, at the Netherlands Institute of Archaeology and Arabic Studies*. Tel Aviv: 293–299.

DREYER, G., 1993. Umm el-Qaab: Nachuntersuchungen im frühzeitlichen Königsfriedhof: 5./6. Vorbericht. *MDAIK* 49: 23–62.

DREYER, G., 1998. *Umm el-Qaab 1: Das Prädynastische Königsgrab U-j und seine frühen Schriftzeugnisse*. AV 86. Mainz am Rhein.

DREYER, G., 2009. Report on the 21st campaign of reexamining the royal tombs of Umm el-Qaab at Abydos 2006/2007. *ASAÉ* 83: 165–175.

DREYER, G., 2011. Tomb U-j: A royal burial of Dynasty 0 at Abydos [in:] TEETER, E. (ed.), *Before the pyramids: The origins of Egyptian civilization*. OIMP 33. Chicago: 127–136.

DREYER, G.; BLÖBAUM, A.I.; ENGEL, E.-M.; KÖPP, H. & MÜLLER, V., 2011. Umm el-Qaab: Nachuntersuchungen im frühzeitlichen Königsfriedhof: 19./20./21. Vorbericht. *MDAIK* 67: 53–92.

DREYER, G.; ENGEL, E.-M.; HARTUNG, U.; HIKADE, T.; KÖHLER, E.C. & PUMPENMEIER, F., 1996. Umm el-Qaab: Nachuntersuchungen im frühzeitlichen Königsfriedhof: 7./8. Vorbericht. *MDAIK* 52: 11–81.

DREYER, G.; HARTUNG, U.; HIKADE, T.; KÖHLER, E.C.; MÜLLER, V. & PUMPENMEIER, F., 1998. Umm el-Qaab: Nachuntersuchungen im frühzeitlichen Königsfriedhof: 9./10. Vorbericht. *MDAIK* 54: 77–167.

DUNAND, M., 1937–1939. *Fouilles de Byblos 1: 1926–1932*. Études et Documents d'Archéologie 1. Paris.

EDWARDS, D.N., 2004. *The Nubian past: An archaeology of the Sudan*. London.

ENGEL, E.-M., 2017. *Umm el-Qa'ab 6: Das Grab des Qa'a: Architektur und Inventar*. AV 100. Wiesbaden.

FABRE, D., 2005. *Seafaring in ancient Egypt*. London.

FACEY, W., 2004. The Red Sea: The wind regime and locations of ports [in:] LUNDE, P. & PORTER, A. (eds), *Trade and travels in the Red Sea region. Proceedings of the Red Sea Project I held in the British Museum, October 2002*. BAR. International Series 1269 ; Society for Arabian Studies Monographs 2. Oxford: 7–18.

FALTINGS, D.; BALLET, P.; FÖRSTER, F.; FRENCH, P.; IHDE, C.; SAHLMANN, H.; THOMALSKY, J.; THUMSHIRN, C. & WODZIŃSKA, A., 2000, Zweiter Vorbericht über die Arbeiten in Buto von 1996 bis 1999. *MDAIK* 56: 132–179.

FÉRÉ, 1954. *Fouilles de El Kab : Documents (Livraison III)*. Brussels.

FEUCHT, E., 1986. *Vom Nil zum Neckar: Kunstschätze Ägyptens aus pharaonischer und koptischer Zeit an der Universität Heidelberg*. Berlin.

FIRTH, C.M., 1927. *The archaeological survey of Nubia: Report for 1910–11*. Cairo.

FRANCAVIGLIA, V.M., 1996. Il existait déjà au Néolithique un commerce d'obsidienne à travers la mer Rouge [in:] *L'archéométrie dans les pays européens de langue latine et l'implication de l'archéométrie dans les grands travaux de sauvetage archéologique. Actes du Colloque d'Archéométrie 1995*. Supplément à la Revue

Archéométrie, Pole Editorial Archéologique de l'Ouest (P.E.A.O.). Perigueux: 65–70.

FRANKFORT, H., 1927. *Studies in early pottery of the Near East: Asia, Europe and the Aegean, and their earliest interrelations*. Royal Anthropological Institute. Occasional Papers 8. London.

FRANKFORT, H., 1930. The cemeteries of Abydos: Work of the season 1925–26. *JEA* 16: 213–219.

FRIEDMAN, R.F., 1996. The ceremonial centre at Hierakonpolis locality HK29A [in:] SPENCER, J. (ed.), *Aspects of early Egypt*. London: 16–35.

FRIEDMAN, R.F., 2003. Return to the temple: Excavations at HK29A. *Nekhen News* 15: 4–5.

FRIEDMAN, R.F., 2004. Elephants at Hierakonpolis [in:] HENDRICKX, S.; FRIEDMAN, R.F.; CIAŁOWICZ, K.M. & CHŁODNICKI, M. (eds), *Egypt at its Origins: Studies in memory of Barbara Adams. Proceedings of the International Conference "Origin of the State. Predynastic and Early Dynastic Egypt", Kraków, 28th August–1st September 2002*. OLA 138. Leuven: 131–179.

FRIEDMAN, R.F., 2006. Bigger than the elephant: More surprises at HK6. *Nekhen News* 18: 7–8.

FRIEDMAN, R.F., 2008. Excavating Egypt's early kings: Recent discoveries in the Elite Cemetery at Hierakonpolis [in:] MIDANT-REYNES, B. & TRISTANT, Y. (eds); ROWLAND, J. & HENDRICKX, S. (coll.), *Egypt at its Origins 2. Proceedings of the International Conference "Origin of the State. Predynastic and Early Dynastic Egypt", Toulouse (France), 5th–8th September 2005*. OLA 172. Leuven: 1157–1194.

FRIEDMAN, R.F., 2009. Hierakonpolis locality HK29A: The Predynastic ceremonial center revisited. *JARCE* 45: 79–103.

FRIEDMAN, R.F., 2018. One to remember: Tomb 111 at HK6. *Nekhen News* 30: 4–6.

FRIEDMAN, R.F., 2010. The early royal cemetery at Hierakonpolis: An overview [in:] RAFFAELE, E.; NUZZOLO, M. & INCORDINO, I. (eds), *Recent discoveries and latest researches in Egyptology. Proceedings of the First Neapolitan Congress of Egyptology (Naples, 18th–20th June 2008)*. Wiesbaden: 67–86.

FRIEDMAN, R.F. & DROUX, X., 2018. More adventures under the spoil heap: HK6 in 2018. *Nekhen News* 30: 15–17.

FRIEDMAN, R.F.; HIKADE, T.; BABA, M.; MAJOR, J. & PAULSON, J., 2008. The 2005–2006 field season of the Hierakonpolis expedition. *ASAÉ* 82: 89–111.

FRIEDMAN, R.F.; HIKADE, T.; GELLER, J.; BABA, M.; TAKAMIYA, I.H.; HITOSHI, E.; DROUX, X. & PYKE, G., 2009. Report on the 2006–2007 season of the Hierakonpolis expedition. *ASAÉ* 83: 191–234.

GARSTANG, J., 1904. *Tombs of the Third Egyptian Dynasty at Reqâqnah and Bêt Khallâf*. Report of Excavations at Reqaqnah 1901–2. Westminster.

GATTO, M.C., 2001–2002. Two Predynastic pottery caches at Bir Sahara (Egyptian Western Desert). *Sahara* 13: 51–60.

GATTO, M.C., 2009. Egypt and Nubia in the 5th–4th millennia BCE: A view from the First Cataract and its surroundings. *BMSAES* 13: 125–145.

GATTO, M.C., 2014. Cultural entanglement at the dawn of the Egyptian history: A view from the Nile First Cataract region. *Origini. Preistoria e Protostoria delle civiltà antiche* 36: 93–123.

GATTO, M.C., 2019. The later Prehistory of Nubia in its interregional setting [in:] RAUE, D. (ed.), *Handbook of ancient Nubia*. Berlin: 259–291.

GILBERT, P., 1954. La place d'El-Kab dans l'histoire [in:] FÉRÉ, *Fouilles de El Kab : Documents (Livraison III)*. Brussels: 83–89.

GIMÉNEZ, J.; SÁNCHEZ, J.A. & SOLANO, L., 2015. Identifying the Ethiopian origin of the obsidian found in Upper Egypt (Naqada period) and the most likely exchange routes. *JEA* 101: 349–359.

GOPHNA, R., 2002. Elusive anchorage points along the Israel littoral and the Egyptian-Canaanite maritime route during the Early Bronze Age I [in:] VAN DEN BRINK, E.C.M. & LEVY, T.E. (eds), *Egypt and the Levant: Interrelations from the 4th through the early 3rd millennium BCE*. New Approaches to Anthropological Archaeology. London: 418–421.

HARTUNG, U., 2001. *Umm el-Qaab 2: Importkeramik aus dem Friedhof U in Abydos (Umm el-Qaab) und die Beziehungen Ägyptens zu Vorderasien im 4. Jahrtausend v. Chr*. AV 92. Mainz am Rhein.

HARTUNG, U., 2016. Chronological aspects of the funerary equipment in Cemetery U at Abydos (Umm el-Qa'ab) [in:] ADAMS, M.D. (ed.); MIDANT-REYNES, B.; RYAN, E.M. & TRISTANT, Y. (coll.), *Egypt at its Origins 4. Proceedings of the Fourth International Conference "Origin of the State. Predynastic and Early Dynastic Egypt", New York, 26th–30th July 2011*. OLA 252. Leuven: 271–298.

