



Results from the re-investigation of Henry Wellcome's 1911-14 excavations at Jebel Moya

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Background

Situated approximately 250km south-south-east of Khartoum, above the confluence of the White and Blue Niles, is the largest mortuary complex of a pastoral society in sub-Saharan Africa (Figure 1). It is situated in the north-east valley, termed Site 100, of the Jebel Moya massif in the southern Gezira Plain. Spanning 10.4ha, it was partially excavated by the founder of the Wellcome Trust, Sir Henry Wellcome, over four seasons from the end of January 1911 until April 1914 (Addison 1949). A total of 3,135 bodies were uncovered from 2,791 excavated undisturbed shallow graves, without substructures or permanent superstructures, in four strata (Stratum A – D in descending order). Of these, 1,108 individuals had accompanying burial assemblages.

The majority of the materials, including the skeletal data and excavation records, were shipped to the UK. Frank Addison (Addison 1949; 1956) published the archaeological report in 1949, while the physical anthropological remains – curated at the Duckworth Laboratory, University of Cambridge – were published subsequently (Mukherjee *et al.* 1955). In the intervening years, there have been a series of small but nevertheless influential studies, some of which have been previously summarised (Brass 2009). J. Desmond Clark and his team undertook test excavations at Jebel Moya and Jebel et-Tomat in 1972 on their way back from excavating Adrar Bous in the Central Sahara. Randi Haaland's (1984; 1987) excavations at nearby Rabak revealed the presence of some Neolithic Jebel Moya-like pottery sherds. Isabella Caneva (1991) recognised and described the existence of late Mesolithic sherds amongst the British Museum's collection. However,

the first real attempt to comprehensively revisit the issue of the chronology since Addison was made by Rudolf Gerharz (1994). Gerharz, though, did not re-investigate any of the extant expedition records or the curated assemblages. Finally, there have been two published bioanthropological studies. The first was by Rachel Hutton MacDonald (1999) to determine the economic affiliation on the basis of dental caries, while the second was a population affiliation study by Joel Irish and Lyle Konigsberg (2007) using dental characteristics of the extant teeth.

Despite the positional and material nature of the site, no attempt has previously been made to elucidate the nature of social organisation as reflected in the mortuary assemblages. My doctoral work sought to revise our understanding of Jebel Moya and its context in a number of ways, starting with a new chronological framework that was provided by (a) applying an attribute-based approach to discern discrete pottery assemblages, and (b) applying initial luminescence dates to facilitate reliable radiometric dating of this site for the first time (Brass and Schwenniger 2013). It was also the

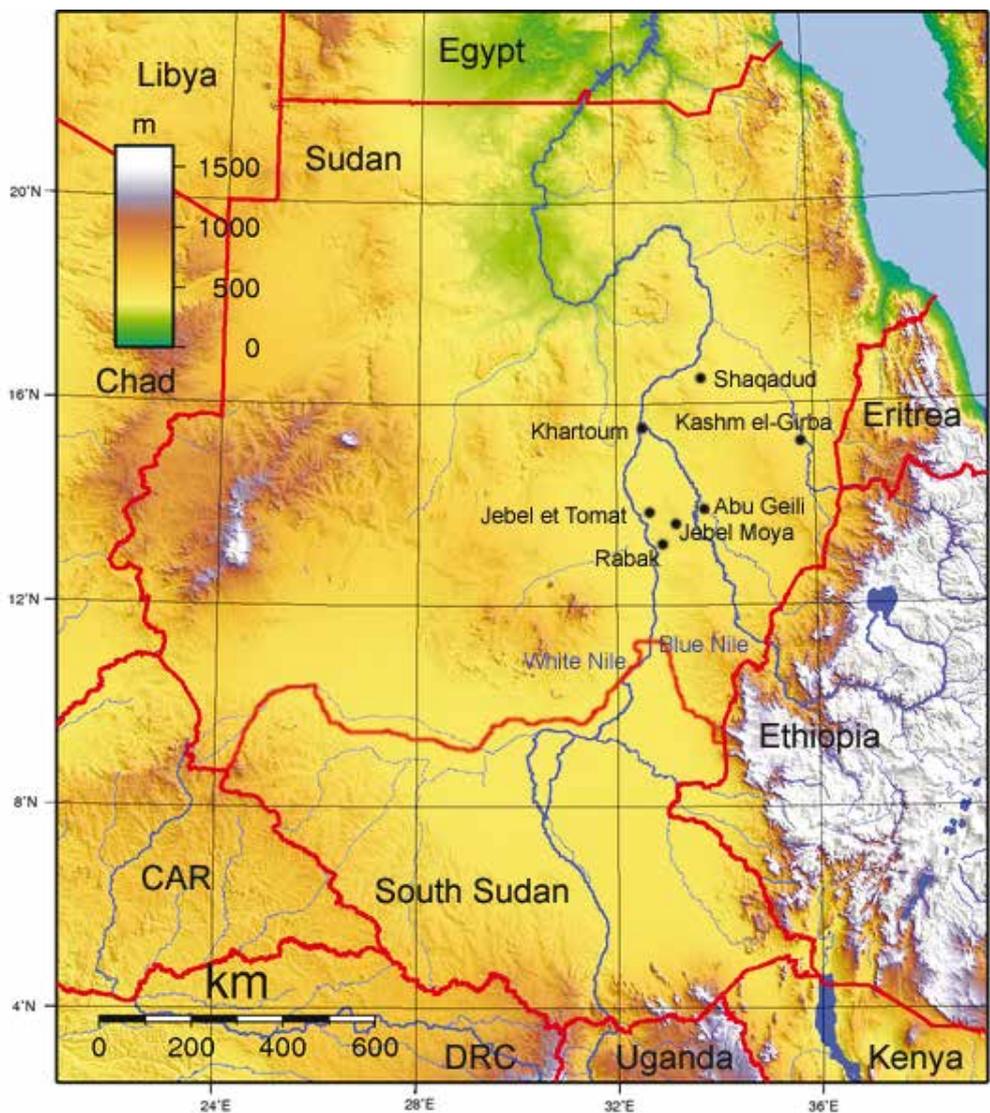


Figure 1. Map of Sudan (reproduced from Brass 2009).

