



A Synthesis and Critical Inventory of Nubian Cores in Middle Stone Age and Middle Palaeolithic Assemblages

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DATA PAPER

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ABSTRACT

Nubian Levallois technology has become a prominent and hotly debated topic in current Palaeolithic discourse, with important arguments surrounding modern human dispersals, cultural interactions and technological innovations resting on the presence of Nubian cores in lithic assemblages. However, not all published instances of Nubian cores fulfil their strict technological criteria, with resultant implications for how their presence in space and time is interpreted. To address this, this dataset compiles a comprehensive literature review of 154 published sites where Nubian cores have been reported. Each case is presented with key contextual information synthesised from the literature, and the identification of Nubian cores is critically evaluated. The dataset shows that over the last decade, while there has been a marked increase in the number and distribution of sites with reported Nubian cores, these artefacts increasingly diverge from the technological and morphological characteristics that define this core type. As such, 24 identifications are queried as not fulfilling the strict Nubian core criteria. A further three are rejected with no supporting evidence in the literature, and four noted as contested cases. This dataset serves as a key resource for studies of Nubian Levallois technology, providing a centralised literature review with spatial and contextual data to support robust future research on the topic.

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1. CONTEXT

Nubian Levallois technology has become a major topic in discourse surrounding human innovation, adaptation and demography in the Middle Stone Age/Middle Palaeolithic [1, 2, 3, 4, 5, 6]. The use of Nubian Levallois technology is most clearly indicated in the lithic record by the presence of Nubian cores, which show a specific reduction strategy and morphology. Two key aspects of current debate concern, firstly, the definition of Nubian Levallois cores, and secondly, their occurrence in space and time. Both of these have implications for subsequent interpretations about early human dispersals within and out of Africa [7, 8, 9], the independent invention of this technology by certain populations [4, 10, 11], and whether it was specific to only one human species [12, 13, 14, 15].

The earliest descriptions of this type of Levallois core were based on artefacts observed in Egypt in the early 20th century [16, 17], but these were only named as a specific “Nubian” type in 1965, due to their geographic location in southern Egypt and northern Sudan [6, 18]. The later identification of Nubian cores outside of this core area of north-eastern Africa has driven a resurgence of interest in the technology (Figure 1). However, an emerging problem is that as Nubian Levallois has gained an increasingly prominent place in archaeological debate, the artefacts identified as Nubian cores have become more heterogeneous, and its distinction from other types of Levallois core is sometimes blurred. Robust evidence indicates that, at least in some regions,

Nubian Levallois was a distinct, deliberate reduction strategy [19, 20, 21], whereas other cases may rather reflect the morphological by-product of other Levallois methods [13, 22, 23]. Distinguishing between these knapping behaviours, and where they occur, is therefore a crucial foundation for constructing models of the dispersal, diffusion or convergence of Nubian technology.

NUBIAN TECHNOLOGY vs. THE NUBIAN COMPLEX

An important aspect of debates surrounding the status of Nubian cores in assemblages lies in their complicated, and controversial, association with the Nubian Complex. This was proposed to be a widespread shared Middle Stone Age/Middle Palaeolithic technocomplex, spanning North Africa during MIS 5, and potentially even earlier and later [1, 7, 24, 25]. Initially, sites were assigned to the Nubian Complex based on not only the presence of Nubian cores, but also other techno-typological features that were regarded as distinguishing these from a contemporaneous Lower Nile Valley Complex [1]. Over time the characteristics that determined whether a site was attributed to the Nubian Complex became less restricted and its chronological and spatial scope expanded [8, 24, 25]. This has culminated in the current situation where the concepts of Nubian technology (i.e. Nubian cores) and the Nubian technocomplex have become intertwined and problematically conflated [4, 6], and the use of both terms in the literature has become confused.

SITE	AGE (Ka)	AGE METHOD	CONTEXT	REFERENCE
NW-Central Sahara				
Uan Tabu	>61	OSL	Minimum age from overlying deposits	[27]
NE Sahara/Nile Valley				
Kharga Refuf Loc.IV	>200	U-series	Minimum age; the site is stratigraphically below dated tufa	[28]
Sai 8-B-11	<152	OSL	Maximum age from underlying deposits	[29]
Sodmein Cave	118; 89–87	TL; OSL	Bracketing ages for MP levels that may contain Nubian cores	[30, 31]
<i>Bir Tarfawi BT-14</i>	135–85	OSL	<i>Bracketing ages for palaeolake deposits</i>	[32]
Kharga Mata'na G	127–103	U-series	Minimum age for Nubian core in deposits and underlying maximum age	[33]
Kharga MD-10	124	U-series	Maximum age for NLCs in deposits	[33]
Kharga Bulaq BQ-04	114	U-series	Minimum age for NLCs in deposits; interpreted as being redeposited	[33]
Taramsa 1	117–102.5; 88.8–58.9	OSL	Nubian cores present in Phases II and III	[34]
Wadi Halfa 34 A	>84	U series	Minimum age; the site is stratigraphically below dated site 1017	[35, 36]
Wadi Halfa 2004	<65	U-series	Maximum age; the site is stratigraphically above ANW-3	[35, 36]
ANW-3	65–62.5	U-series	Unpublished ages; Nubian cores in buried deposits	[35, 36]
BP177	62–17	OSL	<i>Bracketing ages for deposits with MSA</i>	[37]
Affad-23	57–54	OSL	<i>Associated and bracketing ages for the site; previous ages of 16–15 ka were rejected as problematic</i>	[38, 39]

(Contd.)

SITE	AGE (Ka)	AGE METHOD	CONTEXT	REFERENCE
East Africa				
Gademotta ETH-72-6	183–100	Ar-Ar	Bracketing ages for buried Nubian cores; overlying unit may be contemporaneous with the Aliyo Tuff (104/100 ka)	[40, 41, 42]
Keraswanin	>100	U-series	<i>Minimum age for overlying Wakondo tuff</i>	[43, 44]
Aduma	100–80	<i>U-series, TL, OSL</i>	<i>Maximum age for artefacts lying on and in Ardu silts</i>	[45]
Mochena Borego	50–40	C14	<i>Ages for deposits with Nubian-like artefacts</i>	[46]
Midhishi 2	>42	C14, TL	<i>Minimum age for MSA layer</i>	[47]
Rusinga Island	35–42; 100	AMS radiocarbon; tephrochronology	Minimum age for exposed artefacts in Wasiriya Beds; maximum age of tephra 100 ka	[48]
Levant				
Nahal Zipporim RZ1-3	141	OSL	Maximum age for terrace surface with Nubian cores	[49]
Dimona South	116–111	OSL	Nubian cores in buried deposits; bracketing ages of 124 and 85 ka	[21]
Nahal Ziq EZ5	<107, 87	OSL	Maximum ages for terrace surface and travertine with Nubian cores	[49]
'Ain Difla	180–90	OSL, U-series, ESR	Bracketing ages for MP deposits	[50]
Skhul	119–105	<i>U-series, TL</i>	<i>Ages for MP deposits</i>	[51]
Boker Tachtit	51–44		<i>Ages for Level 1 deposits</i>	[52]
Arabia				
Umm al-Sha'al AK-31	253–87	OSL	<i>Bracketing ages for deposits with Nubian-like cores; authors describe lower ages as problematic</i>	[53]
Aybut Al Auwal TH.59	107	OSL	Minimum age for Nubian core in buried deposits	[8]
Central/East Asia				
Guanyindong	170–80	OSL	<i>Ages for deposits with Levallois-like artefacts</i>	[54]
Katoati	61–47	OSL	<i>Ages for deposits with Nubian-like cores; ages are inverted</i>	[55]
Tolbor 4	45–39	AMS radiocarbon	<i>Ages for deposits with Nubian-like cores</i>	[56]
South Africa				
Klipfonteinrand	>57	OSL	Minimum age from overlying deposits	[57]
Mertenhof	>51	OSL	Minimum age from overlying deposits	[58]

Table 1 Radiometric ages for sites with Nubian cores identified, ordered from oldest to youngest by region. Queried and contested cases are indicated in italics.

The proposed solution to advance our understanding of the technological and cultural relationships between assemblages with Nubian cores is to take a bottom-up approach [26]. This begins with the artefact form that best represents the Nubian reduction strategy, implementing a strict set of criteria in its definition. Only once the spatial and temporal occurrence of Nubian cores is established can meaningful comparisons of core frequencies, associated technologies and artefact types be used to construct cultural taxonomic groupings that provide information on past human interaction and demography.