HAYES, W.C., 1953. *The scepter of Egypt: A background for the study of the Egyptian antiquities in the Metropolitan Museum of Art 1: From the earliest times to the end of the Middle Kingdom*. New York.

HENDRICKX, S., 1994. *Elkab 5: The Naqada III cemetery*. Brussels.

HENDRICKX, S. & BAVAY, L., 2002. The relative chronological position of Egyptian Predynastic and Early Dynastic tombs with objects imported from the Near East and the nature of interregional contacts [in:] VAN DEN BRINK, E.C.M. & LEVY, T.E. (eds), *Egypt and the Levant: Interrelations from the 4th through the early 3rd millennium BCE*. New Approaches to Anthropological Archaeology. London: 58–80.

HENDRICKX, S.; DARNELL, J.C. & GATTO, M.C., 2012a. The earliest representations of royal power in Egypt: The rock drawings of Nag el-Hamdulab (Aswan). *Antiquity* 86(334), 1068–1083.

HENDRICKX, S.; DARNELL, J.C.; GATTO, M.C & EYCKERMAN, M., 2012b. Iconographic and palaeographic elements dating a Dynasty 0 rock art site at Nag el-Hamdulab (Aswan, Egypt) [in:] HUYGE, D.; VAN NOTEN, F. & SWINNE, D. (eds), *The signs of which times? Chronological and palaeoenvironmental issues in the rock art of Northern Africa*. Brussels: 295–326.

HENDRICKX, S. & EYCKERMAN, M., 2009. The 1955 excavation of an early Old Kingdom storage site at Elkab [in:] CLAES, W.; DE MEULENAERE, H. & HENDRICKX, S. (eds), *Elkab and beyond: Studies in honour of Luc Limme*. OLA 191. Leuven: 1–30.

HENDRICKX, S. & FRIEDMAN, R.F., 2002. Gebel Tjauti rock inscription 1 [in:] DARNELL, J.C., *Theban Desert Road Survey in the Egyptian Western Desert 1: Gebel Tjauti rock inscriptions 1–45 and Wadi el-Ḥôl rock inscriptions 1–45*. OIP 119. Chicago: 10–19.

HENDRICKX, S. & FRIEDMAN, R.F., 2003. Gebel Tjauti rock inscription 1 and the relationship between Abydos and Hierakonpolis during the early Naqada III period. *GM* 196: 95–109.

HENDRICKX, S.; FRIEDMAN, R.F.; DROUX, X. & EYCKERMAN, M., 2020. Size mattered in Predynastic Egypt: A very large decorated vessel in the British Museum [in:] WARFE, A.R.; GILL, J.C.R.; HAMILTON, C.R.; PETTMAN, A.J. & STEWART, D.A. (eds), *Dust, demons and pots: Studies in honour of Colin A. Hope*. OLA 289. Leuven: 279–304.

HENDRICKX, S. & HUYGE, D., 1989. *Elkab 4 : Topographie, 2 : Inventaire des sites archéologiques*. Brussels.

HENDRICKX, S.; RIEMER, H.; FÖRSTER, F. & DARNELL, J.C., 2009. Late Predynastic/ Early Dynastic rock art scenes of Barbary sheep hunting in Egypt's Western Desert: From capturing wild animals to the women of the "Acacia House" [in:] RIEMER, H.; FÖRSTER, F.; HERB, M. & PÖLLATH, N. (eds), *Desert animals in the Eastern Sahara: Status, economic significance, and cultural reflection in antiquity. Proceedings of an Interdisciplinary ACACIA Workshop held at the University of Cologne (December 14–15, 2007)*. Colloquium Africanum 4. Cologne: 189–244.

HENDRICKX, S. & VAN DEN BRINK, E.C.M., 1989. Inventory of Predynastic and Early Dynastic cemetery and settlement sites in the Egyptian Nile Valley [in:] VAN DEN BRINK, E.C.M. & LEVY, T.E. (eds), *Egypt and the Levant: Interrelations from the 4th through the early 3rd millennium BCE*. New Approaches to Anthropological Archaeology. London: 346–399.

HIKADE, T., 2012. Egypt and the Near East [in:] POTTS, D.T. (ed.), *A companion to the archaeology of the ancient Near East*. Malden: 833–850.

HIKADE, T.; PYKE, G. & O'NEILL, D., 2008. Excavations at Hierakonpolis HK29B and HK25: The campaigns of 2005/09. *MDAIK* 64: 153–188.

HOFFMEIER, J.K. & MOSHIER, O., 2013. "A highway out of Egypt": The main road from Egypt to Canaan [in:] FÖRSTER, F. & RIEMER, H. (eds), *Desert road archaeology in ancient Egypt and beyond*. Africa Praehistorica 27. Cologne: 485–511.

HOFMANN, I., 1967. *Die Kulturen des Niltals von Aswan bis Sennar: Vom Mesolithikum bis zum Ende der Christlichen Epoche*. Monographien zur Völkerkunde 4. Hamburg.

HOLMES, D.L., 1989. *The Predynastic lithic industries of Upper Egypt: A comparative study of the lithic traditions of Badari, Nagada and Hierakonpolis*. BAR. International Series 469; CMAA 33. Oxford.

HOPE, C.A., 1999. Pottery manufacture in the Dakhleh Oasis [in:] CHURCHER, C.S. & MILLS, A.J. (eds), *Reports from the survey of the Dakhleh Oasis Western Desert of Egypt 1977–1987*, DOPM 2; Oxbow Monographs 99. Oxford: 215–250.

HOPE, C.A., 2002. Early and mid-Holocene ceramics from the Dakhleh Oasis: Traditions and influences [in:] FRIEDMAN, R.F. (ed.), *Egypt and Nubia: Gifts of the desert*, London: 39–61.

HUYGE, D., 1984. Rock drawings at the mouth of Wadi Hellal, Elkab (Upper Egypt) [in:] KRZYŻANIAK, L. & KOBUSIEWICZ, M. (eds), *Origin and early development of food-producing cultures in Northeastern Africa*. SAA 1. Poznań: 231–234.

HUYGE, D., 1995. *De rotstekeningen van Elkab (Boven-Egypte): Registratie, seriatie en interpretatie*. Leuven (Unpubl. Phd dissertation, KU Leuven).

HUYGE, D., 1999. Bearers of the sun. *Discovering Archaeology* 1(1): 48–58.

HUYGE, D., 2002. Cosmology, ideology and personal religious practice in ancient Egyptian rock art [in:] FRIEDMAN, R.F. (ed.), *Egypt and Nubia: Gifts of the desert*. London: 192–206.

HUYGE, D. & DARNELL, J.C., 2010. Once more British Museum EA35324. *GM* 225: 71–74.

IBRAHIM, M.R. & TALLET, P., 2008. Trois bas-reliefs de l'époque thinite au Ouadi el-Humur : Aux origines de l'exploitation du sud-Sinaï par les Égyptiens. *RdÉ* 59: 155–180.

IKRAM, S., 2009. Drawing the world: Petroglyphs from Kharga Oasis. *Archéo-Nil* 19: 67–82.

INIZAN, M.-L. & FRANCAVIGLIA, V.M., 2002. Les périples de l'obsidienne à travers la mer Rouge. *Journal des Africanistes* 72(2): 11–19.

JIMÉNEZ-SERRANO, A., 2002. *Royal festivals in the late Predynastic period and the First Dynasty*. BAR. International Series 1076. Oxford.

KABACIŃSKI, J., 2003. Lithic industries at Tell el-Farkha (Eastern Delta) [in:] KRZYŻANIAK, L.; KROEPER, K. & KOBUSIEWICZ, M. (eds), *Cultural markers in the later Prehistory of Northeastern Africa and recent research*. SAA 8. Poznań: 201–212.

KAHL, J., 2001. *Vergraben, verbrannt, verkannt und vergessen: Funde aus dem „Menesgrab"*. Münster.

KAHL, J.; BAGH, T.; ENGEL, E.-M. & PETSCHEL, S., 2001. Die Funde aus dem „Menesgrab" in Naqada: Ein Zwischenbericht. *MDAIK* 57: 171–185.

KANTOR, H.J., 1965. The relative chronology of Egypt and its foreign correlations before the Late Bronze Age [in:] EHRICH, R.W. (ed.), *Chronologies in Old World archaeology*. Chicago: 1–46.

KAPLONY, P., 1981. *Die Rollsiegel des Alten Reiches 2: Katalog der Rollsiegel*. MA 3. Brussels.

KAYSER, H., 1973. *Die ägyptischen Altertümer im Roemer-Pelizaeus-Museum in Hildesheim*. Pelizaeus-Museum zu Hildesheim. Wissenschaftliche Veröffentlichung 8. Hildesheim.

KHALIDI, L., 2007. The formation of a southern Red Seascape in the late Prehistoric period: Tracing cross-Red Sea culture-contact, interaction, and maritime communities along the Tihamah coastal plain, Yemen, in the third to first millennium B.C. [in:] STARKEY, J.; STARKEY, P. & WILKINSON, T. (eds), *Natural resources and cultural connections of the Red Sea. Proceedings of the "Red Sea Project III"*. BAR. International Series 1661; Society for Arabian Studies. Monographs 5. Oxford: 35–43.

KHALIDI, L., 2009. Holocene obsidian exchange in the Red Sea region [in:] PETRAGLIA, M.D. & ROSE, J.I. (eds), *The evolution of human populations in Arabia: Paleoenvironments, prehistory and genetics*. Vertebrate Paleobiology and Paleoanthropology. Dordrecht: 279–291.