first time that the few known archaeological localities of the southern Gezira, and pre-Meroitic and Meroitic-era cemeteries have been compared in an attempt to elucidate the nature of pastoral social organisation at Jebel Moya. After reviewing previous applications of social complexity theory to mortuary data within and outside Africa, and compiling a new register of graves from the original expedition records, new questions were posed for (a) the applicability of mortuary theory to cemeteries of a pastoral society, and (b) the nature of zones of interaction through the application of innovative statistical and spatial analyses, such as cross pair correlation function and multidimensional scaling, to the large archival dataset in light of advances in archaeological practice (Brass 2014). Overall, the study has (a) led to a reinterpretation of Jebel Moya as being inhabited by pastoralists who also buried their dead in the valley, and (b) highlighted the site's potential to serve as a chronological and cultural reference point for future studies in south-central and southern Sudan.

Jebel Moya chronology

Central to improving the understanding of the stratigraphic complexity of Jebel Moya and to subsequently decoding the inter-site variation in material culture was the establishment of a secure chronology. A fundamental component of any chronological re-evaluation of Jebel Moya is its ceramics. In the first instance, given the near total absence of dateable organic remains, the direct luminescence dating of sherds provided the only viable approach to obtaining absolute dates for the site. However, to do so required that a reasoned grouping of pottery from the site be undertaken in order to sample specimens for OSL dating. Likewise, the establishment of a GIS database was essential for the contextual analysis of the register of graves to evaluate evidence for chronological markers in mortuary contexts. Such analyses provided the backdrop against which a new, firmer chronological framework was derived to assist the re-interpretation of the mortuary remains.

Re-evaluating the pottery collection at the British Museum

Classes of pottery assemblages can be sensitive chronological indicators, though caution is necessary against the selection of unsystematic variables which could lead to suppression of variability. Two approaches to pottery analysis have been used in Africa and elsewhere in the world since the 1950s: attribute and typological-based analyses (Caneva 1987; Dunnell 1986; Ford 1954a; 1954b; Mohammed-Ali and Khabir 2003; Spaulding 1953; 1954; 1977; Whittaker *et al.* 1998; Winchell 2013). Fundamentally, previous limited analyses of select Jebel Moya pottery (Addison 1949; Caneva 1991; Clark 1973; Manzo 1995) failed to adequately engage with numerous interpretive scopes beyond attempted typological groupings and, excluding Addison as hardly any sites were then known and explored outside the Nile Valley, only basic attempts were made at cross-correlation with the material culture and dates from other sites in the Gezira and neighbouring

regions. The primary reason for this state of affairs was that Sudanese archaeologists have traditionally operated within both a narrow typological classificatory methodological approach to pottery analysis and a broader discourse of Nubian archaeology long-labouring under the continuing influence of the culture history paradigm (Dann 2009).

The inability of different methodological approaches then proposed for Saharan pottery studies to derive a meaningful chronological ordering led to Isabella Caneva (1987) proposing a new explicitly taxonomic, hierarchical but ultimately still typological classificatory system which proposed 'decorative techniques' as the primary method of analysis. In decreasing order of importance and with increasing levels of specificity in a tree-like typology, Caneva downplayed the usefulness of tools in assessing spatial-temporal and cultural significance, emphasising rather technique -> implement -> element -> motif -> structure (Caneva 1987; Caneva and Marks 1990). As such, she partly moved away from the previous typological systems employed in the Sudan towards an attribute:vessel system but the classification remained structured within a typological framework. It has since been the dominant classificatory system in use in Saharan and Sudanese pottery studies (Caneva and Marks 1990; Gatto 2011a; 2011b; Jesse 2002; 2010; Salvatori 2012), although see also Hays (Hays 1971) for the first use of 'Type Variety' and also Marks *et al.* (1985) and Winchell (2013) for use of 'Type Variety' overlying Caneva's classificatory system in North-East Africa.

Yet, there is a long-standing body of literature which critiques typological approaches to pottery analysis (Dunnell 1971; 1986; Haour *et al.* 2010; Keech McIntosh 1995; Wright 1967), while advances in pottery theory and analysis offer an opportunity to set in place an approach, methodology, classification and interpretation which (a) avoids the pitfalls inherent in typological approaches, and (b) sheds light on social aspects of the pottery assemblages in their respective mortuary and non-mortuary contexts by documenting their variability spatially and temporally (MacDonald 2011a; Mayor *et al.* 2005). By contrast, attribute-based approaches, which work particularly well with handmade ceramic vessels, aim at recording the widest possible range of an object's characteristics, for example, parameters of dimensions, material, colour, tool usage, motor actions and motif placement, etc.

Over-reliance on the appearance of motifs rather than the tools which made them undermines classification by elements of technical style, normally a more reliable indice of social boundaries (Haour *et al.* 2010). The application of a textured approach enables engagement with the presence of formal variability within and between assemblages, which is better arrived at through the employment of different analytical variables. Engagement with technical choices made to shed light on socio-economic, ideological, political and personal motives reflected by the methods chosen by potters, permits archaeologists to move beyond mundane and inadequate descriptions such as 'red-burnished ware', 'Dotted Wavy Line' or 'rocker stamp'.



When applied to pottery, an attribute-based approach permits the researcher to break a vessel down into its constituent components which can then be compared statistically intra- and inter-site. The identification of tools and the motor actions are thereby the starting point and not an outcome or side effort in the analysis; their use helps minimise bias in determining the highest level grouping of attributes. Recognition of aspects of decor as socially embedded technological choices (Kohring 2011) permits a move away from typological categories and towards an understanding of nature and usage of the tools used to produce the range of pottery. The aims of the re-examination of the 486 Jebel Moya pottery sherds curated at the British Museum included the attempted identification of attributes showing evolutionary change and those which marked a distinctive disjuncture, thereby providing a better understanding on what attributes are cultural and time sensitive markers. These attributes allow for subsequent sorting to identify trends and to generate relevant typologies through the recognition of attribute clusters. Three assemblages have been determined using (1) single attribute (tool and motor actions) and (2) co-attribute (rim types and tool motor actions) occurrences. These occurrences were plotted through the different strata to determine whether there was a stratigraphic link which had temporal significance.