CHRONOLOGY

An associated issue is the current lack of chronological control for Nubian cores which predominantly occur as surface finds. Only 33 radiometric ages are associated

with (claimed) Nubian cores, many of which only represent minimum or maximum ages for under- or overlying deposits (Table 1). While there are some extreme (and potentially problematic) ages of MIS 6/7 and MIS 2, the consensus age for undisputed Nubian cores in North-east Africa [33], the Levant [21] and Arabia [8] is early MIS 5. This coincides with humid episodes in present-day arid environments, as well as with the timing of human demographic expansions [59, 60, 61]. However, different chronological scenarios are supported in certain regions, such as South Africa, where Nubian cores occur in contexts with MIS 3 ages [10, 58]. Using relative chronologies based on diagnostic artefact types as a framework for characterising undatable surface contexts is standard archaeological practice, especially in landscapes with complicated depositional histories. The addition of

new ages will help to clarify regional and inter-regional patterning in sites where Nubian cores are present, allowing us to set reasonable chronological anchor-points for nearby surface assemblages. However, an important step is also to distinguish between dated sites with Nubian cores *'sensu strictu'* and those that are more ambiguous.

DEFINITION OF NUBIAN CORES

In their original definition of Nubian cores, Guichard and Guichard [18, 68–69] describe a technological strategy involving “the removal of two elongated flakes or Levallois blades with negative bulbs close to each other; the traces of removals of both blades are delineated by a short ridge”, which has subsequently become known as the distal median (or median/medial distal) ridge [8, 19, 62]. The Guichards [18] identified two typological categories of core, Type 1 and Type 2, on the basis of different preparation strategies of this ridge; Type 1 preparation is from the distal, and Type 2 preparation is from the laterals. A third “Type 1/2” category was recognised later [19, 63] that acknowledges that there can be fluidity between these types, combining configurations of distal and lateral preparation. One of the problems relating to Nubian core types is that Type 2 bilateral or Type 1/2 distal-bilateral preparation can grade into the morphology of a centripetal Levallois core, and as such Type 2 remains a contested category for some [9, 63]. A consideration of scar pattern alone is therefore not a clear-cut marker of Nubian Levallois technology, since bidirectional (Type 1) and centripetal (Type 2, Type 1/2) Levallois core preparation strategies also exist and can result in pointed end-products [e.g. 9, 23, 64, 65]. For this reason, identifying Nubian technology as present in an assemblage based solely on end-product scar pattern is not sufficient evidence of a Nubian reduction strategy [e.g. 66, 67, 68, 69].

Given the limitations associated with a purely typological approach, Usik et al. [19] outlined a system of technological, attribute-based, criteria that Nubian cores must meet: (1) a steeply angled distal median ridge of $<120^\circ$ and generally $>60^\circ$, (2) an opposed striking platform with angle of intersection to the exploitation surface varying from 50° to 90° , (3) a triangular or sub-triangular core shape, and (4) a faceted primary striking platform. As Nubian cores have been identified in more regions of the world, it has become even more important that a unified definition is applied, recently updated by Hallinan et al. [5] to encompass the following characteristics:

1. Possession of a steep ridge at the distal end of the core (the distal median ridge), of 90 degrees or less, formed by two or more intersecting scars.
2. The presence of a distal platform for preparation removals, serving an alternate role to the proximal platform from which preferential removals are struck.
3. The distal portion of the core is the focus of preparation of the distal ridge, with removals from the distal platform and/or steep lateral preparation focused on the distal half to third of the core.
4. The overall morphology of the core is pointed, occurring in a variety of convergent shapes.
5. Reduction is aimed at producing pointed end-products.

These requirements as outlined by Usik et al. [19] and Hallinan et al. [5] are used as the standard against which Nubian core identifications are critically assessed in this dataset (D1.1). However, given that these criteria were only introduced after 2013, the Guichards' [18] definition and Van Peer's [70] subsequent detailed technological study are acknowledged as important earlier benchmarks for defining Nubian cores.

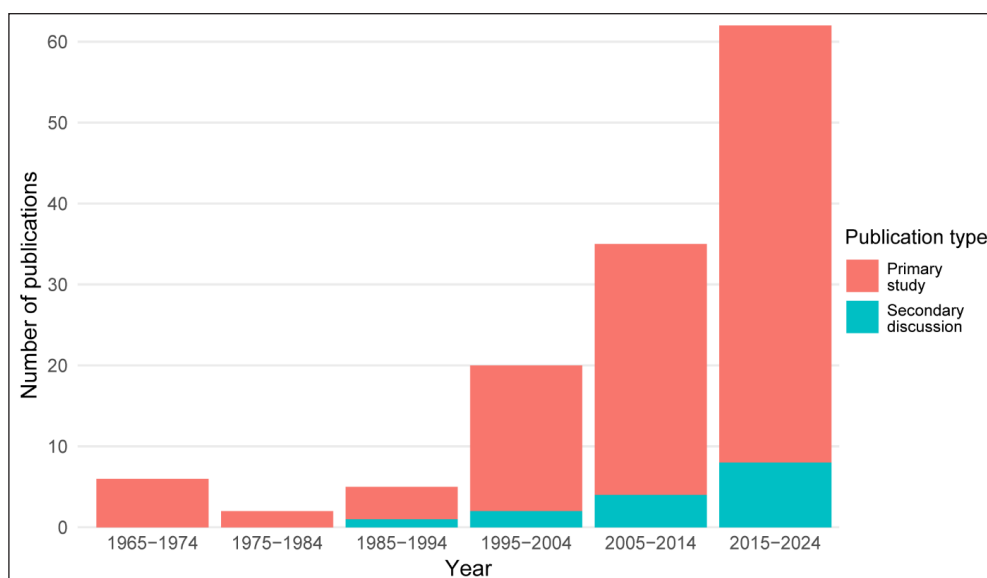


Figure 1 Publications identifying Nubian Levallois cores since 1965. Primary studies comprise analysis of lithic material; secondary studies retroactively identify Nubian cores in assemblages and/or include discussion associated with the topic.

SPATIAL DISTRIBUTION

The distribution of Nubian cores has been presented in the context of various regional studies; in the Levant [9]; Arabia [8, 62] and North-east Africa [6, 7, 71], as well as in broader-scale reviews [4, 11, 24] (D1.3). However, as the literature grows (Figure 1), the evidence available to researchers for evaluating the presence or absence of Nubian cores, in both new and old contexts, is becoming more complex and less coherent. For example, certain sites have been cited to contain Nubian cores despite the evidence in support of this assertion being unclear, as at Gorgora [8, 24, 25, 72]. Other identifications are contested in the literature, such as Bir Tarfawi [1, 2, 7, 24, 25, 73], Aduma [4, 45, 74] and Shukbah [13, 14, 15]. In the unique case of Boker Tachtit, the relationship between its Level 1 cores and Nubian technology in morphological, technological or cultural terms, has also proven a topic of extensive debate [36, 75, 76, 77, 78]. Some recent reports show a loose application (or misapplication) of the features that define Nubian cores [79, 80, 81], or conflate the technological concept of Nubian cores with the (controversial) taxonomic unit, the Nubian technocomplex [79, 82]. Lastly, in certain critical areas, such as East Africa, where Nubian cores occur sporadically but are poorly represented at an assemblage level, it is especially important to verify whether artefacts identified as Nubian cores fulfil the strictest technological and morphological criteria established elsewhere. While it is clearly impractical to expect authors to illustrate every artefact, this would be valuable supporting evidence for sites such as Mochena Borago [46, 83, 84] and Garba III [85].

The presence of Nubian cores is often invoked in arguments related to human dispersals, demographic interactions and technological capabilities. Given the issues outlined above, a systematic review and critical re-evaluation of Nubian cores in the published record is therefore a timely contribution to wider debates in human evolution. To this end, the dataset presented here identifies 154 sites in the published literature where Nubian cores have been identified – either at the time of publication, or in retrospect. For each case, the following questions were asked:

1. On what basis did the authors use the term “Nubian” to describe the artefact?
2. Which criteria were appropriate for the time? – i.e. does it pre-date the initial 1965 definition [18], technological study in the 1990s [70], or more recent attribute-based analysis [5, 19]?
3. Is clear evidence presented that allows the independent verification of the artefact as fulfilling the current strict Nubian core criteria? Specifically, this considers attribute data, detailed descriptions and illustrations. In some cases, re-examination of the material by the author was also possible.