KHALIDI, L.; INIZAN, M.L.; GRATUZE, B. & CRASSARD, R. 2013. Considering the Arabian Neolithic through a reconstitution of interregional obsidian distribution patterns in the region. *Arabian Archaeology and Epigraphy* 24: 59–67.

KHALIDI, L.; LEWIS, K. & GRATUZE, B., 2012. New perspectives on regional and interregional obsidian circulation in prehistoric and early historic Arabia. *Proceedings of the Seminar for Arabian Studies* 42: 143–164.

KHALIDI, L.; OPPENHEIMER, C.; GRATUZE, B.; BOUCETTA, S.; SANABANI, A. & AL-MOSABI, A., 2010. Obsidian sources in highland Yemen and their relevance to archaeological research in the Red Sea region. *JAS* 37: 2332–2345.

KOBUSIEWICZ, M.; KABACIŃSKI J.; SCHILD, R.; IRISH, J.D.; GATTO, M.C & WENDORF, F., 2010. *Gebel Ramlah: Final Neolithic cemeteries from the Western Desert of Egypt*. Poznań.

LANGE, M., 2003. A-Group settlement sites in the Laqiya region (Eastern Sahara, Northwest Sudan) [in:] KRZYŻANIAK, L.; KROEPER, K. & KOBUSIEWICZ, M. (eds), *Cultural markers in the later Prehistory of Northeastern Africa and recent research*. SAA 8. Poznań: 105–127.

LOEBEN, C.E., 2011. *Die Ägypten-Sammlung des Museum August Kestner und ihre (Kriegs-) Verluste*. Museum Kestnerianum 15. Rahden.

LUCARINI, G.; BARCA, D. & MANZO, A., 2020. The provenance of obsidian artefacts from the Middle Kingdom harbour of Mersa/Wadi Gawasis, Egypt, and its implications for Red Sea trade routes in the 2nd millennium BC. *Quaternary International* 555: 85–95.

LUCARINI, G. & MARIOTTI, E., 2014. The Boats Arch: A new rock art site in Wadi el Obeiyid [in:] BARICH, B.; LUCARINI, G.; HAMDAN, M.A. & HASSAN, F.A. (eds), *From lake to sand: The archaeology of Farafra Oasis, Western Desert, Egypt*. Florence: 406–410.

LUCAS, A., 1942. Obsidian. *ASAÉ* 41: 271–275.
LUCAS, A., 1947. Obsidian. *ASAÉ* 47: 113–123.
[MACGREGOR], 1922. *Catalogue of the MacGregor collection of Egyptian antiquities* (Auction Sotheby, Wilkinson & Hodge). London.
MĄCZYŃSKA, A., 2013. *Lower Egyptian communities and their interactions with Southern Levant in the 4th millennium BC*. SAA 12. Poznań.
MĄCZYŃSKA, A., 2014. Some remarks on the visitors in the Nile Delta in the 4th millennium BC [in:] MĄCZYŃSKA, A. (ed.), *The Nile Delta as a centre of cultural interactions between Upper Egypt and the Southern Levant in the 4th millennium BC*. SAA 13. Poznań: 181–216.
MARCUS, E., 2002. Early seafaring and maritime activity in the Southern Levant from Prehistory through the third millennium BCE [in:] VAN DEN BRINK, E.C.M. & LEVY, T.E. (eds), *Egypt and the Levant: Interrelations from the 4th through the early 3rd millennium BCE*. New Approaches to Anthropological Archaeology. London: 405–417.
MARK, S., 1997. *From Egypt to Mesopotamia: A study of Predynastic trade routes*. Studies in Nautical Archaeology 4. London.
MASSOULARD, E., 1936. Lances fourchues et peseshkaf : À propos des deux acquisitions récentes du musée du Louvre. *RdÉ* 2: 135–163.
MCHUGH, W.P., 1982. The stone artifacts from structure II, locality 29 [in:] HOFFMAN, M.A., *The Predynastic of Hierakonpolis: An interim report*. Egyptian Studies Association 1. Cairo: 85–92.
MEEKS, D., 1997. Navigation maritime et navires égyptiens : Les éléments d'une controverse [in:] GARCIA, D. & MEEKS, D. (eds), *Techniques et économie antiques et médiévales : Le temps de l'innovation. Actes du Colloque d'Aix-en-Provence, mai 1996*. Travaux du Centre Camille Julian 21; Collection archéologie d'aujourd'hui. Paris: 175–194.
MENEISY, M.Y., 1990. Vulcanicity [in:] SAID, R. (ed.), *The geology of Egypt*. Rotterdam: 157–172.
MUMFORD, G.D., 2014. Egypt and the Levant [in:] STEINER, M.L. & KILLEBREW, A.E. (eds), *The Oxford handbook of the archaeology of the Levant: C. 8000–332 BCE*. Oxford Handbooks. Oxford: 66–89.
NAVILLE, E., 1914. *The cemeteries of Abydos 1: 1909–1910: The mixed cemetery and Umm el-Ga'ab*. MEEF 33. London.
NEEDLER, W., 1984. *Predynastic and Archaic Egypt in the Brooklyn Museum.* Wilbour Monographs 9. New York.
NEGASH, A.; BROWN, F. & NASH, B., 2011. Varieties and sources of artefactual obsidian in the Middle Stone Age of the Middle Awash, Ethiopia. *Archaeometry* 53(4): 661–673.
O'CONNOR, D., 1987. The earliest pharaohs and the University Museum: Old and new excavations: 1900–1987. *Expedition* 29(1): 27–39.
PAYNE, J.C., 1968. Lapis lazuli in early Egypt. *Iraq* 30(1): 58–61.
PAYNE, J.C., 1987. Appendix to Naqada excavations supplement. *JEA* 73: 181–189.
PAYNE, J.C., 2000. *Catalogue of the Predynastic Egyptian collection in the Ashmolean Museum: With addenda*. Oxford.
PEET, T.E., 1914. *The cemeteries of Abydos 2: 1911–1912*. MEEF 34. London.
PERNICKA, E., 1996. Analyse eines prädynastischen Obsidianmessers aus Unterägypten [in:] KRZYŻANIAK, L.; KROEPER, K. & KOBUSIEWICZ, M. (eds), *Interregional contacts in the later Prehistory of Northeastern Africa*. SAA 5. Poznań: 286–287.
PETRIE, W.M.F., 1901a. *Diospolis Parva: The cemeteries of Abadiyeh and Hu 1898–9*. MEEF 20. London.

PETRIE, W.M.F., 1901b. *The Royal Tombs of the earliest dynasties 1901, part II*. MEEF 21. London.

PETRIE, W.M.F., 1902. *Abydos, part I: 1902*. MEEF 22, London.

PETRIE, W.M.F., 1920. *Prehistoric Egypt, illustrated by over 1000 objects in University College, London*. BSAE/ERA 31. London.

PETRIE, W.M.F. & QUIBELL, J.E., 1896. *Naqada and Ballas 1895*. London.

PETRIE, W.M.F.; WAINWRIGHT, G.A. & MACKAY, E., 1912. *The Labyrinth, Gerzeh and Mazghuneh*. BSAE 18. London.

PRAG, K., 1986. Byblos and Egypt in the fourth millennium B.C. *Levant* 18(1): 59–74.

QUIBELL, J.E., 1896. *Ballas*. ERA 1. London.

QUIBELL, J.E., 1898. *El Kab*. ERA 3. London.

QUIBELL, J.E., 1904–1905. *Archaic objects*. Catalogue général des antiquités égyptiennes du Musée du Caire, nos 11.001–12.000 et 14.001–14754. Cairo.

QUIBELL, J.E. & GREEN, F.W., 1902. *Hierakonpolis, part II*. ERA 5. London.

RENFREW, C., 1975. Trade as action at a distance: Questions of integration and communication [in:] SABLOFF, J.A. & LAMBERG-KARLOVSKY, C.C. (eds), *Ancient civilization and trade*. Albuquerque: 3–59.

RENFREW, C.; DIXON, J.E. & CANN, J.R., 1966. Obsidian and early cultural contact in the Near East. *Proceedings of the Prehistoric Society* 32: 30–72.

RIEMER, H., 2004. News about the Clayton rings: Long distance desert travellers during Egypt's Predynastic [in:] HENDRICKX, S.; FRIEDMAN, R.F.; CIAŁOWICZ, K.M. & CHŁODNICKI, M. (eds), *Egypt at its Origins: Studies in memory of Barbara Adams. Proceedings of the International Conference "Origin of the State. Predynastic and Early Dynastic Egypt", Kraków, 28th August–1st September 2002*. OLA 138. Leuven: 971–989.

RIEMER, H., 2013. Lessons in landscape learning: The dawn of long-distance travel and navigation in Egypt's Western Desert from Prehistoric to Old Kingdom times [in:] FÖRSTER, F. & RIEMER, H. (eds), *Desert road archaeology in ancient Egypt and beyond*. Africa Praehistorica 27. Cologne: 77–106.

RIEMER, H. & KUPER, R., 2000. "Clayton rings": Enigmatic ancient pottery in the Eastern Sahara. *Sahara* 12: 91–100.

RIEMER, H.; LANGE, M. & KINDERMANN, K., 2013. When the desert dried up: Late Prehistoric cultures and contacts in Egypt and Northern Sudan [in:] RAUE, D.; SEIDLMAYER, S.J. & SPEISER, P. (eds), *The First Cataract of the Nile: One region – diverse perspectives*. SDAIK 36. Berlin: 157–183.

