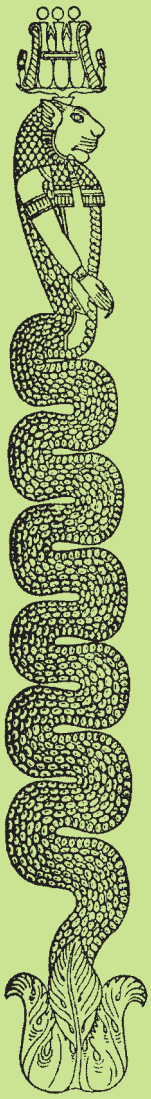

KUSH

PROCEEDINGS

OF THE

14TH INTERNATIONAL CONFERENCE FOR NUBIAN STUDIES

PARIS 2018

VOLUME XX

2023

LOUVRE éditions
SORBONNE UNIVERSITÉ

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THE PRINTING OF THIS VOLUME HAS BEEN FINANCED BY

THE MUSÉE DU LOUVRE AND SORBONNE UNIVERSITÉ/UMR 8167
ORIENT & MÉDITERRANÉE

PRINTED ON THE PRESS OF THE FRENCH INSTITUTE
FOR ORIENTAL ARCHAEOLOGY (IFAO)

National Corporation for Antiquities and Museums
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ISBN 978-2-72471-049-6

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WORKSHOPS

"Diffusionist" Suggestions in the Nile Valley Prehistory

Workshop 1

Coordinators: Donatella Usai, Friederike Jesse.

Participants: Contributions to the discussion came from (in alphabetical order) Julien Cooper, Renee Friedman, Matthieu Honegger, Emma Maines, Andrea Manzo, Uffe Steffensen, Donatella Usai, Lenka Varadzinová, Ladislav Varadzin.

Authors (in alphabetical order): Matthieu Honegger, Friederike Jesse, Emma Maines, Andrea Manzo, Valentin Thouzeau, Donatella Usai.

INTRODUCTION OF THE WORKSHOP

Donatella Usai

Among the many papers that have been published following C. Renfrew's 1987[1] resurrection of migration theory in archaeology "*Migration in archeology: the baby and the bathwater*", a paper written by D. W. Anthony[2] and published in 1990 in the *American Anthropologist Journal*, is one with the most provocative title, but is also rather thoughtful.

The availability of new scientific analytic methods, among which those for studying ancient DNA is possibly the most important development, today allows us to incorporate migration in the explanation of culture change.

One of the first proponents of diffusionism, G. Kossinna,[3] in the early 20th century, worked on identifying the distribution of prehistoric traits in Europe, and used migration as the means by which to interpret similarities in cultures. This tool was also used by G. Childe who, nevertheless, argued against the assimilation of archaeological cultures to ethnic groups.[4]

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[1] Renfrew, *Indo-European Origins*, 1987.
[2] Anthony, *AmAnthr* 92(4), 1990.
[3] Veit, *Saeculum* 35, 1984.
[4] Shennan, in *Archaeological Approaches*, 1994.

Diffusionist theory has been abused in the past to such an extent that it has been largely rejected as having any influence on cultural and social changes. Migrations studies, interpreted as sterile external factors used to explain evolution within a complex society, became irrelevant and were dropped in favour of the search for factors internal to the social system.

Now tools to recognise migration in prehistoric societies are granted by scientific disciplines, but it remains difficult to identifying the causes. So far it seems easier for archaeologists to work on the structural conditions that encouraged the occurrence of migrations.

Among the attempts to rehabilitate diffusionism and migration, for example, is the one approaching the theme of the spread of the Linearbandkeramik group in Neolithic Europe,[5] supported by strontium stable isotope analysis. There are also countless attempts to explain the demic diffusion/migration of humans, animals and plants by means of genetic analyses.[6]

The Nile river is considered as a possible migratory route of *Homo sapiens* out of Africa. The archaeological data in support of this hypothesis are scanty; they may have been destroyed by the ongoing evolution of the river itself. Erosion has left us lag deposits where most often only lithic artefacts survive. This scarcity has kept the Nile Valley in Sudan marginal to discussions on the evolution and diffusion of modern humans, compared to Eastern and Southern Africa. With the advent of pottery technology, decorative patterns suggest a common cultural substratum possibly hiding a story of short or long-distance migrations. Population movements from the North, along the Nile Valley, may be responsible for the acquisition of an agro-pastoral economy in Central Sudan. In fact, the transition to food production, in this area, appears as a radical and almost sudden change accompanied by new social and ideological behaviours.[7]

A scientific approach to migratory movements in the Nile Valley has not yet been widely applied,[8] not least because of poor preservation and the diagenesis of human remains. The overall archaeological record can, however, probably still *suggest* stories of *diffusions* to us, and scholars working in the region are invited to explore this possibility and discuss them in this small forum.

The preceding text is the detailed abstract setting the ground for the prehistoric workshop during the Nubian Conference 2018 in Paris. About 25 scholars

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[5] Price *et al.*, in *Last hunters*, 1995; Bentley *et al.*, *CurrAnthr* 43, 2002.

[6] For ex. Arredi *et al.*, *AmJHG* 75, 2004; Paschou *et al.*, *PNAS* 111(25), 2014; Larson *et al.*, *PNAS* 104(39), 2007; Decker *et al.*, *PLOS Gen* 10, 2014; Allaby *et al.*, *PTRS B* 370, 2014.

[7] Reinold, *el-Kadada*, 2007; *A Neolithic Cemetery*, 2008; *Ghaba*, 2016; *Kadero*, 2011.

[8] But see Pääbo, *Nature* 314, 1985; Krings *et al.*, *AmJHG* 64, 1999; Lalueza Fox, *AnHB* 24,1997; Shuenemann *et al.*, *NatCommun* 6(8), 2017.

followed the invitation to discuss the issues of migration and diffusion in the prehistoric Nile Valley for about two hours on Friday, 14th of September 2018. The workshop started with an introductory statement made by D. Usai. Four short communications then presented case studies in Sudanese prehistory, and were followed up by a general discussion.

For this publication we decided to present the case studies and to summarize the main points of the discussion.[9] In the text, the terms "Mesolithic" and "Neolithic" are used in the tradition of A. J. Arkell's definition, and "Neolithisation", therefore describes the transition to a food producing economy between both phases.

1. INTRODUCTORY STATEMENT

Donatella Usai

There is an enormous literature concerning the subject of diffusion and migration.[10] Topics dealt with are broad, and especially the development and application of new scientific methods in genetic or isotope analysis have contributed to the revival of theories of migration and diffusion as a means of explaining change in prehistoric times. Finally, we can state that people were moving since the earliest times.

In Sudan, however, not all of these new scientific approaches can be applied, as we have to deal with sampling problems, in particular the lack of remaining DNA in human bones which hampers genetic analysis. On the other hand, the Nile Valley has always been discussed as a route for diffusion or migration, most notably in the "Out of Africa" hypothesis. Therefore, one question for our discussion today should be to examine the possible input to the debate about migration from the perspective of the archaeological material.

Within this research topic we may also include the issue of the transition between the Mesolithic and Neolithic in Sudan. The available 14C-dates for Sudan indicate the start of the Neolithic period in the 6th millennium BCE. However, the first evidence of food production in central Sudan emerges nearly a thousand years later than in Upper Nubia. Considering the available 14C-dates, it is possible to see diffusion during the Neolithic in Sudan, from north to south, although there are some dates in the central region that would need to be discussed or interpreted. The ancient dates of Rabak (c. 5000 BCE), are in fact questionable, and

[9] We would like to thank A. Brémont-Bellini for technical assistance during the workshop and also for providing us with her notes taken during the discussion.

[10] E.g. Ammerman, Cavalli-Sforza, in *The Explanation of Culture Change*, 1973; Ammerman, Cavalli-Sforza, *Genetics*, 1984; Härke, *CurrAnthr* 39, 1998; Burmeister, *CurrAnthr* 41, 2000; Chami, *AAR* 24, 2007; Derricourt, *JWP* 19, 2005; Groucutt *et al.*, *EvAnthr* 24, 2015.

also the date of around 5600 BCE for Ghaba (from which a phytolith sample was dated) might not give a Neolithic, but rather a late Mesolithic date.[11] Another hint might be found in the development of pottery: in Central Sudan, during the whole Neolithic period, pottery is decorated. In Upper Nubia however, the Middle Neolithic B phase is characterised by plain pottery, and it seems that the start of movements of groups from the Nubian region may be attributed to this period.

2. FIRST CASE STUDY: THE NEOLITHISATION PROCESS IN NUBIA: ACCULTURATION OR MIGRATION? THE CASE OF EL-BARGA

Matthieu Honegger

Excavations at El-Barga near Kerma have revealed the oldest known Neolithic cemetery in Africa (6000–5500 BCE). It is therefore an interesting site with which to evoke the concept of Neolithisation, a process that closely concerns the question of diffusion, given that a significant part of the Neolithic components that appear in north-eastern Africa originated in the Near East (barley and wheat farming, cattle, caprine and pig breeding). They necessarily spread from this region towards the Nile Valley and the surrounding deserts in ways that have yet to be defined. Many models have been developed to explain, on the one hand, the mechanism of displacement of populations carrying a Neolithic package (wave of advance, leapfrog colonisation) and, on the other hand, the way in which local hunter-gatherer populations adopted the new economy (availability, social, capillary, re-composition).[12] These mechanisms are still largely unknown in the Nile Valley, given the scarcity of sites dating from the early Neolithic, their often significant erosion and their uneven distribution.

If we focus on the early manifestations of the phenomenon in Egypt, the majority of authors now consider that the main domesticated species originated in the Near East and were introduced towards the end of the 7th millennium BCE.[13] A few years ago, two successive waves of introductions were proposed.[14] One, including cattle and caprines, is thought to be associated with mobile and pastoral populations, like those documented in the Western Desert of Egypt. The other is attested as early as the 5th millennium BCE in northern Egypt and is associated with more sedentary populations that practised livestock breeding and agriculture, with a particular focus on wheat and barley. This hypothesis of two separate waves of introduction cannot be ruled out. However, a recent study on

[11] Salvatori, Usai, in *Mél. Geus*, 2007 and *Ghaba* 2016; *A Neolithic Cemetery*, 2008.
[12] Linstädter *et al.*, *QI* 274, 2012.
[13] Brass, *JWP* 31, 2018; Riemer, in *Aridity, change and conflict in Africa*, 2007.
[14] Linseele, in *Neolithisation of Northeastern Africa*, 2013; Linseele *et al.*, *PLOS One* 9(10), 2014.

the contribution of the Sudanese discoveries to the question of the Neolithisation of the Nile Valley, gives a significantly different picture.[15] The discovery of cereal remains in Sudanese cemeteries, at least from the 2nd half of the 6th millennium BCE, as well as the presence of cattle and caprines from the 1st half of the 6th millennium BCE, allows us to consider that all these components arrived at the same time, as a coherent Neolithic package in the Sudanese Nile Valley between the end of the 7th and the beginning of the 6th millennium BCE.