Following this evaluation process, 24 cases are queried where they fail to meet all of the technological and morphological criteria of Nubian cores, and/or where there is insufficient supporting evidence to make an independent assessment. Four cases are noted to be contested in the literature, and a further three are rejected as having no cores that could be classified as Nubian. This underlines that, in order to move forward with research on this topic, it is essential that clear and accurate data are used to support arguments that rest on the presence of Nubian cores in an assemblage, and that future published research strives to meet these high standards.

DATASET AIMS

The database (D1) is intended to provide an accessible and user-friendly synthesis of the published literature, collating primary data (e.g. spatial data, core counts) and contextual information as published along with subsequent debate in the literature. The published information on reported Nubian cores, supported by illustrations where available (D2, D4), are openly assessed against the widely accepted definition of Nubian cores. The aim of the database is to allow researchers to consult primary details (e.g. locations, definitions, numeric inventories, methodologies and direct quotations), as well as providing comprehensive bibliographic references to studies for each site (D1.2, D3). Furthermore, it combines discussion from multiple sources for more complex or disputed cases, giving clear reasoning to explain why a Nubian core classification is queried or rejected. It also serves as supporting open documentation for forthcoming research articles, including spatial [86], demographic [87], and inter-regional assemblage comparisons.

SPATIAL COVERAGE

This dataset covers the global distribution of published identifications of Nubian Levallois cores, encompassing Africa, the Levant and Arabia, but also includes isolated cases in east and central Asia (Figure 2).

Northern boundary: +49.312549 Tolbor 4
 Southern boundary: -32.326881 Tweefontein
 Eastern boundary: +105.968611 Guanyingdong
 Western boundary: -11.419167 Arouakim

TEMPORAL COVERAGE

Many of the sites where Nubian cores occur are surface occurrences and therefore lack absolute chronology. Broadly this technology is attributed to MIS 5 in North Africa, the Levant and Arabia, and MIS 3 in East and South Africa [86], but other Nubian cores have been published associated with ages from MIS 6 [42, 53], MIS 4 [37, 39], and MIS 3 [38, 55] (see Table 1 for details).

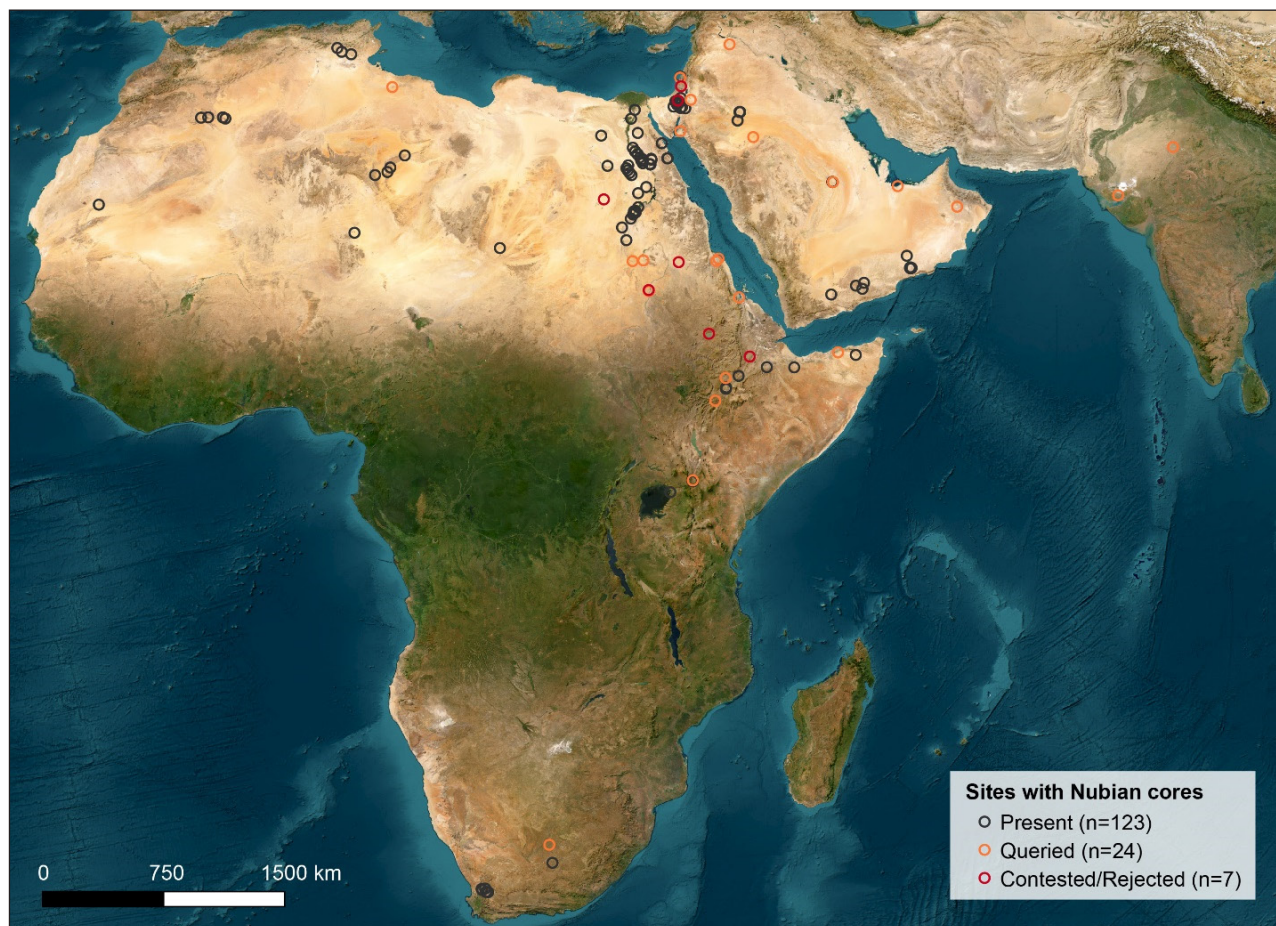


Figure 2 Map showing the distribution of sites where Nubian cores have been identified, classified as present, queried, contested or rejected in the database. Guanyingdong Cave (China, queried) and Tolbor 4 (Mongolia, queried) are beyond the boundaries of the map. Map created with the assistance of Osama Samawi using open-source QGIS software and satellite imagery.

2. METHODS

STEPS

The Nubian database was compiled by the author between 2018 and 2024, taking the following steps: (1) a comprehensive and systematic Google Scholar search for the terms “Nubian Levallois” and “Nubian core” in online academic literature, along with related terms such as “tortoise point” [16]; (2) extraction of site and lithic assemblage data from published works; (3) verification of site location using Google Earth satellite imagery; (4) critical re-evaluation of authors’ identification of Nubian technology using descriptions, attributes and illustrations, in some cases verified by primary study of the lithic material.

SAMPLING STRATEGY

Sites where the term “Nubian” or “Nubian-like” has been explicitly used to describe lithic artefacts (predominantly cores, but also end-products) were included and evaluated. In regions where Nubian cores are often identified – such as at Aterian sites in North Africa, and surface collections in the Nile Valley – early 20th century literature (predating 1965 [18]) was reviewed for illustrations or descriptions of possible Nubian cores.

Many of these sites have also been referenced in prior discussion [e.g. 1, 4, 8, 9, 88, 89, 90]. The definition of a site, in spatial or conceptual terms, is particularly complex for surface sites and varies between studies [91, 92].

Here, the appropriate spatial scale was considered on a case-by-case basis and rested largely on the resolution of published data: if separate assemblages were presented for specific localities within a broader study area (e.g. Abydos (ASPS), Dhofar (TH) sites) they were listed separately; where finds were more sporadic over a general survey area they were grouped under one record (e.g. Tokar Delta, Tankwa Karoo).

QUALITY CONTROL

Definitions of Nubian cores as applied to each assemblage are explicitly stated in the database, assessed against the appropriate definition for the time of publication, and then critiqued where these differ from the current Nubian core attribute list [5, 19]. Published illustrations were used, where possible, to confirm or query the identification of Nubian cores, with depictions in Figures and Plates provided to allow reader verification (D2, D1.4). Where cores were not illustrated and their description as Nubian is questioned, this is clearly stated in the database.