Assemblage 1 (Plate 1). This Late Mesolithic pottery is the rarest with 13 sherds. The 'Dotted Wavy Line' pottery noted by Isabella Caneva could not be re-located. Decoration on the remaining sherds is stamped and pivoted comb, and there is one impressed cord-wrapped roulette. The paste



Plate 1. Assemblage 1 sherd with comb-stamping, from the British Museum collection.

predominantly features sand, usually augmented with some bone and mica. There is no burnishing.

Assemblage 2 (Plate 2). These 104 sherds are comprised of thick (rolled) everted and relatively thinner simple rims with dragged comb and fine spatula stamped chevrons, as well as fine spatula stamped impressions on the lip. The chevron



Plate 2. Assemblage 2 sherd with dragged comb on the rim followed by cord wrapped element, from the British Museum collection.

motif is on top, after which there is a stamped comb, stylus or cord wrapped elements with a plain band. The motifs appear on the outer surface of the lips. The temper comprises coarse grit and sand, with mica sometimes present. Burnishing and slipping are present. The rim angles show predominantly open vessels, with some closed forms. There are a few sherds with zoned motifs (in-filled geometric forms) which may date towards the temporal end of the assemblage as the arrangement is superficially transitional between the majority non-zoned decor of Assemblage 2 and the zoned motifs of Assemblage 3.

Assemblage 3 (Plate 3). This repertoire is comprised of 369 sherds. Sherds are generally highly burnished and red slipped. In comparison to Assemblage 2, there are sherds featuring both thin simple rims as well as thin everted rims. Most are open vessels. Their decorative motifs were made using stamped comb, stylus incisions, and impressed cord. Also frequently present are pendant triangles (zoned forms) in-filled



Plate 3. Assemblage 3 sherd with angular and horizontal zoned comb-stamped lines, from the British Museum collection.

with fine stamping, either with comb or cord-wrapped elements. There are also occasional examples of cord-wrapped roulettes (impressed, not rolled). Some sherds have motifs on the interior. Critically, motifs, apart from those along the lip of vessels, all occur as part of zoned (geometric) forms. Mica temper predominates in the paste with some bone.

There are clear shifts in attribution distribution in the different strata (Tables 1 and 2). The proportion of everted and thick-everted rims increases from Stratum A to the lower Stratum C. Thin, simple rims predominate in Stratum A with the few occurrences of thick-everted rims possibly due to mixing during either the process of grave digging or by Wellcome's excavation, or both. The similar proportion of thin, simple rims in the Stratum A/B category to Stratum A, together with the 100% occurrence of slipping, suggests that perhaps many of those sherds derive from the latter. The incidences of burnishing and slipping decrease in Stratum C.

Similar patterns of differentiation emerge from examining single attribute occurrences of decoration tools and the decor motor actions. Styluses were used on sherds from all three

Table 1. The different rim forms present across the strata and their respective percentage within each stratum.

Rim form	Stratum A	Stratum B	Mixed Stratum A/B	Stratum C
RE	3 (2.88%)	6 (12.5%)	9 (7.89%)	8 (21.62%)
RER	4 (3.85%)	3 (6.25%)	0	9 (24.32%)
RSTN	92 (88.46%)	33 (68.75%)	101 (84.87%)	17 (45.95%)
RSTK	5 (4.81%)	6 (12.5%)	9 (7.89%)	3 (8.11%)
Total	104	48	119	37

Rim types			
RSTN (3-9mm)	Simple thin 	RER (24-26mm)	Everted rolled 
RSTK (10-26mm)	Simple thick 	RE (6-31mm)	Everted 

Table 2. Surface treatments across the strata and their respective percentage out of the total number of sherds per stratum.

Treatment	Stratum A	Stratum B	Mixed Stratum A/B	Stratum C
Burnished	124 (93.94%)	70 (92.11%)	162 (95.29%)	27 (67.50%)
Slipped	132 (100%)	71 (93.42%)	170 (100%)	38 (77.55%)

strata. The use of comb rises to 42.31% in Stratum A, while dragged comb chevrons are not present in the uppermost stratum, which contained dragged comb lines not present in the lower strata. Comb stamped lines are also more prevalent in Stratum A (29.81%) and in the A/B category (41.18%) than both strata B and C (10.42% and 13.51%). Larger numbers of stylus and spatula stamped chevrons also occur in strata A and B. Occurrences of spatula occur throughout the sequence. Cord, hollow reed and filleting are not present on rims from Stratum C. Finally, virtually none of the Assemblage 1 sherds are slipped, none are burnished, the three rims are simple thin rims, and the decor is always comb stamped lines.

In the new Register of Graves, 77 instances of pottery are recorded in direct association with human burials distributed across the valley. Of these 77 burials, 24 (also distributed across the site and through the strata) contain pottery sherds that were illustrated either on the excavation cards or in Addison's publication, or both. Outside of the 24 illustrated sherds, it is not possible to know for certain how many are whole vessels or burst pots. Of the 24 burials with illustrated pottery sherds and vessels found in stated association, 16 are from whole or partially whole vessels, four are pot bursts with the sherds covering a portion of the body such as the upper body or face, and seven have one or more 'loose' pottery sherds. Of the latter, burial 1225 had two large pottery fragments over the head and burial 2386 had a sherd originally from a large red granite vessel over its knee; the other sherds may have been mis-recorded and belong instead to the fill. While burial 1290 had an Assemblage 2 sherd under its left hand, it is likely an accidental association. If we exclude such dubious associations, all the remaining recorded sherds belong to Assemblage 3. Furthermore, none of the descriptions of non-illustrated burial assemblage pottery resembles any of the pottery assigned to Assemblage 2 – they are all attributable to Assemblage 3. The lack of pottery in association with any grave which could be assigned to Assemblages 1 or 2, also the stratigraphic reconstruction of the ground surface from which the graves were dug (see Brass 2015), argue in favour of at least the vast majority of the burials being from a single phase.