The fact that there are no known Neolithic sites dated between the 7th and 5th millennia BCE on the edge of the Egyptian Nile Valley represents a major handicap because it is not known whether this environment close to the river, probably benefiting from favourable environmental conditions, could have been a laboratory for adaptation to African conditions during the first wave in which cattle and goats were introduced. Most of the information regarding the beginning of pastoralism thus comes from what are now desert or oasis regions, and is represented mainly by campsites, often eroded and unstratified, and subject to fluctuating environmental conditions.[16] At the end of the 7th millennium and during the 6th millennium BCE, the volume of hunted fauna remains high in these semi-desert environments and most of the material found consists of hunting equipment. The process of the diffusion of domestic cattle and caprines appears rapidly, whilst groups continued to be strongly marked by hunting and gathering.[17] At the level of material culture, some innovations appear such as axe blades, ornaments, ceramics with a plain surface and a bifacial lithic industry. Some researchers mentioned the possibility of the coeval arrival of goats, smooth-surfaced ceramics and bifacial retouch.[18] This position is not taken up by MacDonald, who shows that these three innovations were apparently introduced separately from each other.[19] The current state of research in Egypt suggests that the sites in the Western Desert, which provide the bulk of the information on the First Neolithic, participated only minimally in the Neolithisation process derived from the Near East.[20] These sites, which offer the image of a gradual transition, would be more a reflection of a distinctive African pathway towards food production,[21] illustrated, among other things, by the diversity of adaptations to different environments, the maintenance of a hunting economy or the late introduction

[15] Salvatori, Usai, *JWP* 32, 2019.
[16] Dittrich, in *Neolithisation of Northeastern Africa*, 2013.
[17] Riemer, in *Aridity, change and conflict in Africa*, 2007.
[18] Kuper, in *Egypt and Nubia*, 2002.
[19] McDonald, *QI* 410, 2016.
[20] Riemer, Kindermann, in *Handbook of Ancient Nubia*, 2019; McDonald, *QI* 410, 2016.
[21] Marshall, Weissbrod, *CurrAnthr* 52(4), 2011.

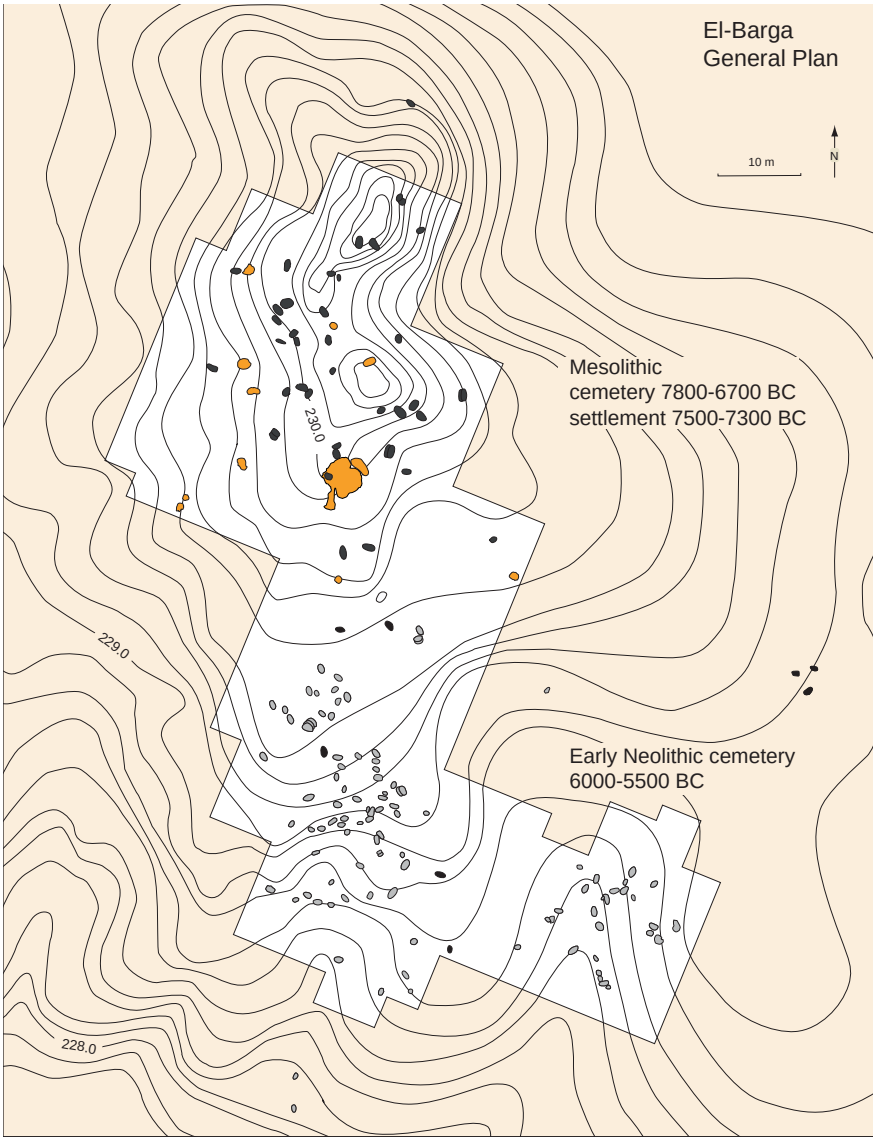

Fig. 1. General plan of the site of El-Barga with Mesolithic graves (black), Neolithic graves (grey), empty grave (white) and Mesolithic habitation structures (orange). Contour equidistance, 10 cm. © Mission archéologique suisse à Kerma, Matthieu Honegger.

of agriculture. We would thus be faced with a type of diffusion that is close to the social or capillary models and that leads to a re-composition of the Neolithic.

The site of El-Barga is located on the edge of the alluvial plain of Kerma, south of the 3rd Cataract, at 11,5 km from the current river bed of the Nile (Fig. 1). The site was excavated between 2001 and 2014 on a surface of a little less than 4000 square meters. It revealed a Mesolithic habitation structure with ten pits and two cemeteries dated from the Mesolithic and Neolithic periods. Preliminary papers have already been published[22] and these two cemeteries will soon be published in detail.[23] We will limit ourselves here to recalling the main characteristics of the site. The Mesolithic cemetery is composed of 45 graves for 46 individuals and the Neolithic one of 105 graves for 107 individuals. If the main concentrations have been excavated, there are probably about thirty more graves in the area.

The Mesolithic graves were dug in the sand or the sandstone bedrock and the position and the orientation of the bodies is various. In only two cases were grave goods associated with adults: a shell (*Unio sp*.) and ostrich eggshell beads. Neolithic graves were more frequently dug in the sand than in the sandstone bedrock. The position and the orientation of the body is varied and generally more flexed than the Mesolithic one (Fig. 2).

The most striking difference is that 65% of the Neolithic tombs contain grave goods (Fig. 3). The main components were completely new in the material culture of the Sudan. They are characterised among other things by the presence of polished stone objects, like axe heads, beads, labrets, earrings and pendants. First stone palettes appear at the same period, as well as ivory bracelets. A few pots were present in some graves. The burnished and plain pottery is a new tradition, which comes from the north and is well known in the Western Desert. On the other side, the impressed pottery remained in the Sudanese tradition known since the Mesolithic.

First morphometric comparisons of the two groups have already been published, one based on the mandible[24] and the other on the teeth.[25] The Mesolithic population had long and wide mandibles with high mandibular corpus and wide ramus. They had more affinity with the population of the Late Pleistocene, like those in the cemetery of Jebel Sahaba. The Neolithic population had shorter and narrower mandibles, and a greater robusticity index. In association with other morphometric analyses still unpublished, the hypothesis of a biological discontinuity between these two populations can be supported. Analyses of ancient DNA

[22] Honegger, *SudNub* 8, 2004; Honegger, *RevPaléobio* 10, 2006.
[23] Honegger *et al.*, in prep.
[24] Crevecoeur, *Kerma* 4, 2012.
[25] Benoiston *et al.*, in *Nubian Archaeology*, 2018.

Fig. 2. Two graves of El-Barga. On the left, female grave of the Mesolithic in a flexed position. On the right, female grave of the Neolithic in a hypercontracted position with many grave goods. © Mission archéologique suisse à Kerma, Matthieu Honegger.

could confirm or disprove this hypothesis. While the first DNA extraction tests carried out in 2013 were negative, new tests in 2019 yielded more conclusive results, leading to a new research programme for future years.

In conclusion, the Neolithic cemetery of El-Barga shows:

– A population that seems largely renewed compared to the Epipaleolithic/Mesolithic substratum. It supposes the arrival of a new population.

– A break in the funerary rites with the introduction of grave-goods.

– A break in the material culture with the introduction of ceramics with undecorated surface and especially the polishing of hard stone, the appearance of axe blades and ornamental elements (labrets, earrings, stone beads, stone pendants).

– Elements of continuity in the presence of pottery with Sudanese style decoration, harpoons or ostrich shell beads, which are part of the continuity of the local material culture of the hunter-gatherers.

These characteristics suggest a rapid diffusion of a Neolithic population along the Nile Valley with a strong cultural identity, which drew its origins from the Near East. As for the elements of continuity in material culture, they imply an interaction with the local settlement. Despite these interactions, the transition

Fig. 3. Examples of Neolithic grave goods of El-Barga. Plain surface pottery on the left and impressed pottery in the Sudanese style on the right. Polished stone tools (axe blades) and ornaments (earrings and labrets). © Mission archéologique suisse à Kerma, Matthieu Honegger.

was apparently less progressive than the observations in the Egyptian Western Desert. It suggests a colonization of the Nilotic corridor by a Neolithic Near Eastern population, accompanied by interactions with local people, and even acculturation. This situation is quite distinct from that proposed for the Western Desert, but it is not contradictory. The Nile Valley would have been subjected more directly to diffusion from the Near East, while the Western Desert would have experienced a less pronounced impact, resulting in Neolithic adaptation and re-composition.

3. SECOND CASE STUDY: CULTURAL TRADITION AND SETTLEMENT IN THE EASTERN CEMETERY OF KERMA

Matthieu Honegger

The Eastern Cemetery of Kerma was systematically investigated between 2008 and 2018 in its early stages, with a view to understanding how the Kingdom of Kerma developed.[26] A total of 409 tombs were excavated for the period between the beginning of the occupation of the cemetery (2550 BCE) and the beginning of Middle Kerma (2050-2000 BCE). Based on pottery style, funerary rites and 14C dating, five successive phases were distinguished. The interest of this sequence lies not only in its precision, but also in the fact that it is possible to follow in detail the stages of the formation of the Kingdom of Kerma, which led to the appearance of a royalty characterised by monumental tombs at the beginning of Middle Kerma. Apart from the presence of Egyptian pottery, the cultural attributions are based on the style of pottery. Three traditions can thus be distinguished: tradition 1, which relates to Pre-Kerma; tradition 2, which relates to

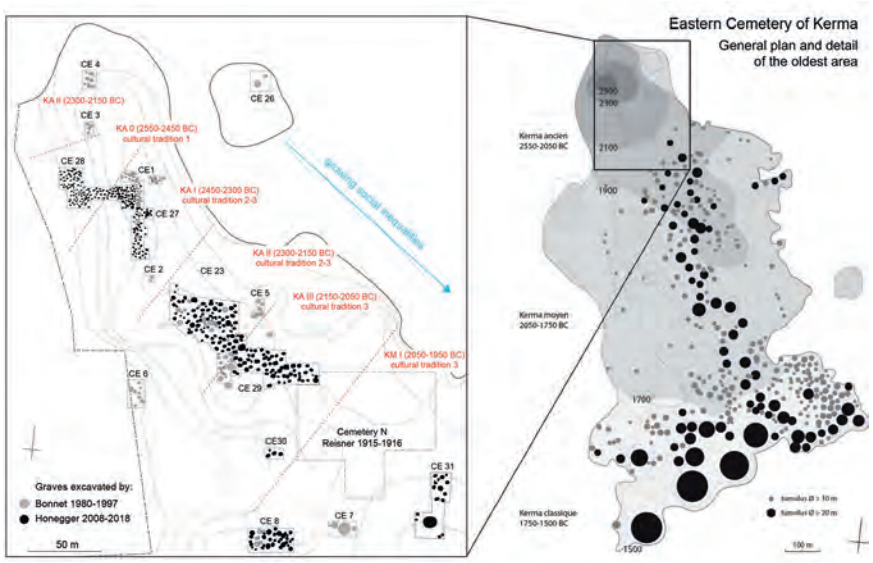

Fig. 4. General plan of the Eastern Cemetery of Kerma and of the oldest area in the northern part where 533 graves were excavated these last decades. The first five centuries of the evolution of the cemetery are separated into five chronological phases of about a century, which show important contrasts in terms of cultural traditions and social hierarchy. © Mission archéologique suisse à Kerma, Matthieu Honegger.