CONSTRAINTS

The review aimed to identify every published use of the technological or typological term “Nubian” to describe Middle Stone Age or Middle Palaeolithic lithics. However, this was limited to indexed, searchable and digitally-available literature. Some older publications were not available in this format; additionally, access to field reports and student dissertations was sometimes limited. While efforts were made to include publications in French (search term:

“Nubien” or “Nubienne”), the non-English-language portion of the literature may also not be fully comprehensive.

DATA STRUCTURE

The main database (**D1.1**) includes a range of data types, such as spatial coordinates, age ranges, categorical classifications, counts and text descriptions (Table 2). Where data are not available or relevant for a site record, it is left blank in the database.

COLUMN	DATA TYPE	DESCRIPTION
Site name	Text	Site name as given in the literature
Latitude, Longitude	Spatial coordinates	Decimal degrees
Accuracy	Categorical	Evaluated as 1–4 by the author
Location source	Text	Reference (Figure, description) and/or other sources
Country	Categorical	Geopolitical name
Region	Categorical	Broad regional grouping by the author
Area	Text	Descriptive
Site type	Categorical	Cave/Open-air
Context	Categorical	Surface/Excavated (in some cases, both)
Site description	Text (descriptive)	Summary/synthesis by the author based on primary and secondary literature, and in some cases the author’s own data
Climate zone	Categorical	Köppen-Geiger Climate Classification after [93], visualised in Google Earth
Age	Numeric range	Chronometric age range (ka) as provided in the literature. Details including error margins are given in Site description
Age method	Categorical	Dating method(s) used for chronometric dates (e.g. Ar-Ar, C14, ESR, OSL, TL, U-series, tephrochronology)
Age note	Text	Notes related to chronometric ages, e.g. reliability
Industry/Complex	Categorical	Taxonomic attribution where specified in the literature
Nubian present	Categorical	Evaluated as Present, Queried, Contested or Rejected by the author (see Comment for details)
Nubian total	Count	Total number of Nubian cores identified at a site
T1	Count	Type 1 Nubian cores (distal preparation) after [18, 19]
T2	Count	Type 2 Nubian cores (bilateral preparation) after [18, 19]
T1/2	Count	Type 1/2 Nubian cores (combination of distal and lateral preparation) after [19]
Centripetal Levallois	Count	Centripetally-prepared preferential unipolar Levallois cores, after [94, 95]
Other Levallois	Count	Other Levallois cores, e.g. unidirectional convergent, bidirectional, blade etc. (see Assemblage details for specific core types)
Nubian definition	Text	Quotes the specific Nubian core definition provided, literature cited, or states that no definition was given
Analytical approach	Text	Based on the published literature, only specified for detailed studies of lithic assemblages
Assemblage details	Text (descriptive)	Summary/synthesis of artefact frequencies and the assemblage context based on primary and secondary literature, with related discussion. The author’s own observations or evaluations are clearly indicated (EH)
Comment	Text	Published and the author’s own reasoning behind the evaluation of Nubian core presence as Queried, Contested or Rejected. Other observations or notes also given here
Illustration	Figure/plate number (publication year)	Illustrations of Nubian cores (photographs, figures, illustrations) in the relevant publications, also included in D2 and indexed in D1.4 .
3D scans	Author, year	Scanned by and date of data collection
References	Citation	Literature used to compile the site record (see D1.2 and D3 for full bibliographic references)
Other related references	Citation	Supplementary literature (e.g. dating, site overviews, related debate)
Record compiled	Date	Date of compilation of the site record prior to publication of the dataset
Record updated	Date	Provisions for transparency in amendments to future versions of the dataset

Table 2 Structure of the database in **D1.1**: column name, data type and description.

SITE LOCATION AND ACCURACY

Spatial coordinates (*Latitude, Longitude*) were taken directly from the literature where available and converted to decimal degrees. Where coordinate data were not provided, published maps and figures were used in conjunction with Google Earth satellite imagery to determine site locations. The quality of the location data (*Accuracy*) was classified as: 1. Accurate (precise coordinates provided or extracted from a high-resolution map or aerial image); 2. Good approximation (precise coordinates not provided but location could be determined from published maps and figures and verified on Google Earth); 3. Reasonable approximation (location determined from a low-resolution published map or figure, or description of distinctive geographic features); 4. Approximate (only a general area could be identified based on the available information) (Table 3). Sites in accuracy categories 1 and 2 are suitable for high-resolution spatial analysis (landscape- or local-scale) but those in 3 and 4 are only sufficient for larger-scale regional analysis. The data source for the location and reasoning behind its accuracy classification are indicated (*Location source*). The present-day geopolitical location (*Country*) is identified, together with broader regional grouping (*Region*), and, in some cases, a specific geographic location (*Area*).

SITE DETAILS

The type of site (*Site type*) was described as ‘Open-air’ or ‘CaveRS’, the latter encompassing both caves and

LOCATION ACCURACY	N SITES	SPATIAL RESOLUTION
1 (Accurate)	54	High
2 (Good approximation)	57	High
3 (Reasonable approximation)	17	Low
4 (Approximate)	26	Low

Table 3 Site location accuracy and suitability for use in spatial analyses.

REGION	OPEN-AIR	CaveRS	SURFACE	EXCAVATED	DATED
NW-Central Sahara	14	1	12	4	0
NE Sahara/Nile Valley	60	1	45	18	14
East Africa	14	4	9	9	6
Levant	15	3	12	7	6
Arabia	31	0	31	2	2
Central/East Asia	3	1	1	3	3
South Africa	5	2	3	4	2
TOTAL	142	12	113	47	33

Table 4 Site type, context and dating. Where sites are represented by both surface collections and excavated material, it is counted in both categories.

rockshelters to overcome any regional differences in terminology. The context (*Context*) of the material recovered was classified as surface and/or excavated (Table 4). A summary (*Site description*) describing the location of the site, its context, sampling methodology and (where possible) geomorphology and chronometric ages, with appropriate references and direct quotations from the literature. The Köppen-Geiger climate classification for site locations places them in their present-day environmental context (*Climate zone*), after [93]. Analysis and interpretation of the dataset in palaeoclimatic context is presented in Samawi and Hallinan [86].

AGE AND INDUSTRY

Many sites with Nubian cores are surface occurrences and are therefore undated, but where chronometric ages are available (*Age*) information about the dating technique (*Age method*) and any notes or concerns regarding the reliability of the data are provided (*Age notes*). The cultural association (*Industry/Complex*) of Nubian technology is available for some sites, presented according to the terminology used in the relevant published literature.

TECHNOLOGICAL DATA

Given the available descriptions, illustrations and attribute data, the presence of Nubian cores was assessed against the published definition agreed upon by researchers working in a variety of regions [5, 19]. Nubian cores that fulfil the established criteria are accepted as ‘Present’, those that are queried pending further data are classified as ‘Queried’ (highlighted in orange text), those that have had their identification disputed in the literature are classified as ‘Contested’ (highlighted in red text), and those that have no evidence indicating Nubian cores are ‘Rejected’ (highlighted in dark red text) (Table 5). The specific reasoning behind querying or rejecting Nubian core identifications is detailed, including any relevant debate in the literature (*Comment*). These comments also note any other observations or discrepancies.

REGION	PRESENT	QUERIED	CONTESTED	REJECTED	TOTAL
NW-Central Sahara	14	1	0	0	15
NE Sahara/Nile Valley	55	3	1	2	61
East Africa	9	7	1	1	18
Levant	13	3	2	0	18
Arabia	26	5	0	0	31
Central/East Asia	0	4	0	0	4
South Africa	6	1	0	0	7
TOTAL	123	24	4	3	154

Table 5 Nubian core identifications that are accepted as present, queried, contested or rejected.

The frequencies of Nubian cores are given where available, also detailing whether these are Type 1 (distal preparation), Type 2 (bilateral preparation) and Type 1/2 (a combination of distal and lateral preparation) (*Nubian total*, *T1*, *T2*, *T1/2*). While it has been recommended that future studies of Nubian cores move beyond typological classification of cores, rather focusing on full technological descriptions of the reduction strategy [5], the type names according to the Guichard and Guichard [18] definitions are widely applied in the literature. The frequencies of cores using other Levallois strategies are also included where possible (*Centripetal Levallois*, *Other Levallois*). The definition of Nubian cores and analytical method applied in the lithic study (*Nubian definition*, *Analytical approach*) are given according to the literature.