New radiometric dating

Samples from six sherds, three each from assemblages 2 and 3, were prepared for optically stimulated luminescence dating of coarse-grained quartz extracted from specimens supplied by the British Museum. An attempt at AMS dating of select human skeletal remains proved unfruitful due to a lack of collagen. New OSL dating techniques can now more accurately indicate the time the ceramic was fired and have been shown to provide similar accuracy to AMS dating of organic remains in pottery (Manning *et al.* 2011). Sample preparation and luminescence measurements were conducted at the Research Laboratory for Archaeology & the History of Art (Oxford University). Although the OSL results have very large standard error deviations (Table 3), there are no



overlaps in the respective dates from the Assemblage 2 and Assemblage 3 sherds. The results indicate that there were three broad temporal phases. The sherds assigned to Assemblage 1 were not directly dated due to the need to obtain clusters of dates on the more numerous second and third assemblages.

Overall, Assemblage 3 covers the middle and late Meroitic periods as well as the aftermath of the breakup of the Meroitic state which stretched from Lower Nubia to above the Sixth Cataract, into the Bayuda, Keraba and Butana and with possible trading stations along the Blue and White Niles. It is also to this phase that the vast majority, if not all, of the burials are assigned.

Table 3. OSL results on the dated samples from the British Museum collection.

Laboratory code	Palaeodose (Gy)	Total dose rate (Gy/ka)	OSL age estimate (years before 2012)	Calendar date
X5291	9.71 ± 1.49	5.52 ± 0.38	1760 ± 295	40 BC - AD 550
X5292	16.33 ± 3.64	5.03 ± 0.33	3245 ± 755	1985 - 475 BC
X5293	7.19 ± 1.20	4.82 ± 0.32	1490 ± 270	AD 255 - 790
X5294	17.38 ± 2.30	5.06 ± 0.33	3435 ± 260	1680 - 1165 BC
X5295	17.96 ± 2.14	5.53 ± 0.37	3250 ± 445	1680 - 790 BC
X5296	7.58 ± 2.58	4.90 ± 0.33	1545 ± 535	70 BC - AD 1005

Origins of the cemetery layout

A few alternatives exist for how the spatial layout of the different burial sectors came into being and how they grew. The first is that there was organic growth over time with shifting burial grounds. The second is that the distribution of the burials was more or less established at the onset of the use of the valley as a cemetery. The former could be due to the dead being buried in temporarily unoccupied space, while the latter could be the result of burial beneath or next to huts occupying most of the valley. There is also the possibility that habitation was abandoned towards the end of the occupation sequence, leaving only mortuary activity occurring within the valley. To help distinguish between the different possibilities, the different sectors were examined for the composition and ratios of types of burial assemblage artefacts: the expectation being that the nature of the burial assemblages would show distinct differences if there were shifting burial grounds, and be similar if the different sectors were by and large all in use throughout this final phase.

Table 4. The breakdown of human and separate animal burials, and the percentage of grave goods associated with the human burials, per sector.

Sectors	Recorded burials	Animal (cattle and dog) burials	Human burials with goods
South-West	825	11	427/814 (52.46%)
North-East	1196	7	336/1189 (28.25%)
East	860	5	217/855 (25.38%)
North-West	174	4	85/170 (50%)
South	49	0	17/49 (34.7%)
West	17	0	4/17 (23.53%)

Comparative nature of the burial assemblages

Approximately 50% of the human burials in the south-west and north-west sectors have accompanying artefacts, while the range is 25- 30% for the east and north-east sectors (Table 4). Comparatively, the number of human burials in the south and west sectors, at a combined total of 66, is less statistically significant. It is the first four sectors – south-west, north-east, east and north-west – which are the main focus in determining how the burial layout arose in the Jebel Moya valley. The number of occurrences of all the artefact categories from these burials was determined for the different sectors.

When the composition of the burial assemblages across the different sectors is broken down, there are no standout differences in the occurrences of the artefact categories (Table 5). There are many categories and their respective occurrences are few, with the prominent exceptions of beads and lipstuds. This scenario is potentially corroborated by (a) there being mass burial activity from above the surface of Stratum C in the south-west sector, and (b) evidence for habitation activities in the form of ovens, stone

pavings, hearths and post-holes also from the south-west sector, while excavator reports of habitation traces from the other sectors cannot be verified. Overall, the pattern in the distribution of the categories across the valley is similar, suggesting that there was no long-term distinct movements of burials across the valley which can be detected.

Although burials amongst agro-pastoral populations near Lake Chad occurred at a designated ground away from habitation (van Beek 2012), burials were still taking place beneath or just outside huts in south Sudan in the early 20th century: amongst the Burun (southern Funj), Bongo (Tonj district, Bahr el-Ghazal), Acholi, Anuak, Kuku, Langu, Lotuko and the Nuer (Addison 1949). However, given the lack of information regarding the habitation remains in the other sectors of the site, it is impossible to determine whether people lived outside the south-west sector until mortuary activity ceased in the valley, like it appears they did in the south-west sector.

Habitation structures

Different cultural perspectives impact upon how social identities and layers of social organisation are represented in the mortuary domain, which requires examination using carefully constructed dimensions of analysis. For Jebel Moya, the first step was to establish the extent to which settlement remains are present through the different strata in order to understand the nature of the use of the site. Unfortunately, field notes detailing the type and stratigraphic positioning of the surfaces interpreted as floors and other man-made features were found by Addison for only the excavated south-west sector of the valley, which hampers attempts to discern the extent and nature of habitation activities within the valley.

Table 5. The sum of the occurrences of artefact categories in each area of the cemetery with corresponding percentage out of the total number of burials-with-goods.