[26] Honegger, in *Nubian Archaeology*, 2018; Honegger, *BSNSN* 138, 2018.

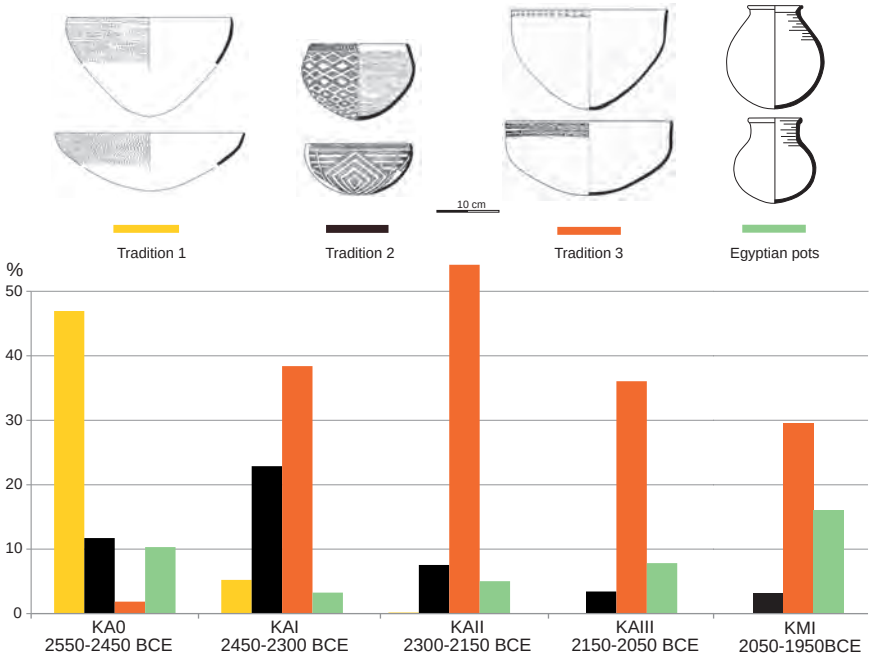

Fig. 5. Histogram showing the proportions of the three Nubian pottery traditions and the Egyptian vessels during the five first phases of the Eastern Cemetery. The proportions are calculated on the total number of pots for each phase. The total of pots considered in this analyse reach 2001. © Mission archéologique suisse à Kerma, Matthieu Honegger.

C-Group; and tradition 3, which corresponds to the Kerma culture. It is important to remember that these three traditions[27] are present in a very contrasting way between the first five phases of the development of the cemetery, each lasting between 100 and 150 years. These are *Kerma ancien* 0 (2550–2450 BCE), *Kerma ancien* I (2450–2300 BCE), *Kerma ancien* II (2300–2150 BCE), *Kerma ancien* III (2150–2050 BCE) and *Middle Kerma Moyen* I (2050–1950 BCE). Fig. 4 shows the spatial distribution of these phases and the traditions associated with them.

The systematic counting of pottery sherds from the surface, filling or bottom of the tombs, and the estimation of the minimum number of vases allowed to calculate the proportion of the three cultural traditions of Nubia at that time, as well as the imported Egyptian pottery (Fig. 5). The proportion of Egyptian imports is interesting; it seems to reflect the existence of periods when commercial exchanges were more or less important. We have already pointed out[28] that

[27] For a detailed description see Honegger, in *Nubian Archaeology*, 2018.
[28] Honegger, in *Nubian Archaeology*, 2018.

the decrease in trade during *Kerma ancien* I must have been the consequence of a certain lack of control over Lower Nubia by the Egyptians between the 5th and the 6th Dynasty.[29] It was Herkouf's expeditions during *Kerma ancien* II that must be at the origin of the resumption of trade growth. As far as Nubian traditions are concerned, *Kerma ancien* 0 shows the dominance of Pre-Kerma pots, the presence of C-Group pottery and the near absence of vases related to Kerma culture. *Kerma ancien* I reflects a strong coexistence of C-Group and Kerma traditions, as well as the disappearance of Pre-Kerma components. In the following phases, C-Group gradually declined, while the Kerma tradition became more and more established.

The question is, how can these observations be interpreted? Do they reflect the presence of different populations, or are they rather social interactions whose foundations are largely unknown to us? When George Reisner defined the A-, B- and C-Groups during the first campaign related to the Aswan Dam,[30] his definitions were essentially based on pottery and he associated them with distinct populations. This relationship between culture and population is a frequent temptation among archaeologists, even though they are aware that the concept of culture is above all a classificatory instrument.[31] In our case, it is not clear whether the transition from a Pre-Kerma to a Kerma tradition should be interpreted in terms of continuity or not on a cultural or population level. On the cultural level, one would be tempted to advocate a certain continuity, on the other hand one cannot say much on the population level, as Pre-Kerma is not well enough known. As for the relationship between the traditions of C-Group and Kerma, the question is more complex. While it is agreed that these two entities can be clearly distinguished from the 2nd millennium BC onwards with a different territorial partition, Lower Nubia for C-Group and Upper Nubia for Kerma, the situation is more confused for the previous period. As Lower Nubia appears to have been largely depopulated during the first half of the 3rd millennium BCE, several authors have proposed to locate the origin of the C-Group further south, in the regions of Kordofan or Darfur.[32] This question of origins is not clearly resolved and one could also locate this supposed area of origin between the 2nd Cataract and the Northern Dongola Reach, where the two traditions are imbricated. Indeed, in the Early Kerma cemeteries of this region, the presence of C-Group pottery has long been highlighted,[33] as well as the presence of burial mounds with stelae considered typical of this group. However, within burial

[29] Török, *Between Two Worlds*, 2008, 53-73.
[30] Adams, *Nubia*, 1977, 122; Reisner, *ASN Bull* 3, 1909.
[31] Gallay, in *Le Chasséen*, 2016.
[32] For a discussion of this issue, see Raue, in *Handbook of Ancient Nubia*, 2019.
[33] Gratien, *Cultures Kerma*, 1978.

spaces such as that of the Eastern Cemetery of Kerma, there is no opposition between the two cultural traditions. On the contrary, the two traditions are interwoven, since the same tomb may be furnished with both C-Group and Kerma vases, just as a tomb with a burial mound from one of these traditions may well be accompanied by pottery belonging mainly to the other tradition.

For the C-Group, it has been suggested that these sophisticated pots formed part of the gift exchanges between members of the elites.[34] Personally, we are not convinced that these pots are the object of exchange. However, we assume that the fine and decorated vases of C-Group and Kerma must have had a symbolic and identity dimension given the fact that they are essentially reserved for funerary rites, imply a high investment in their production, and that the decorations are very characteristic. The problem is that this identity does not necessarily correspond to the ethnic vision that archaeologists usually have in defining such ensembles. It may also be a lineage-based identity that was superimposed on other social, territorial and political subdivisions. It is worth recalling that during his expeditions, during the reigns of Merenre I and Pepi II, ca. 2250–2240 BCE, Herkouf teaches us that several polities occupied Nubia and that these did not necessarily enjoy pacific relations.[35] Can these polities be identified by the characteristics of the fine vessel and of certain burial mounds? Apparently not: they respond to another reality that is not necessarily expressed in material culture. In short, we find it difficult to hold an ethnic or tribal discourse when it comes to opposing the C-Group and Kerma, even though these groups occupied distinct territories with very different destinies at times. It would be wiser to steer our interpretations in other directions than the one that remains too much based on a culture-historical archaeology,[36] trying instead to measure degrees of cultural interconnection between this or that region, rather than reducing the debate to supposedly ethnic or tribal identities. In the case of the Eastern Cemetery, future research should seek to deepen this question of identity by involving a more in-depth study of the pottery decorations, while conducting a series of analyses on ancient DNA and isotopes (C, N, Str) with a view to having more robust data with which to address issues of mobility and identity in these cultures at the end of the 3rd millennium BCE.

Once these issues are better understood, it will be possible to speak in clearer terms of influences or population movements within Nubia. This will then make it possible to propose explanations that go beyond the traditional North-South diffusionism expressed through trade and the gradual adoption of certain Egyptian characteristics among Nubian populations.

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[34] Török, *Between Two Worlds*, 2008, 131-139.
[35] Török, *Between Two Worlds*, 2008, 69-70.
[36] Trigger, *History of Archaeological Thoughts*, 1989.

4. THIRD CASE STUDY (KADRUKA): DENTAL TRAIT ANALYSIS: A MEANS FOR EXAMINING POPULATION CONTINUITY?

Emma Maines and Valentin Thouzeau

The analyses presented within the framework of this workshop embody a series of preliminary tests that provide insight into population proximity and continuity during the Neolithic in Upper Nubia, as well as more broadly from a regional standpoint. These preliminary analyses were further developed and significantly improved upon in subsequent dissertation work and will be the subject of an inclusive and comprehensive article. Nonetheless, these early tests provide insight into specific issues and potential setbacks that may be confronted when analysing prehistoric population distances by virtue of biological data. They also express certain tendencies that were confirmed or further developed by subsequent analysis.

The material directly examined in this study comes from five sites excavated in the Kadruka concession. This zone is located between the 3rd and 4th Cataract of the Nile. J. Reinold previously excavated four of the five sites between the 1980s and the early 2000s, the fifth site, KDK 23, is part of a new project underway since 2014. One of the main objectives of this study was to compare the Kadruka sites, all dating to different portions of the Middle Neolithic,[37] with other sites, deemed close either in terms of geographical or chronological provenance and which are detailed below.

Correspondence analysis. The initial tests relied on the use of correspondence analysis (CA). This test was performed to compare our findings regarding discrete dental characteristics with those from other studies in the region. Indeed, thanks to the prolific work of J. D. Irish on this issue and particularly in the region that concerns us, as well as in neighbouring regions, there is a large amount of data with which we can compare our own.[38] These studies have already examined the question of migration and population admixture by means of discrete dental traits and serve as a comparative basis for ours. Today this comparative base is important and includes several hundred individuals from various regions and periods, with dates ranging from the Palaeolithic to contemporary periods.[39] The particular interest of CA lies in the ease with which it allows for utilizing the data of other researchers, so long as their data are available and their methodological choices are clear (as is the case for the results with which we compared in this instance).

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[37] Reinold, *SudNub* 5, 2001, 6-7.

[38] Irish, *AJPA* 128(3), 2005; Irish, *AJPA* 129(4), 2006; Irish, *SudNub* 11, 2007; Irish, in *A Neolithic Cemetery*, 2008; Irish, Konigsberg, *IJO* 17, 2007; Irish, Friedman, *Homo* 61(2), 2010; Irish, De Groote, in *Ghaba*, 2016.