Full descriptions of cores and their assemblage context are synthesised from the published literature, including direct quotation where appropriate (*Assemblage details*). Any interpretations, reassessment or critique by the database author, rather than in the works cited, are clearly indicated (EH). Translations of text from French were obtained from the open-source online translation tool DeepL.

DATA SOURCES

Published illustrations, photographs or diagrams (*Illustration*) used to verify the identification of Nubian cores (**D1.4** and **D2**), and the primary (*References*) and secondary literature (*Other related references*) consulted in the creation of the dataset are provided, given in full in **D1.2** and **D3**. Additionally, whether artefacts have been 3D scanned is noted (*3D scans*), with the intention that these data will be made openly available upon completion of future publications. The date of compilation of the site record is indicated (*Record compiled*) with provision for subsequent updates to the dataset (*Record updated*). The author welcomes submissions of corrections or additions for future versions to the database which will be reviewed and updated periodically.

3. DATASET DESCRIPTION

OBJECT NAME

D1. Nubian database

D1.1 Site records

D1.2 References

D1.3 Other reviews

D1.4 Index of illustrations

D2. Nubian core illustrations (jpegs of figures and plates (referred to in D1.1 “Illustrations” column and listed in D1.4 “Index of illustrations”) sorted into folders by region)

D3. Nubian database references.

DATA TYPE

Secondary data from previously published literature.

FORMAT NAMES AND VERSIONS

.xlsx, .jpg, .pdf

CREATION DATES

Systematic compilation of the dataset commenced in 2018, with updates in 2020, 2022 and 2023, culminating in its current version (v2) in August 2024.

DATASET CREATORS

Emily Hallinan created the dataset. All published literature and references to associated relevant publications and theses are referenced in dataset **D1.2** and **D3**. Alice Leplongeon made the author aware of and provided digitised sources of some North African literature in French. Site primary locations, details and discussion of certain assemblages were provided by Mae Goder-Goldberger, Maya Oron and Jeffrey Rose.

LANGUAGE

English

LICENSE

CC-By Attribution 4.0 International

REPOSITORY LOCATION

Open Science Framework: Nubian Database (JOAD, Hallinan 2024)

DOI [10.17605/OSF.IO/78YHZ](https://doi.org/10.17605/OSF.IO/78YHZ)

PUBLICATION DATE

23/06/2024 (v1), 02/08/2024 (v2)

4. REUSE POTENTIAL

This dataset presents a comprehensive literature search of sites where Nubian cores have been recognised, giving assemblage context, details and critical evaluation of these identifications. The references and discussion offer a historical perspective on the development of research related to Nubian technology, and how standards for defining Nubian cores have evolved from early descriptions to the current strict criteria [5, 19]. Overall, this synthesis offers a foundation for scholars studying Nubian Levallois technology to appropriately contextualise their work within a complicated debate. While the interoperability of assemblage data as presented in many publications limit quantitative analysis at very broad scales, core frequencies permit some local and regional scale comparative analyses. The accuracy of site locations are clearly indicated, allowing for spatial analyses at appropriate scales of resolution [86]. A key goal is that by highlighting the need for high-quality, well-defined and illustrated data on Nubian core assemblages, future research will provide robust evidence for understanding the role of this distinctive, yet controversial, technology in key narratives in human prehistory.

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COMPETING INTERESTS

The author has no competing interests to declare.

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REFERENCES

1. **Van Peer P.** The Nile Corridor and the Out-of-Africa model: an examination of the archaeological record. *Current Anthropology*. 1998; S115–S140. DOI: <https://doi.org/10.1086/204692>
2. **Schild R.** Comment on ‘The Nile Corridor and the Out of Africa Model’ by P. Van Peer. *Current Anthropology*. 1998; 39: S134–S135. DOI: <https://doi.org/10.1086/204692>
3. **Kleindienst MR.** On the Nile Corridor and the Out-of-Africa Model. *Current Anthropology*. 2000; 41: 107–109. DOI: <https://doi.org/10.1086/300108>
4. **Groucutt HS.** Culture and convergence: the curious case of the Nubian Complex. In Groucutt HS, editor. *Culture History and Convergent Evolution*. Springer; 2020. 55–86. DOI: https://doi.org/10.1007/978-3-030-46126-3_4
5. **Hallinan E, Barzilai O, Beshkani A, Cascalheira J, Demidenko YE, Goder-Goldberger M, Hilbert YH, Hovers E, Marks AE, Nymark A, Olszewski DI, Oron M, Rose JI, Shaw M, Usik VI.** The nature of Nubian: Developing current global perspectives on Nubian Levallois technology and the Nubian complex. *Evolutionary Anthropology: Issues, News, and Reviews*. 2022; 31(5): 227–232. DOI: <https://doi.org/10.1002/evan.21958>
6. **Hallinan E, Marks AE.** The complex taxonomy of ‘Nubian’ in context. *Journal of Paleolithic Archaeology*. 2023; 6(1): 23. DOI: <https://doi.org/10.1007/s41982-023-00151-1>
7. **Van Peer P, Vermeersch PM.** The Nubian complex and dispersal of modern humans in North Africa. In: Krzyzaniak L, Kroeper K, Kobusiewicz M, editors. *Recent Research into the Stone Age of Northeastern Africa*. Poznań Archaeological Museum; 2000. 47–60.
8. **Rose JI, Usik VI, Marks AE, Hilbert YH, Galletti CS, Parton A, Geiling JM, Černý V, Morley MW, Roberts RG.** The Nubian Complex of Dhofar, Oman: an African Middle Stone Age industry in southern Arabia. *PLoS ONE*. 2011; 6(11): e28239. DOI: <https://doi.org/10.1371/journal.pone.0028239>
9. **Goder-Goldberger M, Gubenko N, Hovers E.** “Diffusion with modifications”: Nubian assemblages in the central Negev highlands of Israel and their implications for Middle Paleolithic inter-regional interactions. *Quaternary International*. 2016; 408(B): 121–139. DOI: <https://doi.org/10.1016/j.quaint.2016.02.008>