ROBIN, A.K.; MOURALIS, D.; AKKÖPRÜ, E.; GRATUZE, B.; KUZUCUOĞLU, C.; NOMADE, S.; PEREIRA, A.; DOĞU, A.F.; ERTURAÇ, K. & KHALIDI, L., 2016. Identification and characterization of two new obsidian sub-sources in the Nemrut volcano (Eastern Anatolia, Turkey): The Sıcaksu and Kayacık obsidian. *JAS. Reports* 9: 705–717.

[RÖMISCH-GERMANISCHEN ZENTRALMUSEUMS], 1995. Schwarze Obsidianschale aus Abydos in Oberägypten (spätes 4. Jahrtausend v. Chr.). *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz* 40(2): 668–669.

ROSSI, C. & IKRAM, S., 2018. *North Kharga Oasis Survey: Explorations in Egypt's Western Desert*. BMPES 5. Leuven.

ROY, J., 2011, *The politics of trade: Egypt and Lower Nubia in the 4th millennium BC*. CHANE 47. Leiden.

ROWLAND, J.; MAŘÍKOVÁ VLČKOVÁ, P.; HENDRICKX, S.; HERBICH, T.; CLAES, W. & HUYGE, D., 2009. Old Kingdom settlement remains at Elkab (Upper Egypt): Preliminary report on the 2009 field season. *BKMKG/BMRAH* 80: 21–50.

SALEH, M. & SOUROUZIAN, H., 1986. *Die Hauptwerke im Ägyptischen Museum Kairo*. Mainz am Rhein.

SAYCE, A.H. & CLARKE, S., 1905. Report on certain excavations made at El-Kab during the years 1901, 1902, 1903, 1904. *ASAÉ* 6: 239–272.

SCHARFF, A., 1926. *Ausgrabungen der Deutschen Orient-Gesellschaft auf dem vorgeschichtlichen Gräberfeld von Abusir el-Meleq 1: Die archäologischen Ergebnisse des vorgeschichtlichen Gräberfeldes von Abusir el-Meleq*. WVDOG 49. Leipzig.

SCHARFF, A., 1931. *Die Altertümer der Vor- und Frühzeit Ägyptens 1: Werkzeuge, Waffen, Gefässe*. Staatliche Museen zu Berlin. Mitteilungen aus der ägyptischen Sammlung 4. Berlin.

SCHMIDT, K., 1992. Tell el-Fara'in/Buto and el-Tell el-Iswid (south): The lithic industries from the Chalcolithic to the early Old Kingdom [in:] VAN DEN BRINK, E.C.M. (ed.), *The Nile Delta in transition: 4th.–3rd. millennium B.C. Proceedings of the Seminar held in Cairo, 21.–24. October 1990, at the Netherlands Institute of Archaeology and Arabic Studies*, Tel Aviv: 31–41.

SCHOTTE, Q., 2011. *Analysis of a First Intermediate Period and early Middle Kingdom necropolis at el-Kab*. Leuven (Unpubl. MA dissertation, KU Leuven).

SEIDLMAYER, S.J., 1990. *Gräberfelder aus dem Übergang vom Alten zum Mittleren Reich: Studien zur Archäologie der Ersten Zwischenzeit*. SAGA 1. Heidelberg.

SHARVIT, J.; GALILI, E.; ROSEN, B. & VAN DEN BRINK, E.C.M., 2002. Predynastic maritime traffic along the Carmel Coast of Israel: A submerged find from North Atlit Bay [in:] VAN DEN BRINK, E.C.M. & YANNAI, E. (eds), *In quest of ancient settlements and landscapes: Archaeological studies in honour of Ram Gophna*. Tel Aviv: 159–166.

SOMAGLINO, C. & TALLET, P., 2014. Une campagne en Nubie sous la Ire dynastie : La scène nagadienne du Gebel Sheikh Suleiman comme prototype et modèle. *NeHeT* 1: 1–46.

SPENCER, A.J., 1980. *Catalogue of Egyptian antiquities in the British Museum 5: Early Dynastic objects*. London.

STAGER, L.E., 2001. Port power in the Early and the Middle Bronze Age: The organization of maritime trade and hinterland production [in:] WOLFF, S.R. (ed.), *Studies in the archaeology of Israel and neighbouring lands in memory of Douglas L. Esse*. SAOC 59; ASOR Books 5. Chicago: 625–638.

STEVENSON, A., 2006. *Gerzeh, a cemetery shortly before history*. Egyptian Sites. London.

STEVENSON, A., 2009. *The Predynastic Egyptian cemetery of el-Gerzeh*. OLA 186. Leuven.

TAKAMIYA, I.H., 1994. *Egyptian pottery in A-Group cemeteries, Nubia: Towards an understanding of pottery production and distribution in Pre-dynastic and Early Dynastic Egypt*. Cambridge (Unpubl. M.Phil. dissertation, Cambridge University).

TAKAMIYA, I.H., 2004. Egyptian pottery distribution in A-Group cemeteries, Lower Nubia: Towards an understanding of exchange systems between the Naqada culture and the A-Group culture. *JEA* 90: 35–62.

TAKAMIYA, I.H., 2008. Return to the temple workshop: The manufacture of bifacial flint tools. *Nekhen News* 20: 8–9.

TALLET, P., 2013. The Wadi el-Jarf site: A harbour of Khufu on the Red Sea. *JAEI* 5(1): 76–84.

TALLET, P., 2015. *La zone minière du Sud-Sinaï 2 : Les inscriptions pré- et protodynastiques du Ouadi 'Ameyra (CCIS Nos 273–335)*. MIFAO 132. Cairo.

TAYLOR, S.R. & MCLENNAN, S.M., 1985. *The continental crust: Its composition and evolution*. Oxford.

TRISTANT, Y., 2004. *L'habitat prédynastique de la Vallée du Nil : Vivre sur les rives du Nil aux V^e^ et IV^e^ millénaires*. BAR. International Series 1287. Oxford.

TUTUNDŽIĆ, S.P., 1989. The problem of foreign north-eastern relations of Upper Egypt, particularly in Badarian period: An aspect [in:] KRZYŻANIAK, L. & KOBUSIEWICZ, M. (eds), *Late Prehistory of the Nile basin and the Sahara*. SAA 2. Poznań: 255–260.

VAN DEN BRINK, E.C.M., 1989. A transitional Late Predynastic – Early Dynastic settlement site in the Northeastern Nile Delta, Egypt. *MDAIK* 45: 55–108.

VAN NEER, W.; LINSEELE, V. & FRIEDMAN, R.F., 2004. Animal burials and food offerings at the Elite Cemetery HK6 of Hierakonpolis [in:] HENDRICKX, S.; FRIEDMAN, R.F.; CIAŁOWICZ, K.M. & CHŁODNICKI, M. (eds), *Egypt at its Origins: Studies in memory of Barbara Adams. Proceedings of the International Conference "Origin of the State. Predynastic and Early Dynastic Egypt", Kraków, 28^th^ August–1^st^ September 2002*. OLA 138. Leuven: 67–130.

VAN WALSEM, R., 1979. The *psš-kf*: An investigation of an ancient Egyptian funerary instrument. *OMRO* 59-60: 193–249.

VANHULLE, D., 2011. *La pierre et le pouvoir dans l'Égypte prédynastique : Étude du lapis-lazuli, de l'obsidienne, de la turquoise et de l'améthyste en contexte prédynastique*. Brussels (Unpubl. MA dissertation, Université Libre de Bruxelles).

VANHULLE, D., 2016. *Le bateau pré- et protodynastique dans l'iconographie et l'archéologie égyptiennes : Pour une étude analytique et sémiologique de la navigation au 4^e^ millénaire avant J.-C.* Brussels (Unpubl. PhD dissertation, Université Libre de Bruxelles).

VERMEERSCH, P., 1972. De plaats van Elkab in de voorgeschiedenis van Egypte. *Africa-Tervuren* 18: 104–113.

VERMEERSCH, P., 1978. *Elkab 2 : L'Elkabien, épipaléolithique de la Vallée du Nil*. Brussels.

WAINWRIGHT, G.A., 1927. Obsidian. *Ancient Egypt* 3: 77–93.

WARD, W.A., 1963. Egypt and the East Mediterranean from Predynastic times to the end of the Old Kingdom. *Journal of the Economic and Social History of the Orient* 6(1): 1–57.

WARD, W.A., 1964. Relations between Egypt and Mesopotamia from prehistoric times to the end of the Middle Kingdom. *Journal of the Economic and Social History of the Orient* 7(1–2): 1–45, 121–135.

WENDORF, F. & SCHILD, R. (eds), 2004. The Western Desert during the 5^th^ and 4^th^ millennia BC: The Late and Final Neolithic in the Nabta-Kiseiba area. *Archéo-Nil* 14: 13–31.

WILKINSON, T.A.H., 1999. *Early Dynastic Egypt*. London.

WILLIAMS, B.B., 1986. *Excavations between Abu Simbel and the Sudan frontier 1: The A-Group Royal Cemetery at Qustul: Cemetery L*. OINE 3. Chicago.

WILLIAMS, B.B., 2011. Relations between Egypt and Nubia in the Naqada period [in:] TEETER, E. (ed.), *Before the Pyramids: The Origins of Egyptian Civilization*. OIMP 33. Chicago: 83–92.