[39] Irish, *AJPA* 128(3), 2005; Irish, *AJPA* 129(4), 2006; Irish, *SudNub* 11, 2007; Irish, in *A Neolithic Cemetery*, 2008; Irish, De Groote, in *Ghaba*, 2016.

In practice, CA is a multivariate statistical test that approximates a principal components analysis (PCA), but applies to categorical data instead of continuous data. In similar fashion to a PCA, it allows the researcher to synthesize and to illustrate a dataset on an orthogonal projection. Unlike the MMD (mean measure of divergence) analyses that will be presented secondly within this study, CA only compares the presence rates of the different sets and does not take into account differences between unobservable case rates between samples. It is therefore mainly a descriptive method, which allows one to assign a score to each element of the table. Although CA can, to some extent, indicate variability within a set, its true purpose is to identify the traits that are most important in expressing this variability.[40] Our CA tests were performed with the R® software and with the help of Dr. V. Thouzeau. It should be noted that, as in the case of the CA tests, the results presented at the workshop were preliminary and were subsequently improved upon. The data presented here does not include the dependency tests later performed based on age and sex influence on trait expression, as well as differential inclusion within the 5 cemeteries. Nor does it take into account the potentially biased nature of analyses due to the limited sample size of KDK 2.

Indeed, one of the difficulties encountered with these tests was the potential source of error related to inter-observer variability.[41] Indeed, despite identical methodologies it was our sense (and our research into the issue confirmed this) that certain traits might nonetheless be less reliable than others.[42] Additionally, in regards to the other sites, the results presented here do not perfectly mirror

[40] Irish, *AJPA* 128(3), 2005, 7.

[41] The available literature identifies two fundamental issues to the observation of non-metric variation, as well as a series of traits that are particularly problematic. The two fundamental elements are degree of expression and the threshold of presence (Nichol, Turner, *AJPA* 69(3), 1986, 299). Using the ASUDAS method, each trait is assigned a score of expression, ranging from absent to increasing degrees of presence of expression (Scott, Turner, *Dental morphology*, 1997; Turner *et al.*, in *Advances in Dental Anthropology*, 1991). Some traits, however, are not considered to be "present" before attaining a certain degree (Hillson, *Teeth*, 2005). It is essential to agree on the attribution of a degree of expression or an unequal attribution of presence or absence may result. This is especially true of traits whose "presence" is determined at a low degree of expression, and for which the observation is particularly subjective. Traits for which the identification of the first stage of presence are also problematic, as an erroneous attribution shifts the whole continuum of the identification of the other degrees of expression, as well as the determination of the threshold of presence. The available literature identifies the following traits as particularly problematic for intra-observer reliability: protostylid (because of a poorly identifiable first stage), Carabelli's tubercle and hypocone (because of inconsistency in the identification of relative expression of the different stages), and the distal accessory ridge and the anterior fovea (due to tooth wear that may erase the degree of expression) and finally the tuberculum dentale (due to a high degree of variability of expression) (Marado, *AnthrAnz* 74(1), 2017; Nichol, Turner, *AJPA* 69(3), 1986).

[42] Nichol, Turner, *AJPA* 69(3), 1986; Scott, Turner, *Dental morphology*, 1997; Marado, *AnthrAnz* 74(1), 2017; Turner *et al.*, in *Advances in Dental Anthropology*, 1991, 15.

other tests done for the region, in part because not all of the same traits are taken into consideration.[43] With that being said, later tests do tend to confirm that the Kadruka ensembles more closely resemble one another than other assemblages and the particular expression of certain traits is clearly linked to that. During the workshop we presented three separate tests, the first grouping the Kadruka ensemble and 9 other sites all from the Sudan and all prehistoric or from Upper Nubia (Fig. 6). The second tested the distribution of the 5 Kadruka sites relative to 37 other sites from both Sudan and Egypt and from a variety of periods (Fig. 7). Finally, the last CA examined the Kadruka ensemble relative to sites from Sudan, Egypt and elsewhere in Africa. At each stage, the proximity of the 5 Kadruka sites relative to one another was reinforced. Based on placement, the Kadruka samples seem to confirm relative continuity with later ensembles in terms of trait expression, but are rather remarkably opposed to other ensembles from the same period and region. Finally, in the first and last test, the Kadruka sample also arranges itself in a way that mirrors the second set of analyses that we presented during the roundtable discussion. Indeed, KDK 1, KDK 18 and KDK 23 are closer than KDK 2 and KDK 21 in terms of relative trait expression.

Mean measure of divergence. The second set of analyses presented during this workshop concern the tests performed within the Kadruka sample by means of an analysis called a "mean measure of divergence" (MMD). These tests are significantly more precise and comprehensive than CA analyses as they allow one to measure the distance between different groups, based on the average frequencies of a set of traits recorded within each grouping; the higher the value of the MMD, the greater the distance between the groups. Nonetheless, the results point to trends that were also later confirmed in more comprehensive testing. Our MMD tests were performed with the R® software, as well as with the online software of AnthropMMD®.[44] This software facilitates the selection of traits chosen for comparison and has the advantage of providing easily manipulated graphical representations. The effectiveness of this type of analysis is well established in the literature.[45]

In practice, this analysis is carried out initially by the construction of tables readable by the AnthropMMD® software, and which group data by individual and by site for an analysis of a set of traits. These analyses take into account presence, absence and unobservable cases, and allow for a comparison of the respective frequencies of each between sample sets. For MMD analyses, individuals are taken

[43] Irish, *AJPA* 128(3), 2005; Irish, *AJPA* 129(4), 2006; Irish, *SudNub* 11, 2007; Irish, in *A Neolithic Cemetery*, 2008; Irish, Konigsberg, *IJO* 17, 2007; Irish, Friedman, *Homo* 61(2), 2010; Irish, De Groote, in *Ghaba*, 2016.

[44] Santos, *AJPA* 165(1), 2018.

[45] Harris, Sjøvold, *DentAnthr* 17, 2004; Irish, *AJHB* 22, 2010; Nikita, *AJPA* 157(2), 2015.

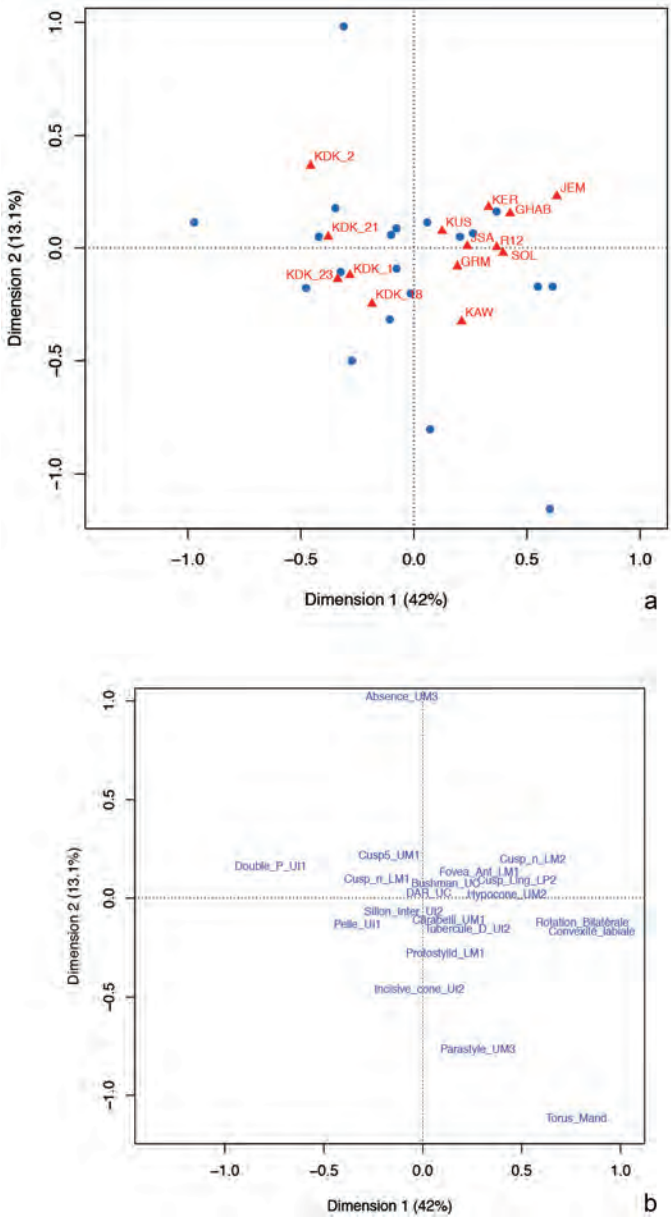

Fig. 6. a) Distribution of the 5 Kadruka sites as compared to the 9 other sites selected for study and in relation to trait presentation and frequency within the populations; b) distribution of the traits selected for study in relation to their differential expression within the populations selected for comparison. © Emma Maines.

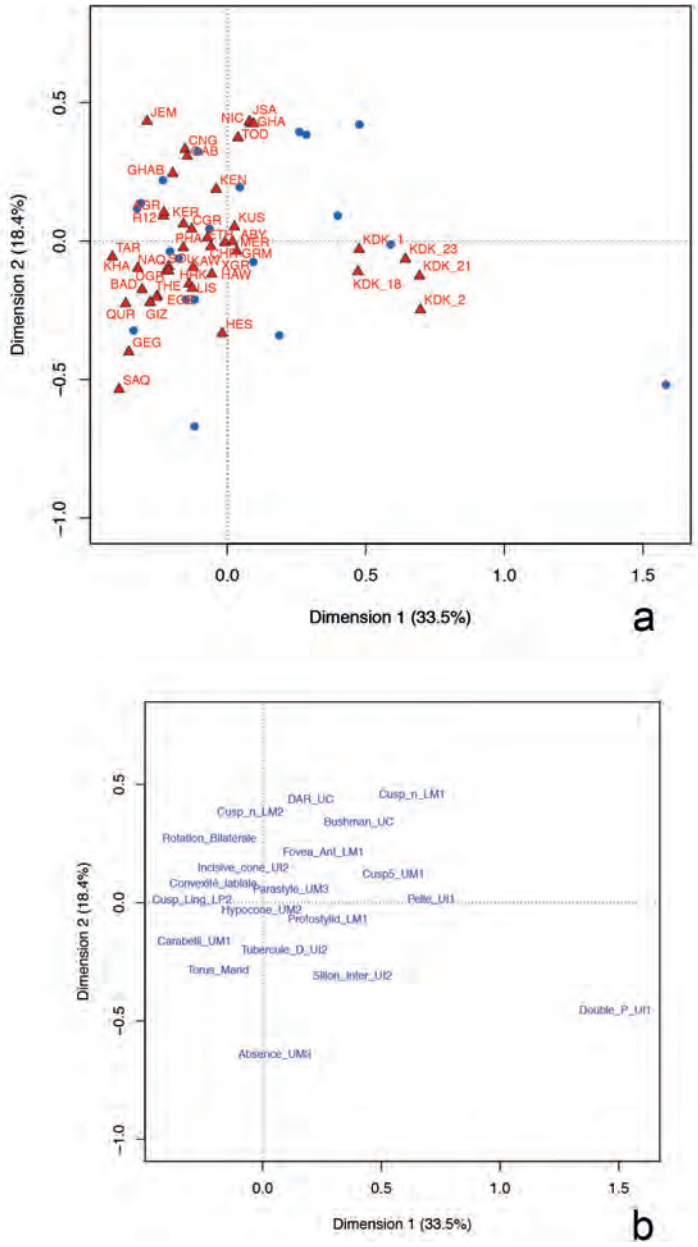

Fig. 7. a) Distribution of the 5 Kadruka sites as compared to the 37 other sites selected for study and in relation to trait presentation and frequency within the populations; b) distribution of the traits selected for study in relation to their differential expression within the populations selected for comparison. © Emma Maines.

into account as a single unit, however, it is their group set that appears on the graphical representation of the results. The difference between the groups studied is recognized as significant when the value of the MMD is at least two times higher than its standard deviation, which is defined as the square root of the variance.[46]

Although we subsequently developed a protocol to attempt to eliminate potential sources of error, we must underscore that the tests presented in this article were prior to our implementation of this protocol, and prior to the elimination of the traits that we identified as sources of possible error in terms of intra-observer reliability. Thus, the relative isolation of the Kadruka sample should not be over interpreted. Despite the preliminary nature of these results, we can confirm that the singularity of KDK 1 was verified by subsequent testing, as was the proximity between the former and KDK 18 and 23, relative to KDK 2 and 21 (Fig. 8). The reasons for these relative distances between populations are certainly multiple and variable according to the sites. That being said, it is interesting to note that, whether it be in terms of stature estimations, skeletal morphology or discrete dental traits, the KDK 1 site stands out as a special case. Its relative proximity to KDK 18 and KDK 23, as well as its distance relative to KDK 2 and KDK 21, might be related to similar burial practices (in terms of selection and which might be based on a variety of criteria, including, but not limited to status, health, relationship *etc*.), to a similar chronological affiliation, as well as to a similar sample of closely located or related populations between the sites.