10. **Will M, Mackay A, Phillips N.** Implications of Nubian-Like core reduction systems in southern Africa for the identification of early modern human dispersals. *PLoS ONE*. 2015; 10(6): e0131824. DOI: <https://doi.org/10.1371/journal.pone.0131824>
11. **Hallinan E, Shaw M.** Nubian Levallois reduction strategies in the Tankwa Karoo, South Africa. *PLOS ONE*. 2020; 15(10): e0241068. DOI: <https://doi.org/10.1371/journal.pone.0241068>
12. **Vermeersch PM, Paulissen E, Van Peer P, Stokes S, Charlier C, Stringer C, Lindsay W.** A Middle Palaeolithic burial of a modern human at Taramsa Hill, Egypt. *Antiquity*. 1998; 72(277): 475–484. DOI: <https://doi.org/10.1017/s0003598x00086919>
13. **Blinkhorn J, Zanolli C, Compton T, Groucutt HS, Scerri EML, Crété L, Stringer C, Petraglia MD, Blockley S.** Nubian Levallois technology associated with southernmost Neanderthals. *Scientific Reports*. 2021; 11(1): 2869. DOI: <https://doi.org/10.1038/s41598-021-82257-6>
14. **Hallinan E, Barzilai O, Bicho N, Cascalheira J, Demidenko Y, Goder-Goldberger M, Hovers E, Marks A, Oron M, Rose J.** No direct evidence for the presence of Nubian Levallois technology and its association with Neanderthals at Shukbah Cave. *Scientific Reports*. 2022; 12(1): 1204. DOI: <https://doi.org/10.1038/s41598-022-05072-7>
15. **Blinkhorn, J, Zanolli, C, Compton, T, Groucutt HS, Scerri EM, Crete L, Stringer C, Petraglia MD, Blockley S.** Reply to: 'No direct evidence for the presence of Nubian Levallois technology and its association with Neanderthals at Shukbah Cave.' *Scientific Reports*. 2022; 12(1): 1208. DOI: <https://doi.org/10.1038/s41598-022-05049-6>
16. **Seligman CG.** The older Palaeolithic age in Egypt. *Journal of the Royal Anthropological Institute of Great Britain and Ireland*. 1921; 51: 115–153. DOI: <https://doi.org/10.2307/2843518>
17. **Vignard E.** Stations paléolithiques de la carrière d'Abou-el-Nour, près de Nag-Hamadi (Haute-Egypte). *Bulletin de l'Institut Français d'Archéologie Orientale*. 1922; 20: 89–109. DOI: <https://doi.org/10.3406/bifao.1922.1785>
18. **Guichard J, Guichard G.** The Early and Middle Palaeolithic of Nubia: Preliminary results. In Wendorf F, editor. *Contributions to the prehistory of Nubia*. Southern Methodist University Press; 1965. 57–116.
19. **Usik VI, Rose JI, Hilbert YH, Van Peer P, Marks AE.** Nubian Complex reduction strategies in Dhofar, southern Oman. *Quaternary International*. 2013; 300: 244–266. DOI: <https://doi.org/10.1016/j.quaint.2012.08.2111>
20. **Groucutt HS, Rose JI.** Standardization of Nubian Levallois technology in Dhofar, southern Arabia. *Lithic Technology*. 2023; 48(4): 422–436. DOI: <https://doi.org/10.1080/01977261.2023.2211878>
21. **Oron M, Hovers E, Porat N, Roskin J, Abulafia T.** Nubian Levallois technology during MIS 5: refitted lithic sequences and OSL ages of Dimona South, Israel, and their broader implications. *Journal of Paleolithic Archaeology*. 2024; 7(1): 4. DOI: <https://doi.org/10.1007/s41982-024-00170-6>
22. **Groucutt HS, Shipton C, Alsharekh A, Jennings RP, Scerri EML, Petraglia MD.** Late Pleistocene lakeshore settlement in northern Arabia: Middle Palaeolithic technology from Jebel Katefeh, Jubbah. *Quaternary International*. 2015; 382: 215–236. DOI: <https://doi.org/10.1016/j.quaint.2014.12.001>
23. **Groucutt HS, Scerri EML, Stringer C, Petraglia MD.** Skhul lithic technology and the dispersal of Homo sapiens into Southwest Asia. *Quaternary International*. 2019; 515: 30–52. DOI: <https://doi.org/10.1016/j.quaint.2017.12.027>
24. **Van Peer P.** Technological systems, population dynamics, and historical process in the MSA of northern Africa. In: Jones SC, Stewart BA, editors. *Africa from MIS 6–2: Population Dynamics and Palaeoenvironments*. Springer; 2016. 147–159. DOI: https://doi.org/10.1007/978-94-017-7520-5_8
25. **Van Peer P, Vermeersch PM.** The place of northeast Africa in the early history humans: new data and interpretations on the Middle Stone Age. In: Mellars PA, Boyle K, Bar-Yosef O, Stringer C, editors. *Rethinking the Human Revolution: New behavioural and biological perspectives on the origin and dispersal of modern humans*. McDonald Institute for Archaeological Research; 2007. 187–198.
26. **Riede F.** Steps towards operationalising an evolutionary archaeological definition of culture. In: Roberts B, Vander Linden M, editors. *Investigating Archaeological Cultures*. Springer; 2011. DOI: https://doi.org/10.1007/978-1-4419-6970-5_13
27. **Martini M, Sibilia E, Zelaschi C, Troja SO, Forzese R, Gueli AM, Cro A, Foti F.** TL and OSL dating of fossil dune sand in the Uan Afuda and Uan Tabu rockshelters, Tadrart Acacus (Libyan Sahara). In: Cremaschi M, Di Lernia S, editors. *Wadi Teshuinat – Palaeoenvironment and Prehistory in south-western Fezzan (Libyan Sahara)*. All'Insegna del Giglio; 1998. 67–72.
28. **Kleindienst MR, Schwarcz HP, Nicoll KA, Churcher CS, Frizano J, Giegengack R, Wiseman MF.** Water in the Desert: First report on uranium series dating of Caton-Thompson's and Gardner's 'classic' Pleistocene sequence at Refuf Pass, Kharga Oasis. In Wiseman MF, editor. *The Oasis Papers 2: Proceedings of the Second International Conference of the Dakhleh Oasis Project*. Oxbow Books; 2008. 25–54.
29. **Van Peer P, Fullagar R, Stokes S, Bailey RM, Moeyersons J, Steenhoudt F, Geerts A, Vanderbeken T, Dapper MD, Geus F.** The Early to Middle Stone Age transition and the emergence of modern human behaviour at site 8-B-11, Sai Island, Sudan. *Journal of Human Evolution*. 2003; 45(2): 187–193. DOI: [https://doi.org/10.1016/s0047-2484\(03\)00103-9](https://doi.org/10.1016/s0047-2484(03)00103-9)
30. **Mercier N, Valladas H, Froget L, Joron JL, Vermeersch PM, Van Peer P, Moeyersons J.** Thermoluminescence dating of a Middle Palaeolithic occupation at Sodmein Cave, Red Sea Mountains (Egypt). *Journal of Archaeological Science*. 1999; 26(11): 1339–1345. DOI: <https://doi.org/10.1006/jasc.1998.0369>
31. **Schmidt C, Kindermann K, Van Peer P, Bubbenzer O.** Multi-emission luminescence dating of heated chert from the Middle Stone Age sequence at Sodmein Cave (Red Sea Mountains, Egypt). *Journal of Archaeological Science*. 2015; 63: 94–103. DOI: <https://doi.org/10.1016/j.jas.2015.08.016>