Artefact categories	South-West	North-East	East	North-West	South	West
Amulets	0 (0%)	0 (0%)	3 (0.69%)	0 (0%)	0 (0%)	0 (0%)
Anklets	0 (0%)	1 (0.30%)	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)
Armlets	15 (3.51%)	1 (0.30%)	2 (0.46%)	0 (0%)	1 (5.88%)	0 (0%)
Beads	135 (31.62%)	119 (35.42%)	78 (17.97%)	27 (31.76%)	1 (5.88%)	2 (50%)
Bone point implements	5 (1.17%)	1 (0.30%)	2 (0.46%)	0 (0%)	0 (0%)	0 (0%)
Borers	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Bowls	0 (0%)	0 (0%)	2 (0.46%)	0 (0%)	0 (0%)	0 (0%)
Bracelets	30 (7.03%)	52 (15.48%)	40 (9.92%)	13 (15.29%)	1 (5.88%)	1 (25%)
Celts	2 (0.46%)	10 (2.98%)	5 (1.15%)	1 (1.18%)	1 (5.88%)	0 (0%)
Ceramics	31 (7.26%)	23 (6.85%)	12 (2.76%)	7 (8.24%)	1 (5.88%)	0 (0%)
Coils	0 (0%)	14 (4.17%)	6 (1.38%)	0 (0%)	0 (0%)	0 (0%)
Earrings	0 (0%)	0 (0%)	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)
Earstuds	5 (1.17%)	3 (0.89%)	1 (0.23%)	6 (7.06%)	0 (0%)	0 (0%)
Flakes	0 (0%)	1 (0.30%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Grindstones	0 (0%)	0 (0%)	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)
Hair ornaments	0 (0%)	0 (0%)	0 (0%)	1 (1.18%)	0 (0%)	0 (0%)
Hair clips	2 (0.46%)	1 (0.30%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Hair rings	0 (0%)	0 (0%)	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)
Knives	3 (0.70%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Lipstuds	266 (62.30%)	128 (38.10%)	61 (14.06%)	56 (65.88%)	11 (64.71%)	1 (25%)
Maceheads	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Needles	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Nosestuds	3 (0.70%)	0 (0%)	0 (0%)	2 (2.35%)	0 (0%)	0 (0%)
Pebbles	2 (0.46%)	2 (0.60%)	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)
Pendants	35 (8.20%)	22 (6.55%)	17 (3.92%)	5 (5.88%)	1 (5.88%)	0 (0%)
Pins	9 (2.11%)	5 (1.49%)	5 (1.15%)	3 (3.53%)	0 (0%)	0 (0%)
Quirms	0 (0%)	0 (0%)	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)
Rings	1 (0.23%)	3 (0.89%)	9 (2.07%)	0 (0%)	0 (0%)	0 (0%)
Rubbers	1 (0.23%)	2 (0.60%)	1 (0.23%)	0 (0%)	0 (0%)	0 (0%)
Scarabs	0 (0%)	2 (0.60%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Statuettes	0 (0%)	0 (0%)	2 (0.46%)	0 (0%)	0 (0%)	0 (0%)

The re-evaluation of the features shows that the first to third floors are in fact clay impregnated with calcium carbonate which lent it their white colour. There are holes in the third calcium carbonate surface, considered to be post-holes associated with grass huts. There is also hardened mud which looks to be mud plaster from one or more wattle and daub structures. Amongst other features, purported floors of red-ware sherds turn out to be pots which burst under pressure.

Of other claimed man-made features in the south-west sector, those below the surface of Stratum C consist of stone flooring, a probable hearth, three hardened mud floors with one exhibiting signs of post-holes and a second with a hearth, and two hearths. All bar the stone flooring and one hearth were on or in the immediate vicinity of the surface of Stratum D, which is consistent with habitation activity

possibly contemporary with the pottery Assemblage 1 and/or (if including the stone flooring and hearth) Assemblage 2. Above the surface of Stratum C, in addition to the naturally occurring calcium carbonate features, were three ovens unearthed within the same levels *c.* 1.57-0.6m above the surface of Stratum C. Also, the post-holes within the third 'flooring' feature attest to habitation activity.

There is also mud plastering from a wattle and daub structure in Stratum B and a claimed stretch of hardened paving; however, there is no sketch or photograph of the latter feature to verify. The mud plaster's exact stratigraphic positioning cannot be reconstructed. The latest activity was a small patch of burnt clay flooring at 1.95m above the surface of Stratum C, which is in Stratum A and towards the end of the period of mortuary activity at the site. The stratigraphic



positioning of these remains correlates with the sequence obtained for the pottery Assemblage 3, which is present in greater numbers in the upper strata than Assemblage 2. What all this means in effect is that there are habitation remains in likely association with all three phases of occupation, with the vast majority of burial activity occurring during the third and final phase (see Brass 2015).

Also in the vicinity of graves in general, but in the south-east portion of the east sector of the cemetery, are a series of stone structures found on the modern ground surface during the second field season. Recorded in the diary of the field excavator Oric Bates, which is curated at the Griffith Institute (Oxford), and unmentioned by Addison, is a series of six small stone structures measured on 20th January 1912 (Figure 2). A seventh was found on 24th January 1912 and is described as being semi-circular with a length of 7m. No further descriptions are provided. Bates believed that these

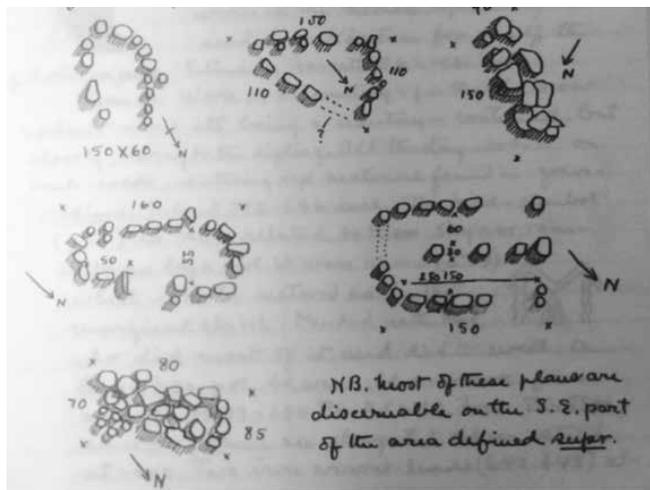


Figure 2. Three small stone structures located in the south-east portion of the east sector of the excavated valley recorded in Oric Bates' diary from the second field season.

structures, comprised of small stones, could not be directly associated with any particular burial and that perhaps they were sub-structures of shelters. However, the structures appear to be too small for shelters and another possibility may be that they could have served as stone platforms (for sacrificing or feasting, for example) (Insoll *et al.* 2015).