ZARINS, J., 1989. Ancient Egypt and the Red Sea trade: The case for obsidian in the Predynastic and Archaic periods [in:] LEONARD, A. & WILLIAMS, B.B. (eds), *Essays in ancient civilization presented to Helene J. Kantor*. SAOC 47. Chicago: 339–368.

ZARINS, J., 1996. Obsidian in the larger context of Predynastic/Archaic Egyptian Red Sea trade [in:] READE J. (ed.), *The Indian Ocean in antiquity*. London: 89–106.

Table 1. Trace elements and rare-earth elements (REE) for obsidian artefacts from Bavay *et al*. 2000; 2004 and from this study (ELK12-F05).

	sector	ppm sample id.	Sc	Co	Cu	Zn	Ga	Ge	Rb	Sr	Y	Zr	Nb
Upper Egypt													
Elkab	ELK12-F05	spot 1	5.8	< 0.1	3.2	126	24	1.9	128	1.51	56	418	132
		spot 2	4.9	< 0.1	3.7	151	22	1.8	128	1.63	57	430	130
		spot 3	5.2	< 0.1	3.7	156	24	2.0	131	1.62	58	441	129
		spot 4	4.7	< 0.1	5.8	149	23	2.0	130	1.57	56	410	128
		spot 5	4.9	< 0.1	3.9	152	24	1.9	130	1.74	56	420	129
		spot 6	4.8	< 0.1	4.4	152	23	2.0	130	1.75	57	420	127
		average	5.1	< 0.1	4.1	148	24	1.9	130	1.64	57	423	129
		SD	0.4		0.9	11	1	0.1	1	0.10	1	11	2
Hierakonpolis		HK6	5.0	2.6	7.8	111	25	2.1	nd	2.8	nd	439	120
		UC: 14877a	29.4	0.8	60	208	30.5	5.3	nd	2.8	nd	524.3	175.6
		UC: 14877b	27.8	1.0	119	210	32.2	3.8	nd	4.0	nd	515.2	164.3
Abydos	U-j	U-j 11a	3.86	1.8	6	136	27.2	2.0	nd	1.6	nd	473.7	123.7
	U-j	U-j 11b	6.2	3.9	20	193	29.4	2.9	nd	4.0	nd	564.9	133.3
		MRAH: E.4833a	17.9	26.5	209	494	36.6	4.5	nd	9.0	nd	732.6	212.6
	O	MRAH: E.4833b	20.5	0.6	52	214	29.8	4.2	nd	3.2	nd	500.5	161.0
		MRAH: E.4833c	24.8	0.9	68	196	28.7	4.8	nd	3.1	nd	481.6	163.1
		MRAH: E.4833e	33.5	1.4	191	230	27.1	7.5	nd	48.3	nd	466.9	121.7
Naqada	499	UC: 4267	43.2	1.0	297	191	33.7	4.1	nd	6.9	nd	563.9	168.9
Naqada	743	UC: 4385	28.1	0.7	111	202	30.2	4.9	nd	3.3	nd	544.2	174.3
Hemamiah	23/1629	UC: 9587	25.6	0.9	93	247	30.9	3.4	nd	3.2	nd	534.7	176.9
Lower Egypt													
Buto	layer IIa	bladelet core	3.5	2.1	4.3	87	22	1.7	nd	0.14	nd	794	34

Ba	Hf	Ta	W	Pb	Th	U	La	Ce	Pr	Nd	Sm	Eu	Gd	Dy	Ho	Er	Yb	Lu
8.4	11.0	9.4	2.26	14.7	15.6	4.4	83	166	15.8	61	11.9	0.52	10.6	11.1	2.13	6.6	7.3	1.17
8.2	10.1	8.5	2.13	12.8	14.4	3.7	85	158	15.3	62	12.0	0.71	10.2	10.6	2.16	6.8	7.7	1.17
8.5	10.0	8.4	2.24	12.3	14.1	3.9	83	159	15.1	60	11.3	0.67	9.9	10.9	2.03	6.6	7.4	1.12
8.0	9.3	8.1	1.96	12.2	13.3	3.5	79	150	14.3	58	10.0	0.61	9.5	10.0	1.95	6.0	7.2	1.01
8.0	10.3	8.1	2.06	12.2	13.6	3.7	80	152	14.3	58	10.5	0.67	9.6	9.1	2.03	5.8	6.5	1.06
7.8	9.7	8.2	2.02	11.7	13.6	3.6	81	153	14.5	57	10.6	0.51	10.2	9.6	1.95	6.2	7.1	0.96
8.1	10.1	8.5	2.11	12.7	14.1	3.8	82	156	14.9	59	11.0	0.61	10.0	10.2	2.04	6.3	7.2	1.08
0.3	0.6	0.5	0.12	1.1	0.8	0.3	2	6	0.6	2	0.8	0.08	0.4	0.8	0.09	0.4	0.4	0.09
20	10.8	5.7	2.4	15	10.7	3.3	76	161	14.3	53.1	9.4	0.53	8.1	8.8	1.8	5.3	5.8	0.8
11.6	14.8	10.0	2.0	18.4	17.4	5.5	99.2	192.0	20.6	67.8	16.4	0.9	14.9	14.8	3.4	8.9	8.5	1.3
17.1	14.6	9.9	1.6	36.5	17.2	5.2	94.0	178.9	18.8	65.6	12.7	1.0	12.4	15.8	3.1	9.1	9.3	1.3
8.6	11.5	5.9	2.1	15.6	11.8	3.3	82.1	159.7	15.4	57.4	10.4	0.6	9.3	10.0	2.2	6.4	6.8	1.0
12.2	14.2	6.9	2.4	22.5	14.6	3.7	95.0	174.9	17.5	66.9	12.4	0.7	11.1	12.5	2.7	7.9	8.2	1.2
17.8	16.2	10.5	3.0	136.3	22.3	5.5	122.2	215.6	22.8	88.3	18.8	0.9	20.2	16.8	nd	10.3	11.3	nd
10.3	12.8	9.6	1.6	19.1	16.6	5.0	95.9	175.3	19.9	65.2	11.8	0.6	13.4	14.4	2.9	8.1	7.7	1.2
12.2	14.1	9.6	2.0	21.7	17.4	4.7	95.2	181.8	20.0	61.7	11.2	1.0	14.0	13.1	3.1	8.4	8.0	1.3
1112.5	14.2	8.0	2.5	63.3	17.4	5.8	78.8	152.1	15.9	52.7	11.2	1.6	12.9	15.1	3.1	9.5	9.9	1.5
13.0	22.7	15.5	2.2	54.6	30.7	10.0	108.1	222.1	25.1	93.3	16.4	1.3	20.1	21.7	4.5	13.9	11.1	1.9
11.9	15.1	9.8	1.7	25.9	17.7	5.3	97.8	193.6	20.6	65.1	12.7	1.0	13.6	14.4	3.3	7.8	7.8	1.4
13.2	13.5	10.5	2.4	37.4	18.2	6.2	98.5	192.3	21.1	66.4	12.7	0.8	15.2	13.7	3.1	8.2	7.5	1.5
1	14.3	1.8	2.82	20.2	12.8	4.9	52	119	12.2	48	10.1	0.27	9.8	11.3	2.37	7.0	7.1	1.05

Table 2. Th/Ta and Zn/Zr ratios for obsidian samples from Upper Egypt; the Lower Egypt Buto sample (last line) differs significantly from the Upper Egypt samples.

Sample	Location	Th/Ta ratio	Zn/Zr ratio
ELK12-F05	***Elkab***	***1.7***	***0.35***
HK6	Hierakonpolis	1.9	0.25
UC: 14877b	***Hierakonpolis***	***1.7***	***0.41***
U-j 11a	Abydos	2.0	0.29
U-j 11b	Abydos	2.1	0.34
MRAH: E.4833b	Abydos	1.7	0.43
MRAH: E.4833c	Abydos	1.8	0.41
UC: 4385	***Naqada***	***1.8***	***0.37***
UC: 9587	Hemamiah	1.7	0.46
Schnitt U I	Buto	7.1	0.11

Catalogue of obsidian objects found at Predynastic and Early Dynastic sites in Egypt and Nubia.