32. **Nicoll K.** A revised chronology for Pleistocene paleolakes and Middle Stone Age – Middle Paleolithic cultural activity at Bîr Tîrfawi – Bîr Sahara in the Egyptian Sahara. *Quaternary International*. 2018; 463(Part A): 18–28. DOI: <https://doi.org/10.1016/j.quaint.2016.08.037>
33. **Smith JR, Hawkins AL, Asmerom Y, Polyak V, Giegengack R.** New age constraints on the Middle Stone Age occupations of Kharga Oasis, Western Desert, Egypt. *Journal of Human Evolution*. 2007; 52(6): 690–701. DOI: <https://doi.org/10.1016/j.jhevol.2007.01.004>
34. **Van Peer P, Vermeersch PM, Paulissen E.** *Chert Quarrying, Lithic Technology, and a Modern Human Burial at the Palaeolithic Site of Taramsa 1, Upper Egypt*. Leuven University Press; 2010.
35. **Marks AE.** The Khormusan: an Upper Pleistocene industry in Nubia. In Wendorf F, editor. *The prehistory of Nubia, Volume 1*. Fort Burgwin Research Center and Southern Methodist University Press. 1968; 315–391.
36. **Rose JI, Marks AE.** “Out of Arabia” and the Middle–Upper Palaeolithic transition in the southern Levant. *Quartär*. 2014; 61: 49–85. DOI: https://doi.org/10.7485/qu61_03
37. **Masoć M, Kusiak J, Standzikowski K, Paner H, Kuc M, Parafiniuk M, Szmit M.** OSL/IRSL estimation for Nubian Complex Middle Stone Age settlement from Bayuda Desert in Sudan. *Journal of Archaeological Science: Reports*. 2017; 16: 391–396. DOI: <https://doi.org/10.1016/j.jasrep.2017.10.026>
38. **Osypiński P, Osypińska M.** Optimal adjustment or cultural backwardness? New data on the latest Levallois industries in the Nile Valley. *Quaternary International*. 2016; 408(Part B): 90–105. DOI: <https://doi.org/10.1016/j.quaint.2015.09.033>
39. **Osypiński P, Burrough S, Skinner A, Standzikowski K.** Re-examining the age of the Affad MSA deposits in the Middle Nile Valley. *Archaeometry*. 2021; 63(6): 1405–1420. DOI: <https://doi.org/10.1111/arc.12670>
40. **Morgan LE, Renne PR.** Diachronous dawn of Africa’s Middle Stone Age: New 40 Ar/39 Ar ages from the Ethiopian Rift. *Geology*. 2008; 36(12): 967–970. DOI: <https://doi.org/10.1130/G25213A.1>
41. **Brown FH, McDougall I, Fleagle JG.** Correlation of the KHS Tuff of the Kibish Formation to volcanic ash layers at other sites, and the age of early Homo sapiens (Omo I and Omo II). *Journal of Human Evolution*. 2012; 63(4): 577–585. DOI: <https://doi.org/10.1016/j.jhevol.2012.05.014>
42. **Douze K, Delagnes A.** The pattern of emergence of a Middle Stone Age tradition at Gademotta and Kulkuletti (Ethiopia) through convergent tool and point technologies. *Journal of Human Evolution*. 2016; 91: 93–121. DOI: <https://doi.org/10.1016/j.jhevol.2015.11.006>
43. **Beverly EJ, Driese SG, Peppe DJ, Johnson CR, Michel LA, Faith JT, Tryon CA, Sharp WD.** Recurrent spring-fed rivers in a Middle to Late Pleistocene semi-arid grassland: Implications for environments of early humans in the Lake Victoria Basin, Kenya. *Sedimentology*. 2015; 62(6): 1611–1635. DOI: <https://doi.org/10.1111/sed.12199>
44. **Blegen N, Jicha BR, McBrearty S.** A new tephrochronology for early diverse stone tool technologies and long-distance raw material transport in the Middle to Late Pleistocene Kapthurin Formation, East Africa. *Journal of Human Evolution*. 2018; 121: 75–103. DOI: <https://doi.org/10.1016/j.jhevol.2018.03.005>
45. **Yellen J, Brooks A, Helgren DM, Ambrose SH, Bonnefille R, Feathers JK, Goodfriend G, Ludwig KR, Renne P, Stewart KM.** The archaeology of Aduma Middle Stone Age sites in the Awash Valley, Ethiopia. *PaleoAnthropology*. 2005; 25–100.
46. **Brandt S, Hildebrand E, Vogelsang R, Wolfhagen J, Wang H.** A new MIS 3 radiocarbon chronology for Mochena Borago Rockshelter, SW Ethiopia: Implications for the interpretation of Late Pleistocene chronostratigraphy and human behavior. *Journal of Archaeological Science: Reports*. 2017; 11: 352–369. DOI: <https://doi.org/10.1016/j.jasrep.2016.09.013>
47. **Brandt SA.** The Upper Pleistocene and Early Holocene prehistory of the Horn of Africa. *African Archaeological Review*. 1986; 4: 41–82. DOI: <https://doi.org/10.1007/BF01117035>
48. **Tryon CA, Peppe DJ, Faith JT, Plantinga AV, Nightingale S, Ogondo J, Fox DL.** Late Pleistocene artefacts and fauna from Rusinga and Mfangano islands, Lake Victoria, Kenya. *Azania: Archaeological Research in Africa*. 2012; 47(1): 14–38. DOI: <https://doi.org/10.1080/0067270x.2011.647946>
49. **Avni Y, Oron M, Cohen-Sasson E, Porat N, Barzilai O.** Chrono-sequences of alluvial terraces and fossilized water bodies as a predictive model for detecting Lower and Middle Palaeolithic sites in the Negev desert, Israel. *Quaternary Science Reviews*. 2021; 268: 107114. DOI: <https://doi.org/10.1016/j.quascirev.2021.107114>
50. **Clark GA, Schuldenrein J, Donaldson ML, Schwarcz HP, Rink WJ, Fish SK.** Chronostratigraphic contexts of Middle Paleolithic horizons in the ‘Ain Difla Rockshelter (WHS 634), West-Central Jordan. In: Gebel HGK, Kafafi ZGO, Rollefson GO, editors. *The Prehistory of Jordan II: Perspectives from 1997 Ex oriente*; 1997. 77–100.
51. **Grün R, Stringer C, McDermott F, Nathan R, Porat N, Robertson S, Taylor L, Mortimer G, Eggins S, McCulloch M.** U-series and ESR analyses of bone and teeth relating to the human burials from Skhul. *Journal of Human Evolution*. 2005; 49: 316–334. DOI: <https://doi.org/10.1016/j.jhevol.2005.04.006>
52. **Boaretto E, Hernandez M, Goder-Goldberger M, Aldeias V, Regev L, Caracuta V, McPherron SP, Hublin JJ, Weiner S, Barzilai O.** The absolute chronology of Boker Tachtit (Israel) and implications for the Middle to Upper Paleolithic transition in the Levant. *Proceedings of the National Academy of Sciences*. 2021; 118(25): e2014657118. DOI: <https://doi.org/10.1073/pnas.2014657118>
53. **Crassard R, Hilbert YH, Preusser F, Wulf G, Schiettecatte J.** Middle Palaeolithic occupations in central Saudi Arabia during MIS 5 and MIS 7: new insights on the origins of the peopling of Arabia. *Archaeological and Anthropological Sciences*. 2019; 11(7): 3101–3120. DOI: <https://doi.org/10.1007/s12520-018-0743-2>

54. **Hu Y, Marwick B, Zhang JF, Rui X, Hou YM, Yue JP, Chen WR, Huang WW, Li B.** Late Middle Pleistocene Levallois stone-tool technology in southwest China. *Nature*. 2019; 565(7737): 82–85. DOI: <https://doi.org/10.1038/s41586-018-0710-1>
55. **Blinkhorn J, Achyuthan H, Petraglia MD, Ditchfield PW.** Middle Palaeolithic occupation in the Thar Desert during the Upper Pleistocene: the signature of a modern human exit out of Africa? *Quaternary Science Reviews*. 2013; 77: 233–238. DOI: <https://doi.org/10.1016/j.quascirev.2013.06.012>
56. **Rybin EP, Khatsenovich AM.** Middle and Upper Paleolithic Levallois technology in eastern Central Asia. *Quaternary International*. 2020; 535, 117–138. DOI: <https://doi.org/10.1016/j.quaint.2018.10.042>
57. **Mackay A, Saktura RBK, O'Driscoll CA, Boyd KC, Marwick B, Moffat I, Jacobs Z.** The Middle Stone Age sequence at Klipfonteinrand 1 (KFR1), Western Cape, South Africa. *Journal of Paleolithic Archaeology*. 2023; 6(1), 20. DOI: <https://doi.org/10.1007/s41982-023-00147-x>
58. **Will M, Jacobs Z, Mackay A.** No one home? New evidence for MIS 3 occupations in the Western Cape (South Africa) from Mertenhof Rock Shelter. *Preprint*; 2024. DOI: <https://doi.org/10.21203/rs.3.rs-4181946/v1>
59. **Osborne AH, Vance D, Rohling EJ, Barton N, Rogerson M, Fello N.** A humid corridor across the Sahara for the migration of early modern humans out of Africa 120,000 years ago. *Proceedings of the National Academy of Sciences*. 2008; 105(43): 16444–16447. DOI: <https://doi.org/10.1073/pnas.0804472105>
60. **Drake NA, Blench R, Armitage SJ, Bristow CS, White KH.** Ancient watercourses and biogeography of the Sahara explain the peopling of the desert. *Proceedings of the National Academy of Sciences*. 2011; 108(2): 458–462. DOI: <https://doi.org/10.1073/pnas.1012231108>
61. **Rosenberg TM, Preusser F, Fleitmann D, Schwab A, Penkman K, Schmid TW, Al-Shanti MA, Kadi K, Matter A.** Humid periods in southern Arabia: Windows of opportunity for modern human dispersal. *Geology*. 2011; 39(12): 1115–1118. DOI: <https://doi.org/10.1130/G32281.1>
62. **Crassard R, Hilbert YH.** A Nubian Complex site from central Arabia: Implications for Levallois taxonomy and human dispersals during the Upper Pleistocene. *PLoS ONE*. 2013; 8(7): e69221. DOI: <https://doi.org/10.1371/journal.pone.0069221>
63. **Chiotti L, Dibble HL, Olszewski DI, McPherron SP, Schurmans UA.** Middle Palaeolithic lithic technology from the Western High Desert of Egypt. *Journal of Field Archaeology*. 2009; 34(3): 307–318. DOI: <https://doi.org/10.1179/009346909791070862>
64. **Munday FC.** Intrasite variability in the Mousterian occupation of the Avdat/Aqev area. In Marks AE, editor. *Prehistory and paleoenvironments of the Central Negev, Israel. Volume 1, The Avdat/Aqev Area, Part 1*. Southern Methodist University Press; 1976. 113–140.
65. **Crassard R, Thiébaud C.** Levallois points production from eastern Yemen and some comparisons with assemblages from East-Africa, Europe and the Levant. In Tensorer JM, editor. *The Lower and Middle Palaeolithic in the Middle East and neighbouring regions*. Université de Liège; 2011. 131–142.
66. **Hérisson D, Soriano S.** A view of the Lower to Middle Paleolithic boundary from Northern France, far from the Near East? *Journal of Human Evolution*. 2020; 145: 102814. DOI: <https://doi.org/10.1016/j.jhevol.2020.102814>
67. **Locht JL, Antoine P, Hérisson D, Gadebois G, Debenham N.** Une occupation de la phase ancienne du Paléolithique moyen à Therdonne (Oise). *Chronostratigraphie, production de pointes Levallois et réduction des nucléus. Gallia Préhistoire*. 2010; 52: 1–32. DOI: <https://doi.org/10.3406/galip.2010.2469>
68. **Volkman PW.** *Boker Tachtit: The technological shift from the Middle to the Upper Paleolithic in the Central Negev, Israel*. PhD thesis, Southern Methodist University; 1989.
69. **Bonilauri S, Beshkani A, Pagli M, Böeda E.** Production and structural tendency of Levallois points in the late Middle Palaeolithic of the Near East steppe zones and Arabia. *Paléorient*. 2023; 49(1): 109–131. DOI: <https://doi.org/10.4000/paleorient.3119>
70. **Van Peer P.** *The Levallois Reduction Strategy*. Prehistory Press; 1992.
71. **Beyin A.** A surface Middle Stone Age assemblage from the Red Sea coast of Eritrea: implications for Upper Pleistocene human dispersals out of Africa. *Quaternary International*. 2013; 300: 195–212. DOI: <https://doi.org/10.1016/j.quaint.2013.02.015>
72. **Sahle Y, Firew GA, Pearson OM, Stynder DD, Beyin A.** MIS 3 innovative behavior and highland occupation during a stable wet episode in the Lake Tana paleoclimate record, Ethiopia. *Scientific Reports*. 2024; 14: 17038. DOI: <https://doi.org/10.1038/s41598-024-67743-x>
73. **Wendorf F, Schild R, Close AE.** *Egypt During the Last Interglacial, The Middle Paleolithic of Bir Tarfawi and Bir Sahara East*. Springer; 1993. DOI: <https://doi.org/10.1007/978-1-4615-2908-8>
74. **Goder-Goldberger M.** *Lithic variability along the Middle Paleolithic dispersal routes of modern humans “Out of Africa.”* PhD thesis. Hebrew University of Jerusalem; 2014.
75. **Clark JD.** The Middle Stone Age of East Africa and the beginnings of regional identity. *Journal of World Prehistory*. 1988; 2(3): 235–305. DOI: <https://doi.org/10.1007/BF00975618>
76. **Demidenko YE, Usik VI.** The problem of changes in Levallois technique during the technological transition from the Middle to Upper Palaeolithic. *Paléorient*. 1993; 19(2): 5–15. DOI: <https://doi.org/10.3406/paleo.1993.4593>
77. **Belfer-Cohen A, Goring-Morris AN.** The shift from the Middle Palaeolithic to the Upper Palaeolithic: Levantine perspectives. In: Camps M, Szmidt C, editors. *The Mediterranean from 50,000 to 25,000 BP: Turning points and new directions*. Oxbow Books; 2009. 89–100.
78. **Hilbert YH, Crassard R, Rose JI, Geiling JM, Usik VI.** Technological homogeneity within the Arabian Nubian Complex: Comparing chert and quartzite assemblages from central and southern Arabia. *Journal of Lithic Studies*. 2016; 3(2): 1–27. DOI: <https://doi.org/10.2218/jls.v3i2.1420>