Bioanthropology

Table 6 compares the sexing done by the original field anthropologists compared to the re-sexing by a former curator (Mercedes Okumura) at the Duckworth Laboratory on the extant cranial and post-cranial remains. The precise methods used in both sexing attempts are unknown. No osteological data is available from the first field season. While the field anthropological designations showed bias towards females, the re-sexing shows that many of males originally were incorrectly assigned as females. Overall, there was no depositional bias in favour of either sex at Jebel Moya.

Interestingly, the original bioanthropological study did not

Table 6. The number of individuals re-sexed by the Duckworth Laboratory and the percentage difference compared to how the same individuals were sexed by the original field anthropologists.

Field season	Field sexing	Differences with laboratory re-sexing
Second	Female	3/9 (33.3%)
	Male	4/18 (22.2%)
	Undesignated	10/10
Third	Female	6/15 (40%)
	Male	1/14 (7.14%)
	Undesignated	10/10
Fourth	Female	55/141 (39.9%)
	Male	10/69%
	Undesignated	44/44
Total		143/330 (43.33%)

compile data on population demography, health and diet as it focused on population affiliation. Subsequently, Rachel Hutton MacDonald investigated whether or not dental anthropology could assist in the reconstruction of ancient diet in her unpublished 1999 UCL Ph.D dissertation. She looked at different ethnographic and archaeological populations of known economic type (agriculturalist, hunter-gatherer and pastoralist). Her analysis encompassed occlusal dental macrowear, buccal microwear, dental caries and wear facets while accounting for feature density due to age and wear. The dental carie studies were comprised of three components: (1) Tooth class (Hillson 1996), (2) proportion of carious lesions for the total number of teeth examined for each population, and (3) the number of carious lesions expressed at an individual level. The carious lesions were scored using a modified version of Simon Hillson's (1979) scoring method, while their location was recorded graphically (following Whitaker and MacDonald's 1989 system) which permitted the recording of the degree of carious destruction and the relationship between neighbouring caries.

Dental caries are caused by the action of acids on the enamel surface, leading to a loss of calcium and phosphate from the enamel (demineralisation). Demineralisation can be localised and progresses slowly. Active periods of demineralisation can be interspaced with remineralisation phases. The active phase occurs when the pH of the oral environment drops to 5.5 or below (Hillson 1986). An important contributor is dietary carbohydrates which encourage plaque development and tend to reduce pH levels (Hillson 1986, Navia 1994).

In the samples analysed by Hutton MacDonald (1999), most of the caries were inbetween teeth rather than atop them which decreases the chances of bias through wear destruction. More specifically, the Jebel Moya sample did not exhibit the high levels of dental disease which are commonly known from peoples who cultivate. Out of the 2,411 teeth, only 5 (0.2%) had caries. This would normally indicate

a non-cultivating, non-high carbohydrate consuming population (see Table 8.1.2 in Hutton MacDonald 1999), but it could also – just possibly – be due to favourable genetics, water chemistry and/or cultural factors governing oral hygiene such as chewing sticks.

The dental macrowear was examined in a number of ways. Comparison of the wear patterns between the first and second molars for individuals aged over 17 was looked at. The difference between these molars represents approximately 6 years of functional wear, to remove different effects of age and/or dietary variations. Data was collected on the wear stage (amount of visible dentine), wear angle and wear direction. Some differences were observed by Hutton MacDonald (1999). Hunter-gatherers exhibited different patterns of anterior tooth wear (incisors and canines) relative to posterior tooth wear (premolars and molars): they tended to use all of their dentition more frequently. The pastoralists and agriculturalists preferentially wore down their posterior dentitions. The hunter-gatherer teeth exhibited rounded horizontal wear forms, while the agriculturalists and pastoralists exhibited oblique wear angles and cupped wear forms. Furthermore, the angles and forms of the teeth created from natural wear use, taking into account functional age as indicated by first molar wear, were similar for the Jebel Moya and the other pastoralist samples in Hutton MacDonald's (1999) study. The Jebel Moya samples followed the latter wear patterns.

In support of designating the population of Jebel Moya as having a pastoral economic base,¹ the archaeological dataset comprises no artefacts which may be indicative of cultivating activities, such as sickles or hoes, and only one grindstone was found in the burial assemblages. In addition to several small clay cattle figurines found in non-burial contexts, it is also worth noting that there are, in total, 55 occurrences of cattle remains among the burial assemblages, either as parts of the animal (e.g. foot) in association with a human burial or as a separate cattle inhumation.

Spatial arrangement of the burials

Figure 3 shows a K-function graph which illustrates that clustering of graves did occur, at least broadly speaking that both graves with goods and graves without goods occur together throughout the cemetery. The ratio of burials-with-goods to burials-without-goods (the relative density of grave goods) is much higher in the south-west (>0.5) than in the north-east (Figure 4), a finding backed up by analysis of what I am terming 'Inverse Distance Values'. I have previously defined Inverse Distance Value (IDV) as the weight (value) assigned to a material which diminishes as the distance from the area/region of origin decreases (Brass 2014). The overall IDV for each burial was calculated on the presence and numbers of

¹ The degree of difference in mobility between the sexes is currently being investigated by Stacy Hackner of the Institute of Archaeology, University College London, as part of her doctoral dissertation.