Abbreviations - Museums

AM = Ashmolean Museum, Oxford
BM = British Museum, London
BrM = Brooklyn Museum, New York
EM = Egyptian Museum, Cairo
FM = Fitzwilliam Museum, Cambridge
GMA = Garstang Museum of Archaeology, Liverpool
MAA = Museum of Archaeology and Anthropology, Cambridge
MMA = Metropolitan Museum of Art, New York
MAK = Museum August Kestner, Hannover
MdL = Musée du Louvre, Paris
NM = Nubian Museum, Aswan
RMAH = Royal Museums of Art and History, Brussels
RPM = Roemer-Pelizaeus-Museum, Hildesheim
SMB = Staatliche Museen zu Berlin – Ägyptische Museum und Papyrussammlung, Berlin
SNM = Suez National Museum, Suez
UB = Universität Bonn – Ägyptisches Museum, Bonn
UC = University College – Petrie Museum of Egyptian Archaeology, London
UH = Universität Heidelberg – Sammlung des Ägyptologischen Instituts, Heidelberg

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
1	Alexandria	Blades	4	Prehistoric	BM 2009,6017.690 BM 2009,6017.692 BM 2009,6017.693 BM 2009,6017.694	Not published.
2	Buto: Schnitt U I	Core	1	Naqada IIB–C		Bavay *et al.* 2000: 19. Bavay *et al.* 2004. Faltings *et al.* 2000: 138, 139, fig. 2.1. Hartung 2001: 288.
3	Tell el-Farkha	Knife (fragment)	1	Naqada IIC–D1		Chłodnicki & Ciałowicz 2002: 99, 101, fig. 26.5. Kabaciński 2003: 202, 2011, fig. 1.5.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
4	Tell el-Farkha: Western Kom, administrative cultic center	Fishtail knife (fragment)	1	Naqada IIIA		Chłodnicki & Ciałowicz 2013: 104, fig. 15. Chłodnicki & Ciałowicz 2015: 178, fig. 7.
5	Tell el-Farkha	Knives (fragment)	Not specified	Naqada IIIB–C1		Chłodnicki & Ciałowicz 2002: 99, 105, fig. 30.3. Kabaciński 2003: 207, 209, fig. 5.3, 211.
6	Tell el-Iswid: Settlement	Knife (fragment)	1	Naqada IIC–D		Bavay *et al*. 2000: 8, 19. Bavay *et al*. 2004: 608–609. Hartung 2001: 290, fig. 53a. Pernicka 1996: 286–287. Schmidt 1992: 34. Tristant 2004: 31, fig. 26, 32, 114. van den Brink 1989: 83, 88–91, fig. 15.11.
7	Gerzeh: Tomb 185	Flake (fragment)	1	Naqada IIC–D2	UC: 42542	Cann & Renfrew 1964: 124, 129, 133. Hartung 2001: 290. Massoulard 1936: 159. Petrie *et al*. 1912: 24. Stevenson 2006: 48. Stevenson 2009: 117, 271. Wainwright 1927: 77, 88. Zarins 1989: 362, tab. 6 (no. 13). Zarins 1996: 92, 98.
8	Gerzeh: Tomb 133	Beads	2	Naqada IID1	AM: E.E.618 (1911.368) AM: E.E.620 (1911.370)	Hartung 2001: 290. Massoulard 1936: 159. Payne 2000: 211 (no. 1720), 212 (no. 1722). Petrie *et al*. 1912: 16, pls II, IV, XIII. Stevenson 2006: 47–48. Stevenson 2009: 117, 266, 300, 310.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
9	Abusir el-Meleq: Tomb 13a2	Blade	1	Naqada IID–IIIB	SMB: 18680	Hartung 2001: 290. Massoulard 1936: 159. Scharff 1926: 48, 114–115, pl. 30 (no. 280). Zarins 1989: 362, tab. 6 (no. 14). Zarins 1996: 98.
10	Abusir el-Meleq: Tomb 36a2	Blades	2	Naqada IID–IIIB		Hartung 2001: 290. Massoulard 1936: 159. Scharff 1926: 132–133. Zarins 1989: 363, tab. 6 (no. 16). Zarins 1996: 98.
11	Abusir el-Meleq: Tomb 46c1	Blades	2	Naqada IID–IIIB		Hartung 2001: 290. Massoulard 1936: 159. Scharff 1926: 140–141. Zarins 1989: 363, tab. 6 (no. 18). Zarins 1996: 98.
12	Abusir el-Meleq: Tomb 51e3	Blades	2	Naqada IID–IIIB	UB: BoSAe 2163a–b (?) (*)	Hartung 2001: 290. Massoulard 1936: 159. Scharff 1926: 142–143.
13	Abusir el-Meleq: Tomb 56c7	Blades	2	Naqada IID–IIIB	EM: JE 38188	Hartung 2001: 290. Massoulard 1936: 159. Scharff 1926: 144–145. Zarins 1989: 363, tab. 6 (no. 20). Zarins 1996: 98.

(*) The collection of the Ägyptisches Museum in Bonn contains two obsidian blades originating most probably from Abusir el-Meleq. The current inventory record states that an old label existed on one of the blades mentioning the number '5123/12'. It is well possible that this number is incorrectly cited on the current inventory card and that it in fact refers to object no. 12 from tomb 51e3 which, according to the published excavation report, contains 12 objects (Scharff 1926: 142–143). Unfortunately, the excavation report does not contain photos or drawings of the obsidian blades of tomb 51e3. Therefore, their attribution to the two fragments kept in Bonn cannot be stated with absolute certainty.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
14	Abusir el-Meleq: Tomb 60a1	Blades	2	Naqada IID–IIIB	SMB: 18690 SMB: 18691	Hartung 2001: 290. Massoulard 1936: 159. Scharff 1926: 48, 146–147, pl. 30 (no. 281). Zarins 1989: 363, tab. 6 (no. 15). Zarins 1996: 98.
15	Abusir el-Meleq: Tomb 1017	Blade	1	Naqada IID–IIIB	SMB: 19134	Massoulard 1936: 159. Scharff 1926: 48, 150–151. Zarins 1989: 363, tab. 6 (no. 17). Zarins 1996: 91, 98.
16	Abusir el-Meleq: Tomb 1035	Blades	4	Naqada IID–IIIB	MAK: 1921.2.26a–d	Hartung 2001: 290. Loeben 2011: 207. Massoulard 1936: 159. Scharff 1926: 48, 152–153. Zarins 1989: 363, tab. 6 (no. 22). Zarins 1996: 98.
17	Abusir el-Meleq: Tomb 1036	Blade	1	Naqada IID–IIIB	SMB: 19310	Hartung 2001: 291. Massoulard 1936: 159. Scharff 1926: 48, 152–153. Zarins 1989: 363, tab. 6 (no. 19). Zarins 1996: 98.
18	Abusir el-Meleq: Tomb 1066	Blade	1	Naqada IID–IIIB		Hartung 2001: 291. Massoulard 1936: 159. Scharff 1926: 156–157. Zarins 1989: 363, tab. 6 (no. 23). Zarins 1996: 98.
19	Abusir el-Meleq: Tomb 1070	Blade	1	Naqada IID–IIIB	RPM: 2763	Hartung 2001: 291. Kayser 1973: 30. Massoulard 1936: 159. Scharff 1926: 48, 156–157. Zarins 1989: 363, tab. 6 (no. 21). Zarins 1996: 98.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
20	Beni Hasan (?)	Blades	2	PD	RMAH: E.6181a–b	[MacGregor] 1922: 148 (no. 1132).
21 (**)	Mostagedda: Tomb 547	Beads	Not specified	Badarian		Brunton 1937: 36: 51, pl. VIII. Hartung 2001: 291.
22 (**)	Mostagedda: Tomb 1631	Bead	1	Naqada IIB–IIIC2		Brunton 1937: 86, pl. XXIX. Hartung 2001: 291.
23 (**)	Badari: Tomb 4602	Beads	2	Naqada IID1		Brunton & Caton-Thompson 1928: 56, pls XXXIII, L. Hartung 2001: 291.
24	Hemamiah: Tomb 1629	Pierced flake (part of string of beads)	1	Naqada IIC	UC: 9587	Bavay *et al.* 2000: 9. Brunton & Caton-Thompson 1928: 50, pl. L. Giménez *et al.* 2015: 350. Hartung 2001: 291. Massoulard 1936: 159. Wainwright 1927: 88. Zarins 1989: 362, tab. 6 (no. 12).
25	Qau el Kebir	Beads	Not specified	PD	UC: 20922 (?)	Not published.
26	Akhmim (?)	Fishtail knife	1	Naqada II–IIIA2	BrM: 35.1445	Bleiberg 2008: 64. Hartung 2001: 291. Needler 1984: 274–275 (no. 171). Zarins 1989: 364, tab. 6 (no. 32). Zarins 1996: 91.
27	Akhmim (?)	Fishtail knives	2	Naqada II–IIIA2	EM: JE 56605 EM: JE 56606	Hartung 2001: 291. Lucas 1947: 120. Saleh & Sourouzian 1986, cat. no. 5. Zarins 1989: 364, tab. 6 (nos 30–31). Zarins 1996: 91.