79. **Masoć M, Nassr A, Kim JY, Krupa-Kurzynowska J, Sohn YK, Szmit M, Kim JC, Kim JS, Choi HW, Wieczorek M, Timmermann A.** Saharan green corridors and Middle Pleistocene hominin dispersals across the Eastern Desert, Sudan. *Journal of Human Evolution*. 2019; 130: 141–150. DOI: <https://doi.org/10.1016/j.jhevol.2019.01.004>
80. **Ehlert M, Kim JY, Sohn YK, Cendrowska M, Krupa-Kurzynowska J, Andrieux E, Armitage SJ, Michalec G, Dreczko E, Alkhidir HM, Szmit M, Masoć M.** The Middle Stone Age in the Eastern Desert. EDAR 135 — a buried early MIS 5 horizon from Sudan. *Azania: Archaeological Research in Africa*. 2022; 57(2): 155–196. <https://doi.org/10.1080/0067270x.2022.2078561>
81. **Demidenko YE, Le Tensorer JM, von Falkenstein-Wirth V.** The Nubian Levallois technology in central Syria in the context of the Middle-Upper Palaeolithic transitional period and the IUP variability in the Eastern Mediterranean Levant. *Litikum – Journal of the Lithic Research Roundtable*. 2023; 11: 9–34. DOI: <https://doi.org/10.23898/litikuma0035>
82. **Beshkani A, Beuzen-Waller T, Bonilauri S, Gernez G.** The first evidence of Middle Palaeolithic Nubian technology in north-central Oman. *Antiquity Project Gallery*. 2017; 91(356): 1–5. DOI: <https://doi.org/10.15184/aqy.2017.4>
83. **Brandt SA, Fisher EC, Hildebrand EA, Vogelsang R, Ambrose SH, Lesur J, Wang H.** Early MIS 3 occupation of Mochena Borago Rockshelter, Southwest Ethiopian Highlands: Implications for Late Pleistocene archaeology, paleoenvironments and modern human dispersals. *Quaternary International*. 2012; 274: 38–54. DOI: <https://doi.org/10.1016/j.quaint.2012.03.047>
84. **Brandt S, Hildebrand E, Vogelsang R, Fisher EC, Kelsey B, Lanzarone P, Parow-Souchon H, Smith BD, Taffere AM, Lesur J, Bermensolo K.** Mochena Borago Rockshelter, Ethiopia. In: Beyin A, Wright DK, Wilkins J, Olszewski DI, editors. *Handbook of Pleistocene Archaeology of Africa*. Springer; 2023. 461–482. DOI: https://doi.org/10.1007/978-3-031-20290-2_28
85. **Mussi M, Altamura F, Macchiarelli R, Melis RT, Spinapolic EE.** Garba III (Melka Kunture, Ethiopia): a MSA site with archaic Homo sapiens remains revisited. *Quaternary International*. 2016; 343: 28–39. DOI: <https://doi.org/10.1016/j.quaint.2013.08.028>
86. **Samawi O, Hallinan E.** More than surface finds: Nubian Levallois core metric variability and site distribution across Africa and Southwest Asia. *Journal of Paleolithic Archaeology*. 2024. DOI: <https://doi.org/10.1007/s41982-024-00192-0>
87. **Goder-Goldberger M, Hallinan E.** Nubian Levallois cores and their place in modeling past human interactions. *Journal of Paleolithic Archaeology*; In preparation.
88. **Scerri EML.** *The Aterian and its place in the North African Middle Stone Age*. PhD thesis, University of Southampton; 2013. DOI: <https://doi.org/10.1016/j.quaint.2012.09.008>
89. **Leplongeon A.** 2022. Le peuplement Paléolithique de l’Afrique du Nord-Est dans son contexte mac-rorégional. *L’Anthropologie*. 2022; 126(2): 103015. DOI: <https://doi.org/10.1016/j.anthro.2022.103015>
90. **Leplongeon A.** Influences du modèle européen de préhistoire en Égypte au début du XXe siècle: Les travaux du Père Paul Bovier-Lapierre S. J. (1873–1950) et d’Edmond Vignard (1885–1969). *Oragnon*. 2022; 54: 65–101. DOI: <https://doi.org/10.4467/00786500.ORG.22.004.16954>
91. **Foley RA.** *Off-site Archaeology and Human Adaptation in Eastern Africa*. British Archaeological Reports International Series 97; 1981.
92. **Hallinan E.** “A survey of surveys” revisited: current approaches to landscape and surface archaeology in southern Africa. *African Archaeological Review*. 2022; 39(1): 79–111. DOI: <https://doi.org/10.1007/s10437-021-09469-z>
93. **Rubel F, Brugger K, Haslinger K, Auer I.** The climate of the European Alps: Shift of very high resolution Köppen-Geiger climate zones 1800–2100. *Meteorologische Zeitschrift*. 2017; 26(2): 115–125. DOI: <https://doi.org/10.1127/metz/2016/0816>
94. **Bordes F.** Le débitage Levallois et ses variantes. *Bulletin de La Société Préhistorique Française*. 1980; 77(2): 45–49. DOI: <https://doi.org/10.3406/bspf.1980.5242>
95. **Boëda E.** Le concept Levallois et évaluation de son champ d’application. In Otte M, editor. *L’Homme de Néandertal, Vol. 4: La technique*. University of Liège; 1988. 13–26.

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