Overview. Not only do all of these results indicate variability in the frequency of trait expression within the Kadruka ensemble, but they also underscore the variation of these frequencies from a regional perspective. The Kadruka sites were clearly influenced by distinct features and can testify to the relative proximity of the Kadruka ensembles relative to other populations in the region. This could support an interpretation of these populations as being relatively independent or closed biologically. It is also possible that these populations functioned in a restricted geographical pattern and that at one time they were relatively isolated from a biological point of view. This could explain why multiple sets from a relatively small geographical area appear immediately close, even compared to others from the same general region. It is also possible that these relatively isolated populations may be the result of multiple arrivals from the North or formerly separate admixtures between the Nile Valley's indigenous populations and newcomers. It would be interesting to confirm some of these hypotheses with MMD analyses based on comparison with other sample sets in order to further elucidate the divergence or proximity between populations. In this case it would be particularly

[46] Rouaud, *Probabilités*, 2017, 36.

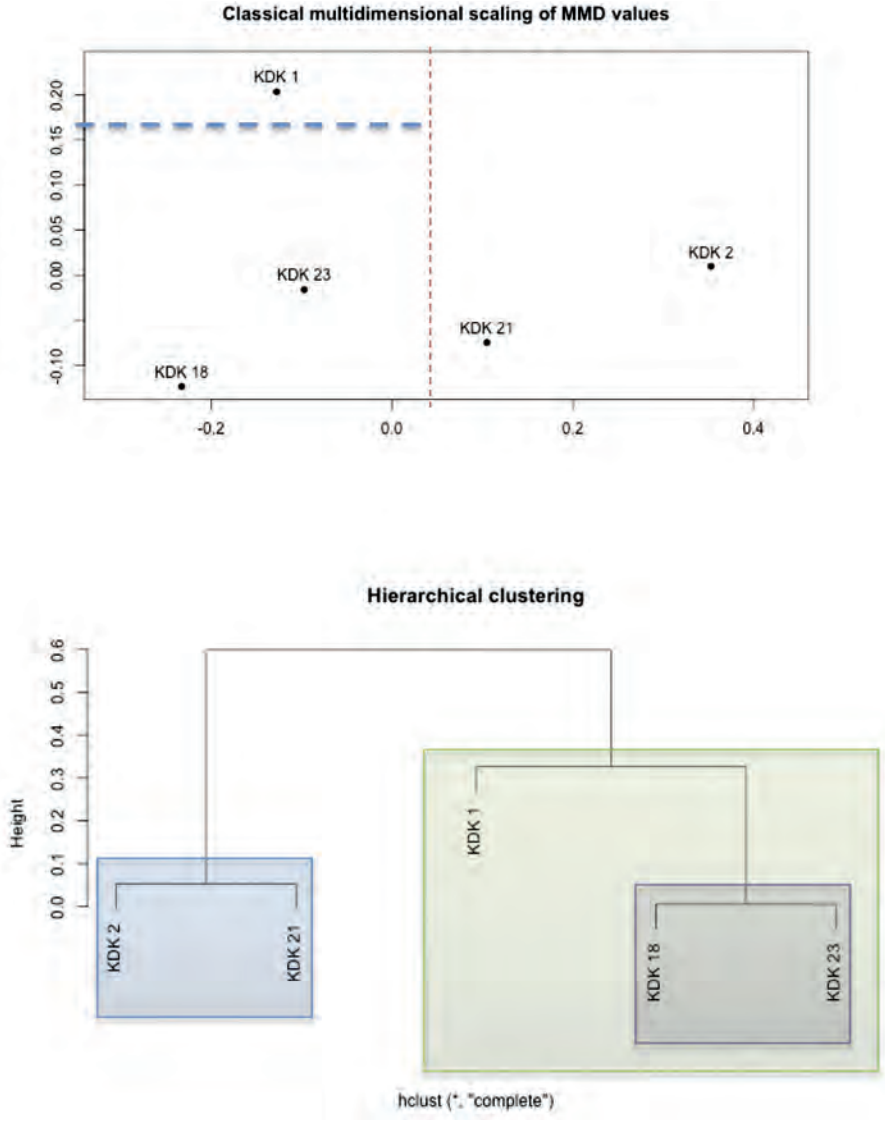

Fig. 8. Illustration of the relative distances between the 5 Kadruka sites based on MMD analysis. © Emma Maines.

interesting to compare the five separate Kadruka populations with those of the R12, El-Ghaba, Gebel Ramlah and Kerma groups.

Prior studies based on discrete traits suggest a break between Palaeolithic populations and more recent populations in Nubia.[47] This supports the hypothesis of a discontinuity and replacement or very strong mixing of the population,[48] followed by a continuity of population during the following periods. According to the discontinuity model, the replacement or genetic submersion of an existing set of genes would have occurred following the arrival and installation of an outside group or groups after the Pleistocene period.[49] However, a more recent study also suggests that these models may need to be revised, as proximities have been identified between a pre-Mesolithic sample and Neolithic samples, and could suggest a measure of population continuity. These pre-Mesolithic populations are identified as diverging significantly from other Pleistocene samples.[50]

In the face of these scenarios there is a need to consider how some of these indigenous genes would have been replaced and which external source or sources may have been responsible for their erasure.[51] Characteristic dental features of late Palaeolithic populations have been observed in recent populations south of the Sahara.[52] An affinity between those prehistoric populations and current sub-Saharan populations based on non-dental data has also been reported by researchers.[53] Characteristic features of later Neolithic Nubian populations have also been identified as similar to the general expressions observed within Egyptian populations and, to a lesser extent, more broadly from North Africa, Western Asia and Western Europe.[54] Finally, previous work also raises the question of the cause and modalities of change: population movements and mixture, as well as the need to ascertain whether or not there is merely one or multiple triggers

[47] Scott *et al.*, *AJPA* 61(1), 1983; Rightmire, *RevArch* 20, 1999; Irish, *AJPA* 128(3), 2005.

[48] Irish, Turner, *Homo* 41, 1990; Turner, Markowitz, *Homo* 41, 1990; Irish, *Dental evidence*, 1993; Irish, *AJPA* 102(4), 1997; Irish, *BMSAP* 10(3-4), 1998; Irish, *Homo* 49, 1998; Irish, in *Human Dental*, 1998.

[49] Irish, Turner, *Homo* 41, 1990; Turner, Markowitz, *Homo* 41, 1990; Irish, in *Human Dental*, 1998; Irish, *AJPA* 128(3), 2005.

[50] Irish, *AJPA* 147(S54), 2012.

[51] Irish, *AJPA* 128(3), 2005.

[52] Irish, Turner, *Homo* 41, 1990; Irish, *Dental evidence*, 1993; Irish, *AJPA* 102(4), 1997; Irish, *BMSAP* 10(3-4), 1998; Irish, in *Human Dental*, 1998.

[53] de Heinzelin de Braucourt, *Ishango*, 1957; Wendorf, in *The Prehistory of Nubia*, 1968, 954-995; Hiernaux, *People of Africa*, 1975; Franciscus, *Nasofacial variation*, 1995; Holliday, *Body size*, 1995; Groves, Thorne, *Homo* 50, 1999.

[54] Irish, Turner, *Homo* 41, 1990; Turner, Markowitz, *Homo* 41, 1990; Irish, *Dental evidence*, 1993; Irish, *AJPA* 102(4), 1997; Irish, *BMSAP* 10(3-4), 1998; Irish, *Homo* 49, 1998; Irish, in *Human Dental*, 1998.

for these phenomena?[55] Similarly, the present results provide us with more clues, but no definitive answers, though hypotheses are improved and honed with each advancement. In light of the results for the Kadruka ensemble, for example, it is possible to imagine that within this global post-Pleistocene continuity, there may have existed isolated or variable biological and/or cultural supply that subsequently influenced populations.

Although biological data provides us with essential information to answer these questions, it is also critical to associate them with the contextual data relative to cultural (including funerary) practices in order to propose a more general interpretation.

In the case of the Neolithic of Central Sudan, chronologically later than in Upper Nubia, though it may be tempting to see the arrival of settlers from the North, who gradually replace the indigenous populations, recent research suggests a much more complex scenario, in which indigenous Mesolithic populations shift between mobile and sedentary strategies, influenced by a multitude of factors.[56] The role or impact of outside populations in this process remains to be determined. Indeed, should we consider that migrations come only from the North? Or should we also consider the possibility of Western and Eastern exchanges? Moreover, is this exchange equally important at every step? What happens when the dissemination of cultural and biological traits is unequal? How are low scale and large-scale migration interpreted in terms of disruption or continuity? What rate of assimilation or mixture should be retained? For example, one can imagine a small migration that brings true cultural innovations, but whose carrier population finds itself biologically embedded and erased within the mass of the indigenous population. And what will be the differences observed depending on whether it is a punctual or long-term phenomenon? How should we qualify an assimilation of cultural ensembles whose populations then become biologically isolated? For the moment, we do not have concrete answers to explain the biological divergence expressed between samples such as R12, El-Ghaba or the Kadruka ensemble. We can, however, affirm, as previous studies have suggested,[57] that according to cultural variables, as well as biological data, it appears that a complex and transitory system of arrival, replacement and fusion occurred between populations.

[55] Irish, *AJPA* 128(3), 2005.

[56] *A Neolithic Cemetery*, 2008; Godde, *Homo* 60, 2009, Usai, in *Oxford Handbooks online*, 2016; Usai, Salvatori, *Azania* 54(4), 2019.

[57] Irish, *AJPA* 128(3), 2005.