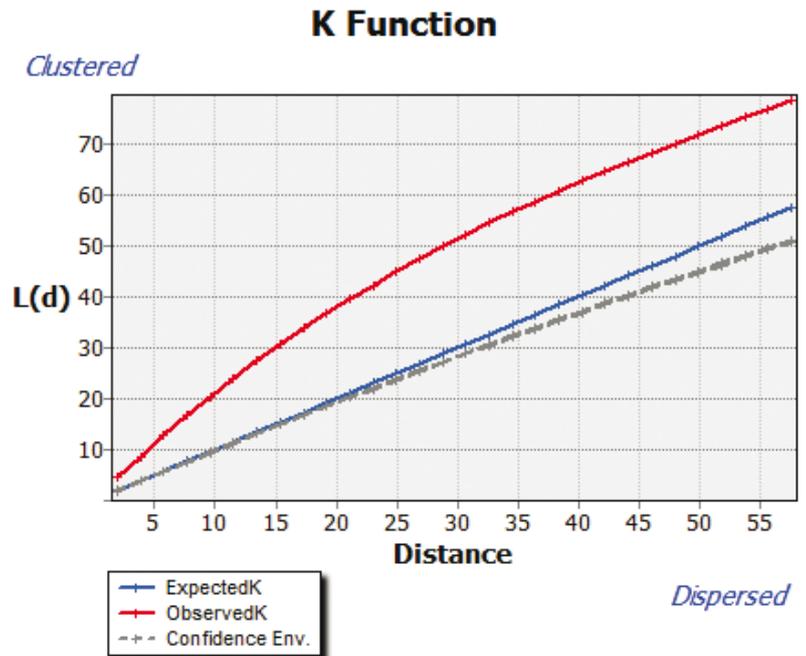


Figure 3. K-Function graph of all the burials showing burials-with-goods and burials-without-goods occur together throughout the cemetery.

items made from the different raw materials. The IDV for each sector of the cemetery was then determined. While items made from imported raw materials appear only in the east and north-east sectors, with the exception of marble lipstuds and one occurrence of faience beads in the south-west sector, the values of the south-west and north-west sectors also indicate that there are different concentrations and materially (possibly ideologically) represented manifestations of wealth across the cemetery.

The highest IDV range is in the adult category but the overall IDV Mean is strikingly similar for adults and young adults. For infants, there are no exclusively or semi-exclusively-reserved artefact categories where beads, bracelets and the occasional pendant and lipstuds predominate. It indicates instead that a limited sub-set of artefacts was permitted in infant burials; the artefacts are manufactured from either

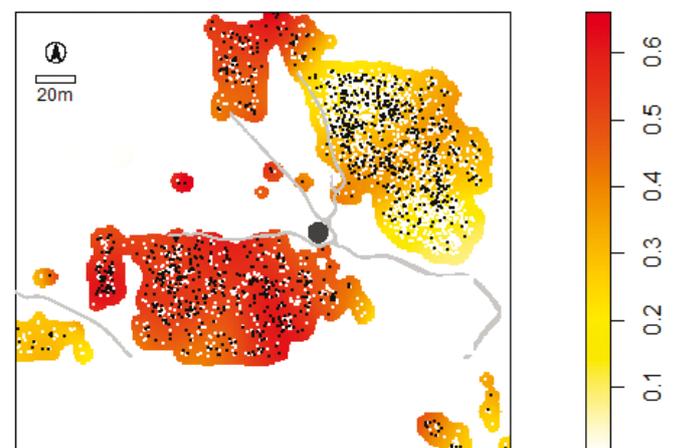


Figure 4. Relative risk density of burials-with-goods versus burials-without-goods. The higher the value, the greater the density.



local materials or materials obtained from likely sources along the Nile. No Meroitic or long-distance sourced raw materials are present with the infants who are also buried across the cemetery.

The IDV values for the different sectors were used in Cross Pair Correlation Function (PCF, also known as a radial distribution function) analyses, which examines how the density of objects vary as a function of distance. PCF was used for point pattern analysis in the program R to determine the spatial configuration for richer burials and less-rich burials where each point represents a burial in two dimensional space. Richer burials are defined as having an IDV of 10 or more. Two tests were run against the burials of each sector of the cemetery: (1) The spacing of the richer burials versus each other, and (2) the spacing of richer burials against less-rich burials, with a randomisation of rich and non-rich burials forming a delineated set of values against which the burial data was calculated. For the first test (Figure 5), the spatial distribution of the richer burials shows no significant patterning, with no suggestion of standardised distances separating the burials.

However, an interesting spatial neighbourhood phenomenon in terms of the distribution of the 27 richer versus poorer burials was observed uniquely for the north-east sector in the second test (Figure 6). There is some inhibition between richer and poorer burials at distances of up to 20m where the line representing the data values dips below the randomisation envelope; the former distance is the result of determining that there is poorer burial density out from each richer burial to a radius of 20m. At larger distances, there is significant clustering where the data values are greater than the randomisation envelope. Therefore, there are fewer poorer burials than expected at short distances from richer burials, but a greater number of poorer burials than expected beyond: in other words, there appears an absence of poorer burials at shorter distances and then an unusually dense halo of such poorer burials at medium distances.

These results raise interesting questions on the meaning of spatial relationships. They suggest a degree to which it was not deemed appropriate to place poorer burials very close to the members of the communities buried with richer accompaniments in the north-east sector, i.e. there is clearly some kind of spatial neighbourhood. One possibility is that there may have been some form of non-permanent marker for the rich graves indicating to the community where not to bury while the marker lasted and until the position of the grave(s) faded from memory. Such a spatial arrangement is unknown in the African pastoral ethnographic literature, but these burials cannot be uncritically assigned to hereditary elites or to a dominant clan lineage without critical analysis of how different aspects of social organisation are represented (McHugh 1999), especially as there is a lack of spatially distinct clusters of both the physical burials and types of accompanying grave goods.

Generally, a common element of differentiation lies in

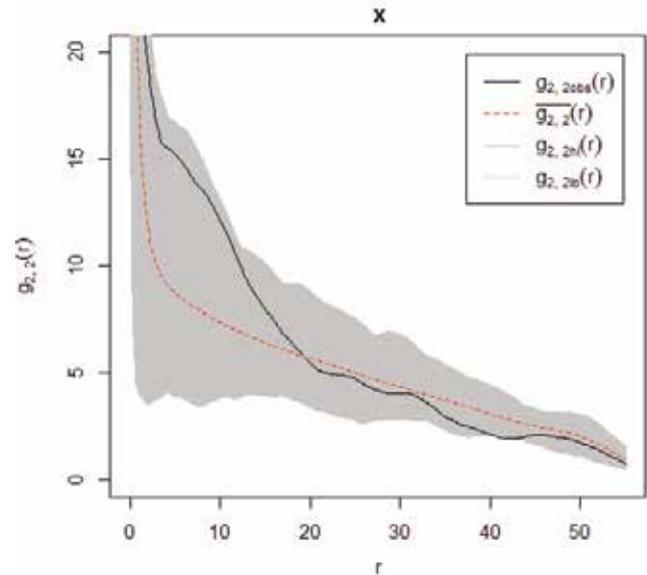


Figure 5. Cross Pair Correlation Function of richer burials versus each other across the cemetery (from Brass 2014).