(**) Identification as obsidian is uncertain.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
28	Akhmim (?)	Fishtail knives	2	Naqada II–IIIA2	MdL: E14278 MdL: E14279	Hartung 2001: 291. Massoulard 1936. Van Walsem 1979: 242. Zarins 1989: 363, tab. 6 (nos 28–29). Zarins 1996: 91.
29	Akhmim (?)	Fishtail knife (fragment)	1	Naqada II–IIIA2	SMB: 15772	Hartung 2001: 291. Scharff 1931: 90 (no. 173), fig. 8 (no. 173). Wainwright 1927: 88–89. Zarins 1989: 363, tab. 6 (no. 26).
30	Akhmim (?)	Fishtail knife (fragment)	1	Naqada II–IIIA2	SMB: 15773	Hartung 2001: 291. Scharff 1931: 90 (no. 174), fig. 8 (no. 174). Van Walsem 1979: 243. Zarins 1989: 363, tab. 6 (no. 27).
31	Abydos: Tomb U-134	Blade	1	Naqada IID		Dreyer *et al.* 1996: 17–18. Hartung 2001: 292. Hartung 2016: 277–279, fig. 3.
32	Abydos: Tomb U-135	Blade	1	Naqada IID		Hartung 2001: 292.
33	Abydos: Tomb U-200	Blade (fragment)	1	Naqada IID		Dreyer 1993: 27. Hartung 2001: 292. Hartung 2016: 277–279, fig. 3.
34	Abydos: Tomb E 381	Flake	1	Naqada IID	BM: EA49318	Hartung 2001: 291–292. Naville 1914: 17, pl. III.1.
35	Abydos: Tomb U-503	Bowl (fragment)	1	Naqada IID		Dreyer *et al.* 1998: 91–92. Hartung 2001: 292.
36	Abydos: Tomb U-545	Blade	1	Naqada IID		Hartung 2001: 292–293. Hartung 2016: 277–279, fig. 3.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
37	Abydos: Tomb U-166	Vessel (fragment)	1	Naqada IID (?)		Hartung 2001: 292.
38	Abydos: Tomb U-2	Flake	1	Naqada II (?)		Hartung 2001: 292. Hartung 2016: 277–279, fig. 3. Peet 1914: 15. Zarins 1989: 362, tab. 6 (no. 9).
39	Abydos: Tomb U-j 11 + U-I Süd	Bowls (fragments)	6	Naqada IIIA1		Baines 2010: 138–139. Bavay *et al.* 2000: 10–11. Dreyer 1992: 297. Dreyer 1993: 34–35. Dreyer 1998: 14–15, 167, 168, fig. 100, 169, fig. 239, pl. 41. Dreyer 2011: 133. Giménez *et al.* 2015: 350. Hartung 2001: 292, fig. 53b–c. [Römisch-Germanischen Zentralmuseums] 1995: 668–669, fig. 35.
40	Abydos : Tomb U-j 1, U-I Süd, U-j Umgebung	Blade & blade fragments	3	Naqada IIIA1		Dreyer 1993: 34. Dreyer 1998: 9, 165, 166, fig. 98 (nos 228, 229a–b), fig. 40 (no. 228). Dreyer 2011: 133. Hartung 2001: 292.
41	Abydos: Tomb U-qq	Flake	1	Naqada IIIA1–2		Hartung 2001: 292.
42	Abydos: Tomb U-g	Blade (fragment)	1	Naqada IIIA2		Dreyer 1993: 28. Hartung 2001: 292.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
43	Abydos: Tomb 1606	Blade	1	Naqada III	MAA: 1926.543	Cann & Renfrew 1964: 124, 130, 133. Frankfort 1927: 192. Frankfort 1930: 214, pl. XXXI.1. Hartung 2001: 291. Wainwright 1927: 88. Zarins 1989: 362, tab. 6 (no. 8). Zarins 1996: 92.
44	Abydos: Tomb U-t (from immediate surroundings)	Blade (fragment)	1	Naqada IIIB		Hartung 2001: 292.
45	Abydos (?)	Fishtail knife	1	Naqada III–1st Dynasty	MMA: 24.213	Hayes 1953: 19.
46	Abydos: Tomb B 5	Comb	1	1st Dynasty		Hartung 2001: 292. Petrie 1901b: 36, pl. XXXII.10. Wainwright 1927: 88. Zarins 1989: 364, tab. 6 (no. 34). Zarins 1996: 98.
47	Abydos: Tomb of Djer	Bead	1	1st Dynasty		Dreyer 2009: 166, pl. VI.f. Dreyer *et al.* 2011: 63, fig. 18.
48	Abydos: Tomb of Djer	Bowl (fragment)	1	1st Dynasty	RMAH: E.4833b	Bavay *et al.* 2000: 9–10. Giménez *et al.* 2015: 350. Hartung 2001: 292, fig. 53e (***). Petrie 1901b, pl. XLVIII.O87. Wainwright 1927: 88. Zarins 1989: 364, tab. 6 (no. 35). Zarins 1996: 98.

(***) Hartung 2001 erroneously refers to fig. 53d instead of 53e.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
49	Abydos: Tomb of Djer	Bowl (fragment)	1	1st Dynasty		I. Regulski, pers. comm.
50	Abydos: Tomb of Djer	Bowl (fragment)	1	1st Dynasty		I. Regulski, pers. comm.
51	Abydos: Tomb of Djer	Bowl (fragment)	1	1st Dynasty		I. Regulski, pers. comm.
52	Abydos: Tomb of Djer	Inlay	1	1st Dynasty		I. Regulski, pers. comm.
53	Abydos: Tomb of Djer	Jar (fragments)	2 (of 1 jar)	1st Dynasty		I. Regulski, pers. comm.
54	Abydos: Tomb of Djer	Knife (fragment)	1	1st Dynasty	AM: E.3000 (AN 1896-1908)	Petrie 1902, pl. XIV.
55	Abydos: Tomb of Djer	Knife (fragment)	1	1st Dynasty	AM: E.2984	Petrie 1902, pl. XIV.
56	Abydos: Tomb of Djer of Djet	Fancy Plate (fragment)	1	1st Dynasty	SMB: 15456	Scharff 1931: 239–240 (no. 728), fig. 28 (no. 728). Wainwright 1927: 89.
57	Abydos: Tomb of Djet	Bowl (fragment)	1	1st Dynasty	UC (?)	Cann & Renfrew 1964: 124, 130, 133. Hartung 2001: 292. Wainwright 1927: 88. Zarins 1989: 364, tab. 6 (no. 37). Zarins 1996: 92, 98.
58	Abydos: Tomb of Den	Bead	1	1st Dynasty		V. Müller, pers. comm.
59	Abydos: Tomb of Den	Flake	1	1st Dynasty		V. Müller, pers. comm.
60	Abydos: Tomb of Den	Projectile point (?)	1	1st Dynasty		V. Müller, pers. comm.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
61	Abydos: Tomb of Den	Vessels	Not specified	1st Dynasty		Dreyer *et al.* 1998: 158.
62	Abydos: Tomb of Den or Djer	Bottle (fragment)	1	1st Dynasty		V. Müller, pers. comm.
63	Abydos: Tomb of Den or Merneith	Vessel (fragment)	1	1st Dynasty		V. Müller, pers. comm.
64	Abydos: Tomb of Den or Qa'a	Bottle (fragments)	5	1st Dynasty		V. Müller, pers. comm.
65	Abydos: Tomb of Den or Semerkhet	Blade	1	1st Dynasty		V. Müller, pers. comm.
66	Abydos: Tomb of Den, Djer or Djet	Bottle (fragment)	1	1st Dynasty		V. Müller, pers. comm.
67	Abydos: Tomb of 'Adj-ib	Bowl (fragment)	1	1st Dynasty	UC: 36621	Hartung 2001: 292, fig. 53d (****) Petrie 1901b: pl. XLVIII.X106. Wainwright 1927: 88. Zarins 1989: 364, tab. 6 (no. 36). Zarins 1996: 98.
68	Abydos: Tomb of Semerkhet	Knife (fragment)	1	1st Dynasty	AM: E.3064	L. McNamara, pers. comm.

(****) Hartung 2001 erroneously refers to fig. 53e instead of 53d.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
69	Abydos: Tomb of Semerkhet	Vessel (fragment)	1	1st Dynasty	AM: E.1273	[Ashmolean Report] 1900: 3.
70	Abydos: Tomb of Qa'a	Bowls (fragments)	3	1st Dynasty		Engel 2017: 407, fig. 258.15: 409.
71	Abydos	Vessel (fragments)	3	1st Dynasty (?)	RMAH: E.4833a RMAH: E.4833c RMAH: E.4833d RMAH: E.4833e	Bavay *et al.* 2000: 10.
72	Abydos: Tomb U-142	Blade	1	??		Hartung 2001: 292.
73	Abydos	Vase	1	??	EM: CGC 14391	Quibell 1904–1905: 259, pl. 55 (no. 14391)
74	Hiw: Tomb U 207	Blade	1	Naqada IIC		Hartung 2001: 293. Massoulard 1936: 159. Petrie 1901a: pl. X.33. Petrie 1920: 43. Wainwright 1927: 88. Zarins 1989: 362, tab. 6 (no. 10).
75	Hiw	Bead	1	Naqada IID	FM (?)	Hartung 2001: 293. Petrie 1901a: 27, pl. IV. (?) Wainwright 1927: 88, 89. Zarins 1989: 362, tab. 6 (no. 11).
76	Abadiya: Cemetery B	Beads	Not specified	Naqada IC–II	MMA: 99.4.2	Petrie 1901a: 27, pl. IV. (?)
77	Naqada: Tomb 74	Blade	1	Naqada IID1	AM: AN1985.1147	Hartung 2001: 293. Payne 1987: 182. Payne 2000: 197 (no. 1626).