5. FOURTH CASE STUDY: MIGRATION IN EASTERN SUDAN? THE CASE OF THE TRANSITION FROM THE GASH GROUP TO THE JEBEL MOKRAM GROUP (CA. 1800 BCE)

Andrea Manzo

As an example of a possible movement of people, I would like to bring our attention to a case study from Eastern Sudan, related to the cultural transition from the Gash Group to the Jebel Mokram Group, chronologically later than the others considered in this panel. The region is currently being investigated by the Italian Archaeological Expedition to the Eastern Sudan of the University of Naples "L'Orientale" and ISMEO (Fig. 9).[58]

In the last few years, it has been demonstrated that the transition between the Gash Group and the Jebel Mokram Group took place around 1800 BCE and not around 1500 BCE, as was previously thought.[59] The transition is eminently marked by changes in the material culture. As far as the ceramic horizon is concerned, the changes are very evident.[60] The close ties between the Jebel Mokram Group pottery and the Pan-Grave one already remarked on by K. Sadr are fully confirmed by my latest investigations, and also by the more recent research on the Pan-Grave culture conducted by A. de Souza.[61] The phase of innovation in the ceramic horizon marking the beginning of the Jebel Mokram Group is precisely due to the wide adoption of Pan-Grave ceramic types, well evident in the stratigraphic sequence of the Gash Group and the Jebel Mokram Group assemblages investigated at the site of Mahal Teglinos (K1) (Fig. 10). The Jebel Mokram Group lithic assemblages are characterized by a certain degree of discontinuity if compared with the Gash Group ones, as already stressed by D. Usai.[62]

If the funerary habits of these groups are considered, the extended position of the bodies, not exclusively but largely dominant in Gash Group times, is apparently completely replaced by tombs with contracted to highly contracted bodies.[63]In this respect, a certain discontinuity between the two cultures can be noted. This was already suggested by some graves likely to date to Jebel Mokram Group times discovered in the western sector of the site of Mahal Teglinos (K1)

[58] Open access reports of the fieldwork conducted by IAEES are yearly published in the Newsletter Archeologia CISA, see http://www.unior.it/index2.php?content_id=3632&content_id_start=1.

[59] Manzo, in *Nubian Archaeology*, 2018.

[60] Sadr, *ANM* 2, 1987; Sadr, *ANM* 4, 1990; and more recently Manzo, *SudNub* 21, 2017.

[61] de Souza, *Pan-Grave*, 2019, 89-97.

[62] Usai, in *Études Nubiennes 1994*, 1997.

[63] Manzo, *Eastern Sudan*, 2017, 53-54.

Fig. 9. Map showing the investigated areas in Eastern Sudan. Fieldwork was conducted by "L'Orientale" and the American-Sudanese team of Southern Methodist University and University of Khartoum (UNO, SMU and UofK in the map) from 1980 to 1995, and by the "L'Orientale - ISMEO" and National Corporation for Antiquities and Museums (UNO and NCAM in the map) since 2010. © Andrea Manzo.

in 1994–1995[64] (Fig. 11). These graves were recently revealed to be part of an extensive cemetery, whose investigation started in 2019.

Interestingly, the quick and radical change we perceive in the material culture and funerary habits of the Jebel Mokram Group is also paralleled in the settlement pattern, both if we look at its quantitative and qualitative aspects.[65] Not only does the number of sites dramatically increase, but their average dimensions decreased. From the qualitative point of view, it should be remarked that the Jebel Mokram Group sites are characterized by very minimal deposits, suggesting that they may have been mostly camps with light huts, some examples of which

[64] Fattovich *et al.*, *NyAk* 42, 1994, 16; see also Manzo, *Eastern Sudan*, 2017, 48, Fig. 43.

[65] Sadr, *Nomadism*, 1991, 56; see also Manzo, *SudNub* 21, 2017.

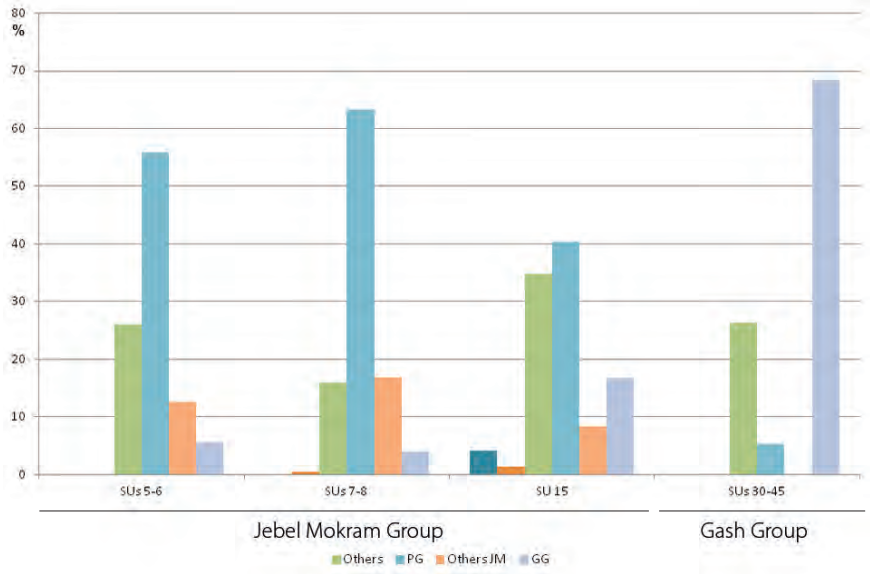

Fig. 10. Frequencies of the Gash Group (GG), the Pan-Grave (PG), and the other minor Jebel Mokram Group (JM) types in the stratigraphic sequence of excavation unit K1 VI, in the western sector of the Mahal Teglinos (K1) site. © Andrea Manzo.

Fig. 11. Typical tombs of the Gash Group (a) and of the Jebel Mokram Group (b) in the western sector of the Mahal Teglinos (K1) site. © Andrea Manzo.

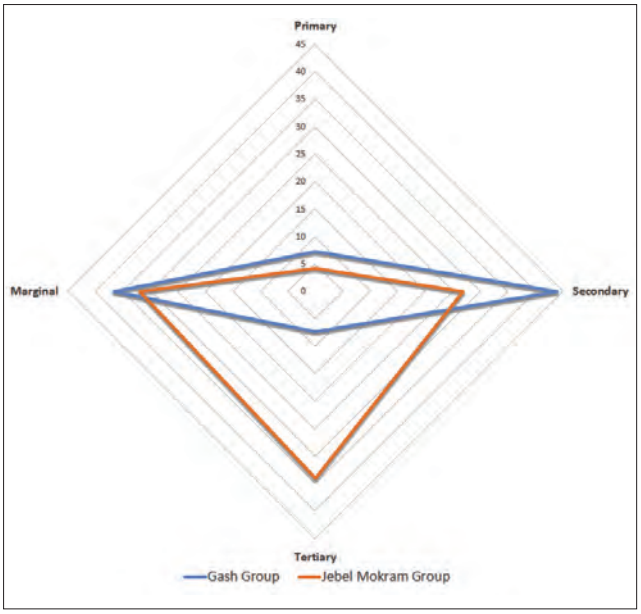

Fig. 12. Graph showing the frequency of the Gash Group and the Jebel Mokram Group settlements located in the areas suitable for agricultural exploitation (primary and secondary soil), in the ones more suitable for grazing (tertiary soil), and in marginal areas. © Andrea Manzo.

were investigated in 2011 at site UA53.[66] Moreover, the Jebel Mokram Group sites are scattered in an area larger than one of the Gash Group, and also occur in sectors of the region less suitable for agricultural exploitation, but including grazing areas, although areas more suitable for agriculture are of course not abandoned[67] (Fig. 12).

The available archaeozoological remains suggest that in the meantime the frequency of bovines increased compared to the caprines,[68] perhaps showing that the pastoral strategy was changing. Parallel changes were observed in the agricultural system, as the barley and wheat occurring with sorghum in Gash Group times were at that time completely abandoned in favour of an exclusive cultivation of sorghum.[69]

All these elements suggest that the agropastoral adaptation already characterizing the Gash Group was shifting to a mostly pastoral and possibly increasingly mobile strategy in Jebel Mokram Group times.[70] The increasingly mobile style of life of the Jebel Mokram Group people compared to the earlier Gash Group

[66] Manzo, *IAEES Report 2011*, 2012, 13-14, 21, Fig. 15, 24.
[67] Sadr, *Nomadism*, 1991, 53.
[68] Manzo, *Eastern Sudan*, 2017, 47, Table 2; Sadr, *Nomadism*, 1991, 48.
[69] Manzo, *Eastern Sudan*, 2017, 47, Table 1; Sadr, *Nomadism*, 1991, 48.
[70] Sadr, *Nomadism*, 1991, 58-71.

is also evident in material culture, if the trend of the wall thickness and of the diameter of the mouth of the ceramic vessels is considered: they all decrease at the transition from the Gash Group to the Jebel Mokram Group, and this suggests an increased portability of the vessels.[71]

Perhaps the explanation for all these changes in adaptation, lifestyle and material culture taking place ca. 1800 BCE in Eastern Sudan can be found in a changing environmental setting: recent investigations suggest that more arid conditions were at that time increasingly evident in the region from the beginning of the 2nd millennium BCE.[72] Indeed, this may have favoured the shift to the exclusive cultivation of sorghum in Jebel Mokram Group times and perhaps also an emphasis on a more mobile pastoral adaptive strategy. Certainly, the changes in the regional environment cannot explain the cultural innovations in the funerary habits and the overwhelming occurrence of Pan-Grave traits in the Jebel Mokram ceramics, unless we broaden our perspective.

More or less at the same time, similar climatic dynamics may also have occurred in neighbouring regions, as suggested by the Semna Dispatches reporting the arrival of groups of Medjay with their livestock, sometimes accompanied also by women from the desert to areas patrolled by the Egyptian troops based in 2nd Cataract region. According to the Fifth Semna Dispatch, when asked by the Egyptian officials about the situation in the desert, the Medjay answered: "the desert is dying of hunger".[73] This dispatch dates to more or less 1800 BCE too, i.e. to the period not only of the emergence of the Pan-Grave related Jebel Mokram Group in Eastern Sudan, but also of the Pan-Grave itself in the Egyptian and Nubian Nile Valley. Therefore, our present interpretation, also shared by A. De Souza who is studying the same problem from the northern, Egyptian and Nubian point of view, is that perhaps the Pan-Grave and the Pan-Grave related Jebel Mokram Group of Eastern Sudan may have originated precisely via the intensification of the contacts favoured by environmental dynamics in an area intermediate between Nubia, Egypt and Eastern Sudan, i.e. the Eastern Desert.[74]

In the case of Lower Nubia and Egypt, the Pan-Grave culture is mainly represented by distinct and separate cemeteries, whose occurrence suggests that some groups were indeed entering the valley and settling there.[75] We can also wonder if in the case of Eastern Sudan the emergence of the Pan-Grave related Jebel Mokram Group was due to a proper migration (Fig. 13a), or just to a change

[71] Manzo, *SudNub* 21, 2017.
[72] Costanzo *et al.*, in *Tales of Three Worlds*, 2020.
[73] Smither, *JEA* 31, 1945, 9, dispatch 5.
[74] Manzo, *SudNub* 21, 2017; Manzo, *Eastern Sudan*, 2017, 52-53; de Souza, *Pan-Grave*, 2019, 148-149.
[75] de Souza, *Pan-Grave*, 2019, 148.