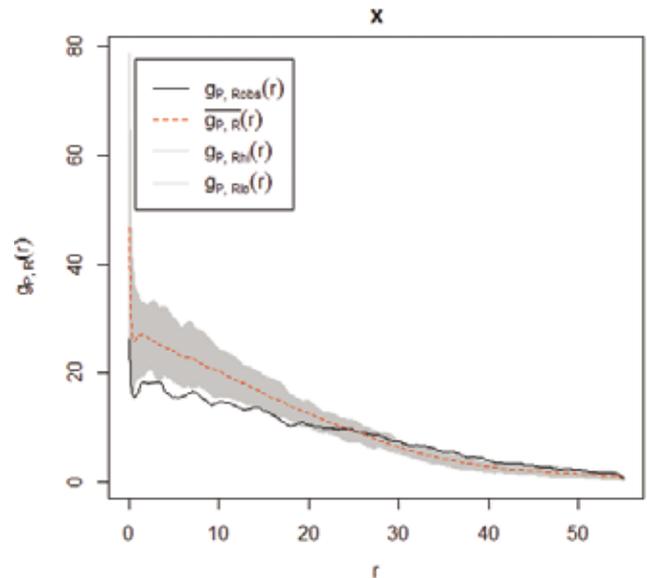


Figure 6. Cross Pair Correlation Function of richer versus poorer burials in the north-east sector of the cemetery (from Brass 2014).

the orientation of the body in select graves compared to other clusters of graves or sections of a cemetery in order to demarcate status, wealth or other social standings. For the north-east sector at Jebel Moya, the 27 richer burials were compared to the 857 burials (out of 1,196) which have recorded cardinal co-ordinates. The richer burials fall within the range of cardinal variations and so directionality cannot be used as a distinguishing factor for this or any other sector. Neither too are the different age sets distinguished by bodily orientation throughout the cemetery. Therefore the contention by Gerharz (1994) that the variable orientation of burials at Jebel Moya should be put down to the site's use as an aggregation locale by various different pastoral communities in the southern Gezira cannot be taken at face value. Revised analysis reveals that the nature of directionality is

not as mixed as claimed by Gerharz for all the burials across the cemetery: the majority of the burials are often buried in a south-westerly to north-westerly direction.

However, there is variation in the reconstructed surface levels from which the north-east sector richer burials were most likely dug. No depth measurements were provided for seven out of the 27 rich burials. There is an outlier burial at -100mm below C Surface, with the remainder of the reconstructed burial surface starting from 700mm above C Surface. The concentration of rich burials coincides with the rise and decline of the peak period of burial activity in the sector. Other analysis shows that there were burials in the north-east sector prior to the micro-scale of burying 19 out of the 20 rich individuals within the time period demarcated by the OSL dates for Assemblage 3. So what is being exhibited are deliberate, intentional burial behavioural patterns with a portion of the cemetery delineated from a particular period in time to a sector of the population who commanded enough respect and status to be actively spatially distinct from those individuals deposited in less rich graves.

As there are also females present amongst the 27 richer burials, the potential for differentiation using artefact category types was examined too. However, there is a remarkable degree of uniformity in the number of burial assemblages in which similar artefact categories are present between male and female individuals re-sexed by the Duckworth Laboratory. Neither are there are particular items which distinguish adults from young adults, nor are there any forms of particular artefacts which could have functioned as age group symbolic markers.

Conclusion

Social and political relations were effectively inscribed onto the landscape through the use of part of the Jebel Moya massif as a mortuary complex, turning the social landscape into a space where ritual and history mutually reinforce each other and indeed are constructs of each other (for further archaeological and anthropological examples see di Lernia and Manzi 2002; Insoll 2004). As such, the nature of occupation of the valley during Assemblage 3 times in particular linked kin and landscape together through the inscription of genealogies into the common landscape, a landscape portraying an underlying ideological stratum of beliefs which both extrapolated and downplayed differences within the mortuary realm.

While the excavated sectors of the Jebel Moya valley appeared to exhibit a large degree of uniformity in terms of the appearance of artefact categories accompanying the burials, there is a distinct patterning of richer burials in the north-east sector. This sector also has a high proportion of burials without accompanying assemblages. The 'social neighbourhood', in which no poorer burials were permitted within 20m of the known/visible location of a richer burial, created a distinct area of prestige which probably encouraged other individuals to be buried in the same general vicinity for

prestige association. The greater proportional presence of the occurrence of select imported raw materials such as carnelian, a highly prized traded material elsewhere (MacDonald 2011b), in the richer burials of the north-east sector, lend support to the notion that these individuals may have been a social elite which developed possibly at the end of the early burial phase as the valley was being used more intensively as a cemetery.

Overall, there is little way of being able to recognise pre-depositional rites, but ultimately examination of Inverse Distance Values, burial posture and burial orientation is suggestive that all the individuals had defined death social personae, that there was representation in the mortuary realm of a social elite for at least part of the temporal period of Assemblage 3, and that there is enough of a similarity in the types of artefacts deposited with young adults to suggest perhaps increasing involvement in similar roles as their adult counterparts. There also appears to be a high level of sex-agnosticism as the individuals are represented in the mortuary realm, lending weight to the hypothesis that individual identity is being stripped for the majority of the burials in favour of a multiple manifestations of memory in the mortuary realm.

Finally, it is hoped that the new OSL dates from Jebel Moya and the formation of a firm pottery assemblage framework will serve as a catalyst for the further investigation of pottery finds up and down the Blue and White Niles, and the refinement of localised chronologies.

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