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
78	Naqada: Tomb 743	Knife (fragment)	1	Naqada IID1	UC: 4385	Baumgartel 1970: pl. XXIX. Bavay *et al.* 2000: 11–12. Giménez *et al.* 2015: 350. Hartung 2001: 293. Holmes 1989: 277–278, 282. Massoulard 1936: 158–159. Petrie & Quibell 1896: 27, 45. Petrie 1920: 43, pl. XLV.46 Wainwright 1927: 88. Zarins 1989: 361, tab. 6 (no. 4). Zarins 1996: 93, tab. 1.
79	Naqada: Tomb 499	Beads	12	Naqada IID2	UC: 4267	Baumgartel 1970: pl. XXI. Bavay *et al.* 2000: 11 Cann & Renfrew 1964: 124, 130, 133. Giménez *et al.* 2015: 350. Hartung 2001: 293. Massoulard 1936: 159. Petrie 1920: 44. Wainwright 1927: 88. Zarins 1989: 362, tab. 6 (no. 5). Zarins 1996: 92, tab. 1.
80	Naqada: Tomb 1260	Blades	Not specified	Naqada IID2	UC: 5427	Baumgartel 1970: pl. XXXVII. Hartung 2001: 293. Holmes 1989: 277–278, 282. Massoulard 1936: 158–159. Petrie & Quibell 1896: 45. Petrie 1920: 43. Quibell 1896: 30. Wainwright 1927: 88. Zarins 1989: 361, tab. 6 (no. 3). Zarins 1996: 91, tab. 1.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
81	Naqada: South Town (?)	Axe (fragment)	1	Naqada II (?)	AM: AN1895.1146	Baumgartel 1970: LXXII. Hartung 2001: 293. Payne 2000: 197 (no. 1629). Petrie & Quibell 1896: 57. Zarins 1989: 362, tab. 6 (no. 7). Zarins 1996: tab. 1.
82	Naqada: South Town (?)	Flakes	Not specified	Naqada II (?)	AM: AN1895.1146	Payne 2000: 197 (no. 1629). Petrie & Quibell 1896: 57. Zarins 1989: 362, tab. 6 (no. 7). Zarins 1996: tab. 1.
83	Naqada	Blade	1	Naqada II (?)	AM: AN1895.1148	Payne 2000: 197 (no. 1627).
84	Naqada	Blade	1	Naqada II (?)	AM: AN1895.1149	Hartung 2001: 293. Payne 2000: 197 (no. 1628).
85	Naqada: Tomb 140	Blades	Not specified	Naqada IIIA2–B (?)		Baumgartel 1970: pl. VI. Hartung 2001: 293. Zarins 1989: 362, tab. 6 (no. 6). Zarins 1996: tab. 1.
86	Naqada: Tomb 388	Bead (obsidian or pitchstone)	1	Naqada IIIA	UC: 4503	Baumgartel 1970: pl. XVI. Hartung 2001: 293. Payne 1987: 184.
87	Naqada: Royal Tomb, room C	Bottle (fragment)	1	1st Dynasty	EM: CGC 11971	de Morgan 1897: 163, 180, fig. 627. Hartung 2001: 293, fig. 53.f. Kahl 2001: 16, fig. 19. Kahl *et al.* 2001: 183, fig. 5d. Quibell 1904–1905: 193 (no. 11971). Wainwright 1927: 88. Zarins 1989: 364, tab. 6 (no. 33). Zarins 1996: 98.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
88	Naqada: Royal Tomb, room C	Bottles (fragments)	3	1st Dynasty	EM: CGC 11970 EM: CGC 11970a	de Morgan 1897: 163, 180, fig. 625. Hartung 2001: 293, fig. 53.f. Kahl *et al.* 2001: 183, fig. 5a–b. Quibell 1904–1905: 193 (nos 11970, 11970a). Wainwright 1927: 88. Zarins 1989: 364, tab. 6 (no. 33). Zarins 1996: 98.
89	Naqada: Royal Tomb	Vase (fragment)	1	1st Dynasty	EM: CGC 11973	Quibell 1904–1905: 193 (no. 11973).
90	Naqada: Royal Tomb	Vase (fragment)	1	1st Dynasty	EM: CGC 11974	de Morgan 1897: 163, 180, fig. 626. Hartung 2001: 293, fig. 53.f. Kahl *et al.* 2001: 183, fig. 5c. Quibell 1904–1905: 194 (no. 11974). Wainwright 1927: 88. Zarins 1989: 364, tab. 6 (no. 33).
91	Naqada: Royal Tomb	Vase (fragments)	2	1st Dynasty	EM: CGC 11972	Quibell 1904–1905: 193 (no. 11972).
92	Naqada: Royal Tomb	Vase	1	1st Dynasty	GMA: E.5150	Kahl *et al.* 2001: 183, fig. 5e. Wainwright 1927: 89.
93	Naqada: Royal tomb	Vase	2	1st Dynasty	GMA: E.5149 GMA: E.5152	Kahl *et al.* 2001: 183, fig. 5f. Wainwright 1927: 89.
94	Hierakonpolis: HK29, Square 17L13, Structure II	Flakes	Not specified	Naqada I		Hartung 2001: 293. McHugh 1982: 90–91. Zarins 1989: 361, tab. 6 (no. 1). Zarins 1996: 91, 98.
95	Hierakonpolis: HK6, Structure E8, Deposit A	Not specified	1	Naqada IC–IIA2		Friedman 2006: 7. Friedman *et al.* 2008: 90.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
96	Hierakonpolis: HK6, Tomb 84 (?)	Blade	1	Naqada IIA–B		Friedman & Droux 2018: 16.
97	Hierakonpolis: HK6, Square H12/18H, Context 5	Blades	4	Naqada IIA–B		Adams 1998: 3. Adams 1999: 48. Friedman 2004: 150, fig. 13. Van Neer *et al.* 2004: 88.
98	Hierakonpolis: HK6, Structure E8, Feature D	Flakes and large chunk	Not specified	Naqada IIA–B		Friedman 2004: 145. Friedman 2006: 7. Friedman 2008: 1173. Friedman 2009: 87. Friedman *et al.* 2008: 90.
99	Hierakonpolis: HK6, Loc. 13110, associated with Tomb 73	Blade	1	Naqada II–B (?)		R.F. Friedman, pers. comm.
100	Hierakonpolis: HK29A, Square 140L50-13, reg. 442	Bead	1	Naqada IIB–C		Friedman 1996: 29. Friedman 2009: 98.
101	Hierakonpolis: HK29A, Wall trench	Flake and chunk	2	Naqada IIB–C		Friedman 2003: 4 Friedman 2009: 90
102	Hierakonpolis: HK29A, Square 140L50, loc. 3	Flakes	Not specified	Naqada IID–IIIA		Takamiya 2008: 8.
103	Hierakonpolis: HK29B	Not specified	5	Naqada IIB–D		Friedman *et al.* 2009: 196. Hikade *et al.* 2008: 177.
104	Hierakonpolis: HK6, Surface	Blade (fragment)	1	Naqada II–III (?)		Bavay *et al.* 2000: 12.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
105	Hierakonpolis: HK6, Tomb 11	Blades	5	Naqada IIIA2		Adams & Friedman 1992: 334. Adams 1995: 51–52. Adams 1996a: 13. Adams 1996b: 140. Adams 2000: 83-84, pl. XXX.f, figs 14.128, 15.127. Hartung 2001: 294. Zarins 1989: 361, tab. 6 (no. 2) Zarins 1996: 98.
106	Hierakonpolis: HK6, Tomb 111	Blades and chunk	5 blades, 1 chunk	Naqada IIIA2		Friedman 2018: 4
107	Hierakonpolis: Nekhen, revetment	Beads	Not specified	Naqada III (?)	FM: E.111.1898 (?)	Adams 1974b: 18. Zarins 1989: 364, tab. 6 (no. 41).
108	Hierakonpolis: Nekhen, bead production deposit	Beads and flakes	3 beads, 2 flakes	Naqada III (?)	UC: 14877	Adams 1974a: 30–31 (no. 149), pl. 31. Adams 1974b: 32. Adams 1995: 70. Bavay *et al.* 2000: 12–13. Giménez *et al.* 2015: 350. Quibell & Green 1902: 12, 52. Wainwright 1927: 88. Zarins 1989: 364, tab. 6 (nos 38, 40, 43).
109	Hierakonpolis: Nekhen, temple or royal ritual precinct	Flake	1	Naqada III (?)		Adams 1974b: 52. Adams 1996b: 140. Zarins 1989: 364, tab. 6 (no. 42).
110	Hierakonpolis: Main Deposit (below Narmer palette)	Bead	1	??		Adams & Friedman 1992: 319.

No.	*Site / Context*	*Description*	*Number*	*Period*	*Museum Inv. number*	*Bibliography*
111	Elkab: Settlement, TP3	Flake	1	Naqada IIA		Claes *et al.* 2014: 85. Claes & Huyge 2016: 41. Claes & Huyge 2017: 46.
112	Khor Bahan	Not specified	Not specified	A-Group		Giménez *et al.* 2015: 358. Williams 2011: 83.
113	Sheikh Sharaf: Cemetery 134, Tomb 6	Flake	1	A-Group		Adams 1996b: 140. Bavay *et al.* 2000: 17, n. 45 Firth 1927: 193, pl. 21.e1. Hofmann 1967: 95. Roy 2011: 130.
114	Naga el Sheikh: Cemetery 136, Tomb 2	Flake	1	A-Group		Adams 1996b: 140. Bavay *et al.* 2000: 17, n. 45 Firth 1927: 200, pl. 21.e2. Hofmann 1967: 95.
115	Sayala: Shelter	Flake	1	ED		Bietak & Engelmayer 1963: 26, pl. XIX (no. 13). Hofmann 1967: 95.
116	Unknown	Flakes	3	PD	EM	Lucas 1947: 120.
117	Unknown	Blade	1	PD–OK (?)	UH: 756	Feucht 1986: 11, 13 (no. 16). Zarins 1989: 363, tab. 6 (no. 25).
118	Unknown	Knife (fragment)	2	PD–OK (?)	BM: EA35121 BM: EA35122	Not published.
119	Unknown	Blades	2	PD–OK (?)	EM	Not published.
120	Unknown	Flakes	Not specified	ED (?)	NM	Hartung 2001: 294. Lucas 1947: 119. Wainwright 1927: 88 Zarins 1989: 364, tab. 6 (no. 39).
121	Unknown	Vessel	1	ED (?)	SNM	Not published.
122	Unknown	Blade	2 (of 1)	PD–ED	SMB: 15341	Scharff 1931: 58 (no. 86), fig. 8 (no. 86).