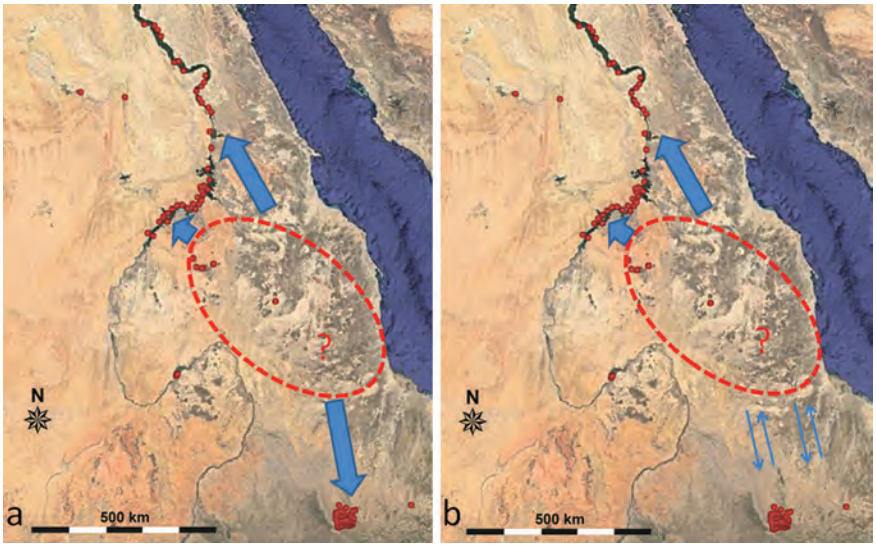

Fig. 13. Maps showing the Pan-Grave and the Jebel Mokram Group sites (red dots), and the two (not alternative) interpretative models of contacts with the Eastern Desert from which the Jebel Mokram Group may have originated, migrations (a), and seasonal movements (b). © Andrea Manzo.

in the patterns of seasonal movements causing a more frequent and recurrent interaction with the groups inhabiting the Eastern Desert (Fig. 13b). The two interpretations were subsequently proposed by K. Sadr in his two seminal articles on the Jebel Mokram Group and its relation with the Pan-Grave culture published in *Archéologie du Nil Moyen*: in his 1987 work he supported the idea of the movement into Eastern Sudan of groups originating in the Eastern Desert, while in the article that appeared in 1990, he was emphasizing the role played by cultural contacts in the adoption of foreign Pan-Grave traits in Eastern Sudan.[76] Somehow, the change in the interpretation of this specific phase of the history of Eastern Sudan epitomized the more general transition, in the history of Nubian archaeology (and in archaeology as a whole), from an invasionist or migrationist interpretative approach, to a paradigm emphasizing the relevance of the internal changes of social systems for explaining discontinuities.[77]

Of course, even if in the last decades emphasis was increasingly placed on cultural and presumably population continuity and on the fact that changes may have resulted from the internal dynamics of each group, rather than from

[76] Sadr, *ANM* 2, 1987; Sadr, *ANM* 4, 1990.
[77] Trigger, *IJAHS* 27, 1994, 326-338.

exogenous influences, this does not mean that permanent or temporary movements of groups of people did not take place, as it is well known to have been the case in later phases of Sudanese history. In particular, in Eastern Sudan, this is the case with the Rashaida, who arrived in the region from the Arabian Peninsula in the mid-19th century.[78] When contacts and even movements of groups can be proposed as an explanation for cultural changes characterized by the adoption of exogenous elements in a specific region, it should be emphasized that the changes always result from a dialectic synthesis of newly introduced elements and locally rooted cultures, a process whose ultimate results are determined by social and economic factors. Moreover, the arrival of exogenous groups or even contacts with other groups do not automatically lead to a change in culture, economy and society, or even to more limited adoptions of single traits. The cultural impact of contacts or more permanent movements of groups is of course a matter of negotiation, always related to the attitude and readiness to change and to adopt — and eventually adapt — exogenous elements of the groups and individuals involved, which are in turn affected by social, economic and cultural factors. Indeed, as pots (and lithics) are not people and people are not (necessarily) pots, we can agree with the hope already expressed by B. Trigger that physical anthropology would help to trace the movements of human groups independently of cultural evidence.[79]

Going back to the case of the emergence of the Jebel Mokram Group in Eastern Sudan, I think that the process may have been a complex one, perhaps combining both an intensification of contacts with the Eastern Desert due to the changes in the pattern of the seasonal movements of different groups, and the permanent migration of groups from the Eastern Desert to Eastern Sudan. Actually, these two dynamics do not exclude each other, and may have operated together or separately in different phases of a process starting at the beginning of the 2nd millennium BCE, as perhaps suggested by the occurrence of some scattered and rare Pan-Grave-like materials already occurring in assemblages of the end of the Gash Group.[80] The idea that some new groups may have entered and settled in Eastern Sudan, mixing with the local ones, and that exogenous cultural traits were at that time widely adopted in the region is somehow supported by the rapidity of the transition from the Gash Group to the Jebel Mokram Group, and by the fact that changes were apparently emerging at the same time in several aspects of the material culture, funerary habits, lifestyle and economy of its inhabitants.[81]

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[78] MacMichael, *History*, 1922, vol. 1, 345.
[79] Trigger, *IJAHS* 27, 1994, 343.
[80] Manzo, in *Études Nubiennes 1994*, 1997.
[81] Manzo, *SudNub* 21, 2017.

Fig. 14. Partial view of the possible Jebel Mokram Group cemetery brought to light in excavation unit K1 XIV, in the western sector of the Mahal Teglinos (K1) site. © Andrea Manzo.

To try to get more data for a further in-depth investigation of the issue, following the abovementioned auspices of B. Trigger, systematic anthropological studies are presently conducted in the framework of the IAEES. Thanks to the recent identification of a possible extensive Jebel Mokram Group cemetery at Mahal Teglinos (K1) (Fig. 14), the hypothesis that the above described cultural changes characterizing the transition from the Gash Group to the Jebel Mokram Group are related to the arrival in Eastern Sudan of exogenous groups ca. 1800 BCE, is being tested by the systematic use of isotopic analysis, following a strategy already adopted in other contexts.[82] A problem in this perspective may be the lack of regional isotopic ratios for Eastern Sudan, and a strategy based on the sampling of bones of young children, who presumably did not move that much before death, is being attempted to get a regional reference to be compared

[82] E.g. Budd *et al.*, *Antiquity* 78, 2004.

with the results of analysis of samples from adult individuals. In the meantime, more traditional anthropological strategies have also been adopted to compare the Gash Group and the Jebel Mokram Group human remains.[83] Therefore, it is hoped that new insights into the dynamics affecting Eastern Sudan ca. 1800 BCE will shortly be achieved from the combination of the results of the anthropological investigations with the above described cultural and economic evidence.

POINTS OF DISCUSSION

Compilation Friederike Jesse and Donatella Usai

Several points were raised during the discussion and the main aspects will be summarized in the following. Among the participants of the workshop those who contributed to the discussion were (in alphabetical order) Julien Cooper, Renée Friedman, Matthieu Honegger, Emma Maines, Andrea Manzo, Uffe Steffensen, Donatella Usai, Lenka Varadzinová, Ladislav Varadzin.

The role of Egypt. Here the lack of data was considered as the biggest problem for evaluating Egypt's role concerning migration and diffusion. For example, data for the dispersal of domesticates is missing, there is evidence for the 6th millennium BCE for domesticates, but there is no evidence for a first wave. According to R. Friedman there is actually no help from the Nile Valley. In Hierakonpolis, there are more than 10 m of sediment and the sterile soil has not yet been reached. There is also the problem of the groundwater which hampers the excavations.

Interaction between different groups. The Neolithisation of Europe is considered as a question of interaction. According to M. Honegger there is a huge problem regarding the interaction with the last hunter-gatherers in the whole of Europe. There is a gap of some generations. D. Usai raised the question if there are empty spaces when taking a look at the Nile Valley and Northeast Africa in general which leads to the question of whether or not there is a problem of research.

In central Sudan for example there is no continuity of population and there is no late Pleistocene evidence so far. L. Varadzinová mentioned the dates from the 9th millennium BCE (8800–8600 cal BCE) in Sabaloka, where small lumps of clay even indicate early pottery.

An important point is the reconstruction of the environment during the Late Pleistocene and Early Holocene, especially in the Nile Valley. According to D. Usai, the landscape of central Sudan might have to be compared with the

[83] These analyses are being conducted by Giusy Capasso, under the coordination of Alessandra Sperduti, Museo delle Civiltà, Rome.

Sudd. There was general agreement that regional or even local resolution is needed for ecological reconstruction.

L. Varadzin emphasised that there was movement of people but that we do not know if all changes were due to migration or not. The movements of small groups might be a trigger. This led directly to the next point, the question of Neolithisation.

Neolithisation. Here we should be open as to how the process of Neolithisation might be different in different places. According to D. Usai, Neolithisation in Central Sudan seems to happen suddenly and the movement of people from the north might have pushed it forwards. There are similar dates for a late Mesolithic and an early Neolithic in central Sudan. We must expect small traditional or conservative enclaves who were in a very different situation compared to other neighbouring populations around them, which means that it is very important to look at the contextual data. As an example, we can look at the two partially contemporaneous cemeteries of Kadero and Ghaba: there is no trace of the tradition of putting bucrania in Kadero burials while a small enclave of such burials was recovered at Ghaba.

Directly linked with the question of Neolithisation is the question of the appearance of domesticated animals and plants. As L. Varadzin pointed out, we have evidence for early sorghum domestication in eastern Sudan and therefore for something which is not coming from the north. Sorghum domestication was a separate process in the south, so there was a process of Neolithisation which was not coming from the north.

A. Manzo detailed that domesticated sorghum is dated to the 4th millennium BCE in eastern Sudan (site KG 23). The evidence from plant impressions on pottery suggests that the domestication process might even have started in the 5th millennium BCE. There is also evidence for wheat and barley in the 4th millennium BCE. Clearly, we have evidence for the Near Eastern package and local crops in the 4th millennium BCE, and then in the 2nd millennium BCE, only sorghum. The impact of climatic conditions should, however, not be forgotten. Also, the presence of caprines in the north can be explained as a reply to the stress caused by desiccation.

As wheat, barley and goat cannot have arrived alone in the Nile Valley, there is still the question of if they were brought there by one large-scale wave of people coming or just small groups. Another question is how can we trace these groups? Here, pottery is an important indicator as genetic evidence is mostly lacking. M. Honegger suggested to intensify analysis on lithics and to apply more scientific methods (e.g. phytolith analysis) to get more evidence on domesticated plants and animals.

The important point of whether a shared material culture defines a cultural group was struck in the discussion. There was agreement that ethnic groups are not cultural groups, but M. Honegger correctly pointed out that Kerma, A-Group, C-Group, are all considered as if they were social entities. R. Friedman

asked if these are entities and raised the question of identity. She pointed out that raising a cow does not change the culture and one cow does not create a mass migration. People did not change their entire culture just because they neolithicised — although in some cases they clearly did.

L. Varadzin summarized that there is a Neolithic package, but it is not always the same package. There were probably many different formulae, or facets, or local strategies of adaptation. Furthermore, there may have been continuity in some traits (e.g. settlement sites, burial grounds, hunting, fishing) and change in others. There might even have been the presence of polished pottery but people still subsisted as hunter-gatherers. In Sabaloka, for example, there is a continuity of place regarding the burial grounds, but a change of material culture. D. Usai mentioned that at al-Khiday, there was a continuity in burial ground, but noteworthy changes in cultural material and in ritual. In pre-Mesolithic times there were nearly no grave goods. In the Neolithic there was an increasing number of beads and personal ornaments, although with substantial differences between Nubia and central Sudan. The landscape changes between the Early and Late Neolithic were bigger than between the Mesolithic and Neolithic.

Site preservation. There are also local disparities and biases in our samples. L. Varadzin pointed out that after 3000 BCE, in Central Sudan, we are completely lacking any evidence. D. Usai added that there is the problem of erosion and the fact that many sites are single occupation sites, especially in the Dongola Reach (Northern and Southern) and also in the 4th Cataract. Central Sudan is different, with stratified deposits, even though they are usually destroyed. M. Honegger agreed that preservation is a major question. In the north in good situations there is sometimes protection against erosion. Little research has been done in the Dongola Reach, but there are plenty of Mesolithic sites which might have multiple layers. In the south the situation is exceptional. For eastern Sudan, A. Manzo reported that there is also much erosion on the sites.

Due to the conference time schedule, after a scant hour of vivid discussion, the workshop had to close without the possibility of drawing major conclusions. Therefore, the "Concluding remarks" offer a state of art as well as perspectives for the future to deal with the question of diffusionism.

CONCLUDING REMARKS

Donatella Usai and Friederike Jesse

Given the scientific progress in genetic studies and new instruments available to archaeologists, a theory that has been neglected for many years, *diffusionism*, albeit resurrected under other terminological guises and more properly understood as a complex phenomenon which more often involves movements of small

groups, can nowadays be considered as an explanation of changes that are perceived, at biological and cultural levels, in prehistoric societies. The workshop held in Paris, on the occasion of the 14th International Conference for Nubian Studies, has provided an opportunity to confront this subject whilst generating a vivid discussion that indicated that indeed *diffusionist* interpretations should be taken into account when discussing the development of prehistoric societies in Sudan.

This is especially the case when regarding the still unresolved process of Neolithisation, but is also relevant with regard to later phases. The discussion has also raised consciousness of several limitations imposed on us by the state of the research in the Nile Valley, among which we can list the very few prehistoric sites excavated, studied and published, few sites that have produced well sealed contexts, and the post-depositional alteration of human remains. In other archaeological contexts, outside the Nile Valley,[84] genetic studies have substantially contributed to disentangle the complexity of the processes that occurred with the formation/transformation of some human *enclaves* in Europe at the start of the food-producing stage.[85] Genetic studies on ancient Nile Valley populations have had to face the problem of the preservation of organic collagen in human remains and at the moment aDNA studies from this region are few,[86] some of which oriented to methodological and taphonomic problems.[87] Most genetic studies on the Nile Valley are made on modern human samples yet with an eye to processes that involved past human beings offering insightful observations. For example, Krings *et al.* state that "*Although the potential of the Nile River Valley to serve as a corridor for human migration seems obvious, some archaeological evidence suggests, instead, that there was a significant and long-standing frontier zone between the northern and southern states in lower Nubia…*"[88] migration may have indeed occurred, both from north to south and *vice versa* and there may not have been significant local barriers to migration. Although they have been mostly focusing on migrations regarding later phases of Nile Valley history, during the Middle Kingdom, their model probably applies to earlier phases. Working on even more recent admixtures, deriving from contacts between North Sudanese and Arab groups dating back to the fall of the Christian Kingdoms,[89] Hollfelder *et al.* state that: *"Hence, the Nubians can be seen as a group with substantial genetic material relating to Nilotes that later have received much gene-flow from Eurasians (likely*

[84] For example Hervella *et al.*, *PLOS One* 10(6), 2015; Rivollat *et al.*, *PLOS One* 10(4), 2015; Fernandes *et al.*, *SciRep* 8(1), 2018.

[85] Luglié, *QI* 470, 2018.

[86] Lalueza Fox, *AnHB* 24(3), 1997; Francigny *et al.*, *NyAk* 79, 2013; Sirak *et al.*, *AJPA* 153(S58), 2014; Cherifi, Amrani, *BioRxiv*, 2020.

[87] Francigny *et al.*, *NyAk* 79, 2013.

[88] Krings *et al., AmJHG* 64, 1999, 1167.

[89] Hollfelder *et al., PLOS Gen* 13(8), 2017, 7/17.

Middle Eastern) and from East Africans". Similar conclusions seem to be drawn by Dobon *et al.* as they identify an ancestral component common to Darfurians, Nuba and Nilotes whose relics are present but a minority in Nubians.[90] We can wonder whether this information correlates with the suggested proximity between a pre-Mesolithic population located in central Sudan at the al-Khiday site and Nubian Neolithic populations based on phenetic affinities among dental morphological traits according to studies made by J. Irish.[91] Some recent considerations[92] suggest a possible date for the al-Khiday pre-Mesolithic human remains at around 12 000 BCE, which would put them contemporaneous to Jebel Sahaba,[93] a population with different dental morphological traits.[94] Although they did not use the same method of analysis used by Irish,[95] Benoiston *et al.*[96] state that the Mesolithic population of El-Barga, dating to 7800–6900 BCE, is similar to that of Jebel Sahaba and Wadi Halfa and different from that of the following Neolithic period, which would indicate a possible discontinuity between the two El-Barga groups. Originally Irish contemplated the possibility that the distance between Jebel Sahaba population and the Neolithic one he had included in his test (Gebel Ramlah), could be determined by the huge chronological gap separating them.[97] He states that "*Recent unpublished craniodental findings by the author, based on a small sample of fragmentary Early (ca. 9,800-7,300 BP) and Late (6,500-5,800 BP) Neolithic skeletons from Nabta Playa (near Gebel Ramlah) (Wendorf and Schild, 2001), do not contradict the possibility of a Late Paleolithic/Early Neolithic connection*".[98] Given the heterogeneous character of these "*pre-final Neolithic*"[99] human remains, he ended up considering the results as tentative. Whilst there are apparently several millennia separating Mesolithic El-Barga and Jebel Sahaba, this continuity seems to be represented here, whereas discontinuity seems highly possible between the El-Barga Mesolithic and Neolithic, although "*a certain level of continuity cannot and should not be ruled out between these two human occupations*".[100] If the al-Khiday pre-Mesolithic population can be considered ancestral to that of Neolithic Nubians, we would end up with quite an intriguing anthropological picture of the region.

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[90] Dobon *et al.*, *SciRep* 5, 2015, Fig. 3.
[91] Irish, *AJPA* 147(S54), 2012.
[92] Dal Sasso *et al.*, in *Tales of Three Worlds*, 2020.
[93] Zazzo, *PPP* 416, 2014; Usai, *ArchPol* 58, 202.
[94] Irish, *AJPA* 147(S54), 2012; Irish, De Groote, in *Ghaba*, 2016.
[95] Irish, *AJPA* 128(3), 2005.
[96] Benoiston *et al.*, in *Nubian Archaeology*, 2018.
[97] Irish, *AJPA* 128(3), 2005.
[98] Irish, *AJPA* 128(3), 2005, 13.
[99] Irish, *AJPA* 128(3), 2005.
[100] Benoiston *et al.*, in *Nubian Archaeology*, 2018, 813.

E. Maines' contribution to the workshop has brought to our attention some problems deriving from dental trait morphological analysis. Furthermore, some recent studies[101] suggest that not all dental traits "*preserve neutral genomic signature*".[102]

However, Maines' application of this method of analysis to the five Kadruka cemeteries evidenced an intriguing proximity of the populations recovered there. The point she raises at the end of her examination: "*Although biological data provides us with essential information to answer these questions* [all connected to migratory events, see above], *it is also critical to associate them with the contextual data relative to cultural (including funerary) practices in order to propose a more general interpretation*" should lead us to further reflection. Indeed, one may wonder whether the fact that KDK 1, 23 and 18 seems to pertain mainly to a Middle Neolithic B context, with elements of the Multaga phase (4500–4000 BCE), cannot provide an explanation as to why they tend to form a distinct group separated by KDK 2 and 21. The analysis of the R12 cemetery made by Irish[103] did not discriminate between the two phases, Middle Neolithic A and B, that were recognized throughout the analysis of cultural context made by S. Salvatori.[104] On the contrary this was done by isotopic analyses which produced a significant differentiation between the two groups of individuals.[105] Looking at the cultural sphere, the fact that pre-Mesolithic individuals at al-Khiday observed a very peculiar burial ritual, prone and extended, that has no counterpart in Nubian cemeteries, all buried in flexed position (both Jebel Sahaba and El-Barga Mesolithic) leads us to question how this should be interpreted? And what about the high presence of dental avulsion at al-Khiday, only recorded among Nubian populations in the Mesolithic of El-Barga[106] and widespread in other Saharan populations?[107]

This finally brings us to one of the most important points raised during the discussion, but one that was not fully explored: archaeological cultures and identity. Is there a way to relate the archaeological record to groups that recognised themselves as corporate identities? According to Benz *et al.*[108] the birth of corporate identities can be linked strongly to the Neolithic turn toward sedentism and the formation of larger groups with the need of resolving conflicts that arise at individual, intra and inter-groups levels. Such a necessity is considered of minimal influence in earlier hunter-gatherer societies that are made of smaller

[101] Rathmann, Reyes-Centeno, *PNAS* 117, 2020.
[102] contra Irish *et al.*, *AJPA* 172(3), 2020.
[103] Irish, in *A Neolithic Cemetery*, 2008.
[104] Salvatori, in *A Neolithic Cemetery*, 2008.
[105] Iacumin, in *A Neolithic Cemetery*, 2008.
[106] Crevecoeur, *Kerma* 4, 2012.
[107] Stojanowski *et al.*, in *Dental Anthropology*, 2016.
[108] Benz *et al.*, in *Neolithic Corporate Identities*, 2017.

flexible groups that can more easily resolve possible conflicts.[109] The reality we are confronted with, however, is made up of hunter-gatherer-fishers, pottery-makers, whose sedentarisation reached relevant levels and who may have already started to develop some kind of group identity. Later, during the Neolithic, these societies developed forms of food producing economies with pastoralism retaining an important role.[110] Maybe a theoretical approach considering how cultural identities were constructed can help in interpreting the archaeological record on which we are forced to rely. How this identity combined with the anthropological aspect is yet another question. We can see in A. Manzo's contribution on 2nd millennium BCE eastern Sudan groups a positive attempt to combine archaeological data with processes linked to subsistence and environment, but he also ended up claiming the importance of genetic data to confirm his hypothesis, a similar claim expressed by M. Honegger for both case studies. Although genetic data can substantially contribute to the understanding of past processes and especially those linked with migration and/or diffusion, we should not leave the field of interpretation only to genetics. A combination of different approaches and methods including traditional archaeological ones should be the aim.

Finally, it must be underlined that research in Nubia and, more generally, in the Nile Valley, has only recently started to produce relevant archaeological and genetic data, albeit mostly on modern population, to approach the problem of the Neolithisation of the region. The paucity of data leaves space for more than the normal disagreement that finds a place among the different researchers on this topic (see for example the subject of sorghum domestication which, it cannot be excluded *a priori*, may be the result of a *secondary process* promoted by the imitation of non-local models). As the contribution of A. Manzo indicated, and also that of E. Maines suggested, it is necessary not only to focus on the Nile Valley, but to incorporate much more broadly the areas east and west of the Nile to achieve a full understanding of historical processes. The discussion, especially concerning sorghum, indicates that we should take a broader perspective: it is not only the North (Egypt) or the Near East which influences Nubia and the Central Sudan but also the South, East and West. The hope is that further archaeological data, as well as the development of new techniques for aDNA extraction, and an overcoming of the limits inherent to physical anthropological and correlated studies (dental traits morphological analysis), will contribute to a better understanding of the extent to which migrations and local genetic input contributed to modelling the Nile Valley societies in the late prehistoric periods.

[109] E.g. scalar stress: Johnson, in *Theory and Explanation*, 1982; Bandy, *AmAnthr* 106(2), 2004; Alberti, *PLOS One* 9(3), 2014; Lobo *et al.*, *Mansueto Res Pap* 7, 2019.

[110] Contra see Salvatori, Usai, *JWP* 32, 2019.

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